# US Domestic Vehicle Communication Software Manual

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# Safety Information

For your own safety and the safety of others, and to prevent damage to the equipment and vehicles upon which it is used, it is important that the accompanying *Safety Information* be read and understood by all persons operating, or coming into contact with, the equipment. We suggest you store a copy near the unit in sight of the operator

This product is intended for use by properly trained and skilled professional automotive technicians. The safety messages presented throughout this manual are reminders to the operator to exercise extreme care when using this test instrument.

There are many variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. Because of the vast number of test applications and variations in the products that can be tested with this instrument, we cannot possibly anticipate or provide advice or safety messages to cover every situation. It is the automotive technician's responsibility to be knowledgeable of the system being tested. It is essential to use proper service methods and test procedures. It is important to perform tests in an appropriate and acceptable manner that does not endanger your safety, the safety of others in the work area, the equipment being used, or the vehicle being tested.

It is assumed that the operator has a thorough understanding of vehicle systems before using this product. Understanding of these system principles and operating theories is necessary for competent, safe and accurate use of this instrument.

Before using the equipment, always refer to and follow the safety messages and applicable test procedures provided by the manufacturer of the vehicle or equipment being tested. Use the equipment only as described in this manual.

Read, understand and follow all safety messages and instructions in this manual, the accompanying safety manual, and on the test equipment.

## Safety Message Conventions

Safety messages are provided to help prevent personal injury and equipment damage. All safety messages are introduced by a signal word indicating the hazard level.

**DANGER**

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or to bystanders.

**WARNING**

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to the operator or to bystanders.

**CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury to the operator or to bystanders.

Safety messages contain three different type styles.

- Normal type states the hazard.
- Bold type states how to avoid the hazard.
- Italic type states the possible consequences of not avoiding the hazard.

An icon, when present, gives a graphical description of the potential hazard.

Example:

**WARNING**

Risk of unexpected vehicle movement.

- **Block drive wheels before performing a test with engine running.**

*A moving vehicle can cause injury.*

# Important Safety Instructions

For a complete list of safety messages, refer to the accompanying safety manual.

## SAVE THESE INSTRUCTIONS

# Table of Contents

# Chapter 1 Using This Manual

The following is an overview of the conventions used in this manual. Some of the illustrations shown in this manual may contain modules and optional equipment that are not included on your system. Contact a sales representative for availability of other modules and optional equipment.

## 1.1 Conventions

This manual uses the conventions described below.

### 1.1.1 Bold Text

Bold text is used for emphasis and to highlight selectable items like buttons and menu options.

Example:

- Press the **Y** button.

### 1.1.2 Terminology

Certain terms are used to command specific actions throughout this manual. Those terms are described below.

#### Select

The term “select” means scrolling to a menu item or other option with the Thumbwheel or Thumb Pad and pressing the **Y** button to confirm the selection.

Example:

- Select **Functional Tests**.

#### Scroll

The term “scroll” means moving the cursor or changing data by turning the Thumbwheel or pressing the Thumb Pad.

Example:

- Scroll to see any other codes and the data list.

### Scan Tool

The term “scan tool” refers to your Snap-on diagnostic tool. When necessary, the term “Snap-on scan tool” will be used to distinguish Snap-on equipment from another diagnostic devices, such as the scan tool from the original equipment manufacturer.

## 1.1.3 Notes and Important Messages

The following messages appear throughout this manual.

### Notes

A note provides helpful information such as explanations, tips, and comments.

Example:

**NOTE:**
For additional information refer to...

### Important

Important indicates a situation which, if not avoided, may result in damage to the test equipment or vehicle.

Example:

**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.

# Chapter 2 Introduction

The US Domestic Vehicle Communication Software (VCS) allows your scan tool to test multiple vehicle systems: engine, transmission, ABS and SRS. The functional and component tests offered by the software allow for simplified diagnostics and troubleshooting.

The US Domestic VCS establishes a data link between the scan tool and the electronic control systems of the vehicle being serviced. This data link allows you to view diagnostic trouble codes (DTCs), serial data and freeze-frame information available from the electronic control module (ECM). On models with bi-directional communication, the VCS also lets you perform certain system and component tests and provides the ability to switch off the malfunction indicator lamp (MIL) after repairs are made.

The amount and type of information and tests available with the US Domestic VCS varies by the year, make, model and equipment options of the test vehicle. With the software you can: interpret electronic control module trouble codes, read input and output signals, perform tests on OBD-II vehicles, test specific systems and components, check the operation of certain actuators (solenoids, valves, and relays), customize your scan tool function, and record and view data movies. Manufacturer specific sections feature detailed locations of hard to find connectors and information on manual code reading. This manual also includes chapters on manufacturer specific data parameters and scan tool specific troubleshooting advice.

The first two chapters of this manual overview safety and usage conventions. The remainder of this manual is divided into the following chapters:

- Chapters 3 and 4 offer testing information and procedures for various Chrysler control systems.
- Chapters 5 and 6 offer testing information and procedures for various Ford control systems.
- Chapters 7 and 8 offer testing information and procedures for various General Motors control systems.
- Chapters 9 and 10 offer testing information and procedures for various Jeep control systems.
- Chapters 11–14 provide data parameter definitions.
- “Appendix A: Troubleshooting” offers advice for troubleshooting scan tool-to-vehicle communication and other issues.
- “Glossary of Terms” lists terms and acronyms used in this manual and in US Domestic manufacturer’s literature.

# Chapter 3 Chrysler Operations

This chapter explains how to begin the scan tool's basic setup and test functions. This information is specific to Chrysler vehicles. For general scan tool functionality, see the user's manual appropriate to your diagnostic tool.

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

- "Chrysler Testing" on page 12
- "Chrysler and Jeep Data Parameters" on page 235
- "Chrysler Communications Problems" on page 707

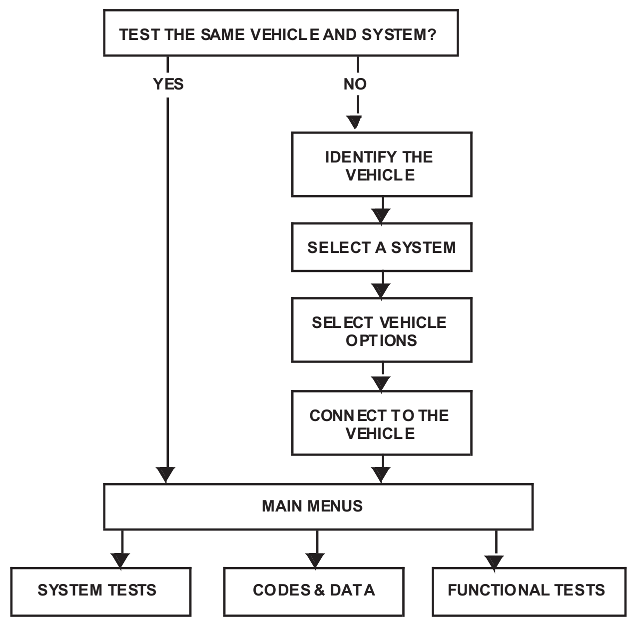


**Figure 3-1** *Basic Chrysler test routine*

## 3.1 Identifying a Vehicle

Many late-model vehicles have an automatic vehicle identification (ID) function that identifies the test vehicle based on information transmitted on the serial data stream. For others, the vehicle must be manually identified by entering specific vehicle identification number (VIN) characters into the scan tool.

### 3.1.1 Manual Identification

You must manually enter the vehicle ID for all 1995 and earlier vehicles. You may also manually identify automatic ID systems.

**Note the following when manually identifying Chrysler vehicles:**

- Because of midyear manufacturing changes in engine computer systems, you should always enter a new identification when you test a different vehicle, even when two vehicles are the same year, model, and have the same engine and accessories.
- Models with Mitsubishi-built engines must be identified as an Asian Import.
- The following models were built using 1986 logic modules:
  - Some 1987 Sundance and Shadow (P-body) models with turbocharged engines
  - Some 1987 Omni, Horizon, and Charger (L-body)

  Vehicle identification for these models should be entered into the scan tool as 1986 models (10th VIN character G for 1986, instead of H for 1987). A 1986 logic module can be identified by the MAP sensor mounted on the module case. The 1987 logic modules use MAP sensors mounted in the engine compartment.
- To test Jeep vehicles with the US Domestic software:
  - 1990 and later—select Chrysler from the manufacturer selection menu
  - 1989 and earlier—select Jeep from the manufacturer selection menu
- Many 1983 and later Chrysler imports, except Maserati TC, are tested with the Asian Import software. The US Domestic software does not test these vehicles, which often have “Diamond Star” imprinted on the body label attached to the firewall.

The vehicle ID process begins from the Software Confirmation menu (Figure 3-2).

```
>Chrysler Database (1983-2006)     V 11.0


Press Y To Continue
```

**Figure 3-2** *Sample Software Confirmation menu*

### 3.1.2 Automatic Identification

Automatic ID is available on most 1996 and later models.

**To automatically identify a vehicle:**

1. Attach the test adapter to the data cable.
2. Connect the adapter to the vehicle.
3. Turn the ignition switch on.
4. Select **Domestic** > **Chrysler**
5. Select the year (10th VIN character) and follow the additional screen requests.

   The scan tool automatically identifies the vehicle and control module, then displays a vehicle ID confirmation screen (Figure 3-3).

```
VIN: -B3-J--C-X------
Vehicle: 1999 DODGE CAR JA
Engine: 2.0L L4 SOHC
Press Y To Continue.  N For New ID
```

**Figure 3-3** *Chrysler Automatic ID confirmation screen*

## 3.2 Selecting a System

Four control systems are generally available from the System Selection menu (Table 3-1, Figure 3-4).

**Table 3-1** *Chrysler control system tests*

| Control System | Tests Available | Description |
|---|---|---|
| Engine | Codes & Data<br>Functional tests<br>System tests | Engine system tests include all available engine control tests from 1983 to the current model year. |
| Transmission | Codes & Data<br>Functional tests | Transmission functional tests include test programs for the following:<br>Transmissions: 42RE, 44RE, 45RFE, 46RE, 47RE<br>Transaxles: A604, 41TE, 42LE |
| Body | Codes & Data<br>Actuator test mode (ATM) tests | Body system tests include:<br>Body computer<br>Driver information systems<br>Electronic ride control<br>Electronic and mechanical instrument cluster tests |
| ABS | Codes & Data<br>Functional tests | ABS functional tests include antilock brake tests on 1990–2006 vehicles with the following ABS control systems:<br>Bendix 4, ABX-4, 6, or 10<br>Kelsey-Hayes<br>Teves |

```
Scroll To Select A System:
>Engine
 Trans
 ABS
```

**Figure 3-4** *Sample Chrysler System Selection menu*

Selecting any one of these systems may cause additional vehicle identification menus to display. For instance, select Engine and a Vehicle Options menu displays (Figure 3-5).

```
Scroll to Select Vehicle Options:
>A/T With A/C
 A/T Without A/C
 M/T With A/C
```

**Figure 3-5** *Sample Chrysler Vehicle Options menu*

This menu describes whether the vehicle has an automatic or standard transmission, and if it has air conditioning. Other menus are similar and all require a selection.

## 3.3 Connecting to the Vehicle

Once a vehicle has been identified and a system has been selected, a scan tool connection message instructs you to use the vehicle test adapters supplied to connect the scan tool for testing (Figure 3-6).

```
Connect OBD-II K13 Adapter To Connector
Located Under Left Side Of Dash, Near
Hood Release.
Press Y To Continue.
```

**Figure 3-6** *Sample Chrysler connection message*

Each test adapter plugs into a specific vehicle diagnostic connector and attaches to one end of the data cable. The other end of the data cable attaches to the scan tool.

The following adapters are available to test Chrysler vehicles:

- CHRY-1—engine test adapter (except LH cars)
- CHRY-2—body, ABS, transmission, and LH-car engine test adapter
- MITSU-1—Mitsubishi engine and transmission test adapter (used for Avenger, Sebring, and Talon models)
- OBD-II—16-pin adapter for vehicles with the 16-pin OBD-II connector
  - The K-7 Personality Key™ must be installed into the OBD-II adapter when used with MITSU-1 for the Avenger, Sebring, and Talon.
  - The K-13 or K-25 Personality Key™ must be installed for all other Chrysler applications
  - The K-25 Personality Key™ must be installed with the CAN-1B adapter for CAN vehicles.

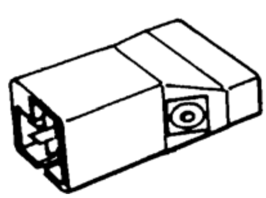

**Figure 3-7** *CHRY-1 adapter*

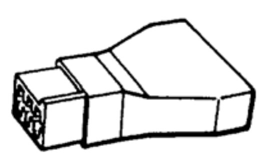

**Figure 3-8** *CHRY-2 adapter*

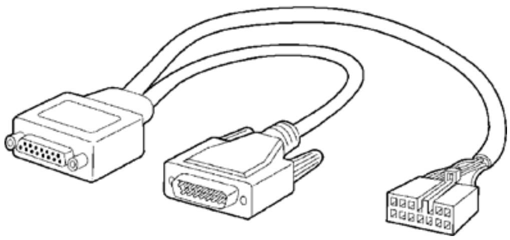

**Figure 3-9** *MITSU-1 adapter*

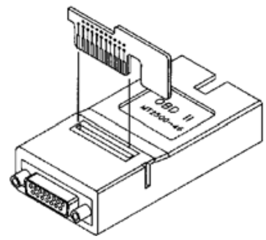

**Figure 3-10** *OBD-II adapter*

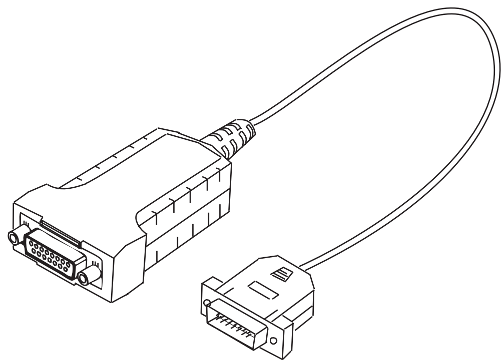

**Figure 3-11** *CAN-1B adapter*

The CHRY-1 test adapter has a socket for connecting the battery power or cigarette lighter power cables. A power cable is not required with the CHRY-2 and the OBD-II test adapters.Table 3-2 contains connector locations for Chrysler vehicles.

**Table 3-2** *Chrysler adapters and connector locations (part 1 of 2)*

| System | Model &year | Adapter | Connector Location |
|---|---|---|---|
| ABS, Body, Automatic Transmission | All 1995 and earlier except Avenger, Cirrus, Neon, Sebring, Stratus, and Talon | CHRY-2 | Under the dash on the driver side. See Figure 3-13 for Concorde, Intrepid, LHS, New Yorker, and Vision. For most others, see Figure 3-12. |
| | 1995 Neon, Cirrus, and Stratus | OBD-II with K-13 Personality Key™ | Under the dash on the driver side near hood release. |
| | 1995 and later: Avenger, Sebring, and Talon | OBD-II with K-7 Personality Key™ and MITSU-1 | Under the dash on the driver side near center console. |
| | Most 1996 and later except Avenger, Sebring, and Talon | OBD-II with K-13 or K-25 Personality Key™ | Under the dash on the driver side. See Figure 3-15. |

**Table 3-2** *Chrysler adapters and connector locations (part 2 of 2)*

| System | Model &year | Adapter | Connector Location |
|---|---|---|---|
| Engine and Transmission | 1995 and earlier Concorde, Intrepid, LHS, New Yorker, and Vision | CHRY-2 | Under the steering wheel. See Figure 3-13. |
| | 1995 Neon, Cirrus, and Stratus | OBD-II with K-13 Personality Key™ | Under the dash on the driver side near hood release. |
| | 1995 and later Avenger, Sebring, and Talon | OBD-II with K-7 Personality Key™ and MITSU-1 | Under the dash on the driver side near center console. |
| | Most 1996 and later | OBD-II with K-13 or K-25 Personality Key™ | Under the dash on the driver side. See Figure 3-15. |
| | All others | CHRY-1 | Under the hood near a strut tower or on the firewall. |

For 1995 and earlier models, diagnostic connectors can be found in one of two places:

- Under the instrument panel (except LH models, Figure 3-12)
- Under the steering wheel (LH models only, Figure 3-13)

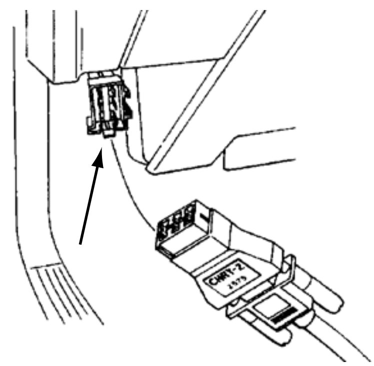

**Figure 3-12** *1995 and earlier diagnostic connector under the instrument panel (except LH models)*

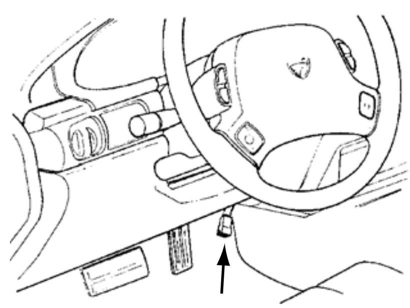

**Figure 3-13** *1995 and earlier diagnostic connector under the steering wheel (LH models only)*

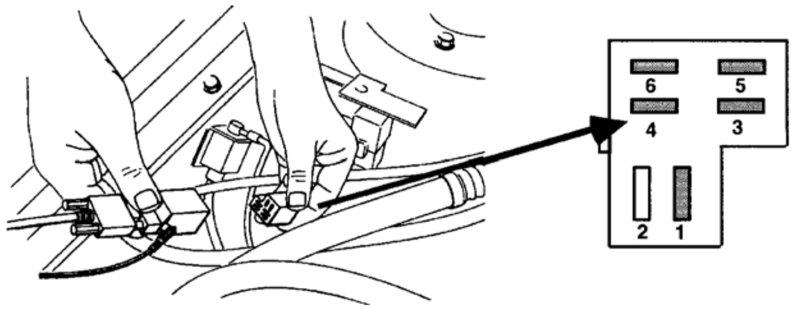


**Figure 3-14** *1995 and earlier diagnostic connector (except LH models)*

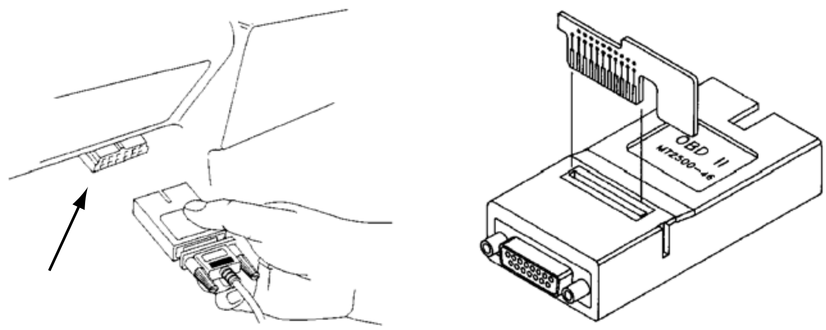


**Figure 3-15** *16-pin connector and the OBD-II adapter with Personality Key™ device*

**To connect the scan tool to the test vehicle:**

1. Be sure the ignition switch is off.
2. Follow the on-screen instructions and connect the scan tool data cable to the test vehicle.
   a. Select the proper test adapter and attach it to the data cable.
   b. Connect the other end of the data cable to the scan tool data port.
   c. Connect the test adapter to the vehicle. Test adapters fit into the connectors only one way. Be sure the connector is installed securely.
3. Switch the ignition on.
4. Press **Y** to continue.

   The main menu for the selected system displays when the scan tool establishes communication with the vehicle data stream.

# 3.4 Chrysler Vehicles Without Self-Diagnostic Capability

The Chrysler vehicles listed below either do not have electronic engine control systems or they have control systems without self-diagnostics capabilities.

**Table 3-3** *Chrysler vehicles without self-diagnostics capability (part 1 of 2)*

| Year | Models |
|---|---|
| pre–1983 | All models |
| 1983–84 | All carbureted engines |
| 1985–87 | 2.6L, 4-cylinder carbureted engine with Mitsubishi control system (VIN code G) |
| 1988 | 5.9L carbureted (VIN code W) |

**Table 3-3** *Chrysler vehicles without self-diagnostics capability (part 2 of 2)*

| Year | Models |
|---|---|
| 1983–91 | All rear-wheel-drive passenger cars (with V8 or 6-cylinder engine) |
| 1983–91 | All diesel-powered vehicles |
| pre–1992 | All Eagle and AMC-Renault models, except 1984–88 4.2L Eagle |

# Chapter 4 Chrysler Testing

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

- Engine
- Body and Transmission
- ABS

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


- "Chrysler Operations" on page 4
- "Chrysler and Jeep Data Parameters" on page 235
- "Chrysler Communications Problems" on page 707


## 4.1 Testing Engine Systems

The following sections contain scan tool testing information for Chrysler engine systems.

### 4.1.1 Control System Summary

This section contains a brief summary of the engine control system variations used on Chrysler carbureted and fuel-injected engines from 1983 to the present.

#### Carbureted Engines

Chrysler domestic-built, 4-cylinder engines used in 1985–87 cars and 1985–88 trucks, as well as 1985–88 V6 and V8 truck engines with carburetors, have diagnostic capabilities. Carbureted 6-cylinder and V8 engines in rear-wheel drive cars do not.

Carbureted engines use a spark control computer (SCC) and diagnostic capabilities are limited to sensor, switch, and actuator tests. Scan tool communication, or serial data, is not available on these engines.

Carbureted engines are placed in the diagnostic mode by blocking the carburetor idle switch open. Vehicles with carbureted engines do not have a malfunction indicator lamp (MIL).

#### Fuel-Injected Engines

All Chrysler fuel-injected engines provide access to computer data in the Codes and Data mode ("Codes and Data Selections" on page 26). Most 1988 and earlier systems must be placed in the diagnostic mode for sensor, switch, and actuator tests by cycling the ignition on-off-on-off-on. Most 1989 and later systems do not require the on-off-on-off-on cycle to enter diagnostic mode.

### Logic and Power Modules

The engine control system computer on most Chrysler fuel-injected engines built from mid-1983 through late 1987 is divided into two separate modules: the logic module and the power module.

- The **logic module** contains the system programs. It receives all sensor signals and processes all information used to control the system actuators.
- The **power module** controls the high-current actuators, such as the ignition coil, the fuel injectors, and the auto shutdown relay.

### SMEC, SBEC, and JTEC

In late 1987, Chrysler introduced the single-module engine controller (SMEC), which combines the logic and the power modules in a single assembly. The single-board engine controller (SBEC I), which was introduced in 1989, combines all logic and power functions onto a single circuit board.

The updated SBEC II is used on 1991–95 models. The SBEC III computer (OBD-II-compliant) is used on vehicles manufactured since mid-1995. In 1996, Chrysler introduced the Jeep/Truck Engine Controller (JTEC) on trucks, which is also OBD-II compliant.

### NGC

Starting in 2002, both SBEC and JTEC controllers began to be replaced by the Next Generation Controller (NGC). The NGC combines the PCM and the TCM into a single unit and can be identified by the four 32-pin connectors on vehicles with automatic transmission, or by the three 32-pin connectors and an empty cavity on vehicles with manual transmission.

## 4.1.2 Functional Tests—1988 and Earlier, 1989 Turbo II

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

The Functional Tests menu (Figure 4-1) shows only the tests available for the identified vehicle.

```
Functional Tests:
>Engine Off Tests     CDR Tester
 Running Tests        Fuel Pressure Test
 Read IGN(+) At DLC
```

**Figure 4-1** *Sample Chrysler Functional Tests menu*

The Functional Tests menu selections for most 1983½ through 1988 and 1989 Turbo II are discussed in the following sections:

- “Engine Off Tests” on page 14
- “Engine Running Functional Tests” on page 18
- “Read IGN(+) at DLC” on page 20
- “CDR Tester” on page 20

- “Fuel Pressure Test” on page 21

## Engine Off Tests

Selecting Engine Off Tests accesses a series of diagnostic tests from Chrysler service manuals. The Engine Off tests follow this general order:

1. A review of fault codes from the PCM.
2. A group of switch tests to check driver-controlled switch operation.
3. An actuator test mode (ATM) to check the operation of actuators, such as fuel injectors, the engine cooling fan and relay, and others.
4. A group of tests to check the operation of sensors, such as the oxygen sensor and the throttle position sensor.

**To conduct Engine Off tests:**

1. Select **Engine Off Tests**.

   A test activation screen displays (Figure 4-2).

```
Turn The Ignition Key Off-Off-On-Off-On,
Without Starting The Engine.  Test
Sequence Will Be:  Fault Codes, Then
Switch Tests, Then Test Menu Selections.
```

**Figure 4-2** *Sample Chrysler Engine Off test activation screen*

2. Cycle the ignition switch to begin the tests.

   Tests are performed in a programmed sequence.
3. Press **Y** to initiate a test, or **N** to return to the Functional Tests menu.

### *Fault Codes*

If there are any codes are present, they display in numerical order between 88 and 55.

- *88* signals the start of the fault code display.
- *55* signals the end of the code display.

DTCs may be classified as either “hard” or “soft” codes. Some control modules indicate if a code is hard or soft on the screen, but many do not.

- **Hard codes** indicate a problem that exists at the time of testing.
- **Soft codes** indicate a problem that occurred in the past but is not present now. These may also be referred to as “history” codes, “continuous memory” codes, or another name.

**To distinguish between hard and soft codes:**

1. Clear the PCM memory and reenter Codes and 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.

**To view fault codes:**

- Turn the ignition key on and off three times within five seconds and leave it on.

  If codes are not present, the following message similar to the following displays (Figure 4-3).

```
88 Start Of Fault Code Report.
55 End Of Faults.  Press Y To Continue.
```

**Figure 4-3** *Sample Codes Not Present screen*

If codes are present, a message similar to Figure 4-4 displays.

```
88 Start Of Fault Code Report.
13 MAP Signal Not Changing At Startup
14 MAP Sensor Open Or Shorted
21 02 Sensor Signal Not Present
```

**Figure 4-4** *Sample Codes Present screen*

### *Switch Tests*

Switch tests are available from the fault codes display.

Keep hands and equipment test leads away from the electric cooling fan and other engine components during the switch tests. The fan and other actuators may operate without warning.

**To conduct a switch test:**

1. Press **Y** after fault codes display.

   The Switch Test screen displays (Figure 4-5).

```
Test For Switch Operation:  Brake Pedal,
Neutral Safety/Backup, A/C Clutch, And
Vehicle Speed Sensor.  Y To Continue.
       - 00 - Switch Is Off - 00 -
```

**Figure 4-5** *Sample Switch Test screen*

   The specific switches on the vehicle are listed on the second and third lines of the display.

2. Actuate any of the switches listed in the display to check its operation.

   As the switch position changes, the fourth line indicates either 88 for on or 00 for off. These are Chrysler change of state symbols.

3. Press **Y** to open the Engine Off Functional Tests Menu (Figure 4-6).

```
Engine Off Functional Test Menu:
>Review Codes         Print Codes
 ATM Tests            Sensor Tests
 Clear Codes
```

**Figure 4-6** *Sample Chrysler Engine Off Functional Test Menu*

See the following sections for descriptions of engine off functional tests.

### Review Codes

When fault codes are displayed at the beginning of the engine off tests, the scan tool records them in memory. Selecting Review Codes displays the complete code list in memory without waiting for the PCM to transmit a new list.

### Clear Codes

Selecting Clear Codes erases codes from the vehicle PCM, not from scan tool memory. The code list stays in scan tool memory for later review or printing until the fault code display operation is repeated.

The clear codes operation is the same as that described in "Clear Codes" on page 29.

### Print Codes

Selecting Print Codes prints the list of fault codes stored in scan tool memory. See the user's manual for your diagnostic tool for printer setup details.

### ATM Tests

Selecting ATM Tests initiates actuator test mode (ATM), which is used to check the operation of system actuators. The ignition must be on and the engine must be off to begin the ATM tests.

For 1983–88 vehicles, except 1983–84 EFI and turbo models, the PCM stays in the last ATM selection made until the ignition is switched off or the test time limit expires.

Keep hands and equipment test leads away from the electric cooling fan and other engine components during the ATM tests. The fan and other actuators may operate without warning.

**To stop the actuation:**

- Either switch off the ignition or select another test. For 1989 vehicles, the ATM test stops as each individual test is exited.

**To conduct ATM tests for 1983–84 EFI and Turbo:**

1. Select **ATM Tests**.

   The the following screen displays (Figure 4-7).

```
Press Y To Start (Stop) ATM Test.
Ignition Coil, AIS Motor & Fuel Injectors
Should Activate Every 2 Seconds.
Press N For Test Menu.
```

**Figure 4-7** *Sample 1983–84 Chrysler ATM test screen*

2. Press **Y** to start.

The ignition coil, automatic idle speed (AIS) motor, and injectors cycle on and off until **Y** is pressed again to stop the cycle.

3. Press **N** to return to the ATM Test Menu.

**To conduct an ATM test for all other vehicles:**

1. Select **ATM Tests**.

   The ATM test menu displays (Figure 4-8).

```
Scroll To Select A Test.
>01 Ignition Coil
 02 Fuel Injectors
 03 Automatic Idle Speed (AIS) Motor
 04 Radiator Fan Relay
 05 A/C WOT Cutout Relay
 06 Shutdown Relay
 07 Canister Purge Solenoid
 08 Shift Indicator Light
 09 Alternator Field
 10 Auto Trans Lockup Solenoid
 11 EGR Solenoid
```

**Figure 4-8** *Complete ATM test menu*

2. Select the desired test.

   The ATM number and the name of the actuator display on the top line (Figure 4-9).

```
03 Automatic Idle Speed (AIS) Motor
Should Switch Regularly For 5 Minutes.
Press Y For Next Test
Press N For Test Menu
```

**Figure 4-9** *Sample Chrysler ATM test activated screen*

3. Press **Y** to end the test and proceed to the next test in the sequence.

### *Sensor Tests*

Selecting Sensor Tests checks the operation of individual sensors with the engine off.

**NOTE:**
Sensor tests are not available on 1983–85 models with limited ATM tests.

Values displayed in these sensor tests are the actual sensor signals. They are not default values used by the PCM in the case of sensor failure.

**To conduct sensor tests:**

1. Turn the ignition on with the engine off.
2. Select **Sensor Tests**.

A menu of individual tests displays. Selections vary for different vehicles, but the menu for a fuel-injected engine appears similar to Figure 4-10.

```
Scroll To Select A Test.
>01 Battery Temp Sensor (Volts)
 02 Oxygen Sensor (Volts)
 03 Charge Temp Sensor (Volts)
 04 Coolant Temp Sensor (Volts)
 05 Throttle Position (Volts)
 06 Battery Voltage (Volts)
 07 MAP Sensor (Volts)
 08 Speed Control Switches
```

**Figure 4-10** *Complete sensor test menu for a fuel-injected engine*

3. Select the desired test.

   The selected sensor test number and the name of the sensor display on the top line (Figure 4-11). The measured value of the input signal from the sensor to the PCM display at the right. The input signal displays as voltage, temperature, or another value.

```
02 Oxygen Sensor (Volts) = 0.4
........................................
Press Y For Next Semsor Test
Press N For Sensor Test Menu
```

**Figure 4-11** *Sample Chrysler sensor test display*

4. Press **Y** to end the test and proceed to the next test in sequence.

## Engine Running Functional Tests

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

Selecting Running Tests checks the operation of the AIS motor and the sensors.

**NOTE:**
These functional tests are not available on 1983–85 models with limited ATM tests.

During engine running tests, the scan tool LEDs are activated to indicate two engine-operating conditions:

- LED 1 turns on when exhaust oxygen content is rich and off when the exhaust is lean.
- LED 3 flashes when engine pinging is detected by the knock sensor.

**To conduct engine running functional tests:**

1. Select **Running Tests**.
2. Switch the ignition off, then start the engine.
3. Press **Y** to continue.

The Engine Running Functional Tests Menu displays (Figure 4-12).

```
Engine Running Functional Tests Menu
>AIS Motor Test (Increase Idle Speed)
 Continue To Sensor Test Menu
L1=Rich Exhaust       L3=Knock Detected
```

**Figure 4-12** *Chrysler Engine Running Test menu*

Two choices are available from the menu:

- AIS Motor Test (Increase Idle Speed)
- Continue To Sensor Test Menu

### *AIS Motor Test*

Selecting AIS Motor Test checks the operation of the automatic idle speed (AIS) motor.

**To conduct an AIS motor test:**

1. Select **AIS Motor Test**.
   The idle speed increases to a maximum of 1500 RPM.
2. Press **Y** and engine speed returns to normal idle.
   As idle speed starts to increase, the second line of the display changes (Figure 4-13).

```
Engine Running Functional Tests Menu
 AIS Motor Test (Increase Idle Speed)
 Continue To Sensor Test Menu
L1=Rich Exhaust       L3=Knock Detected
```

**Figure 4-13** *AIS motor test screen*

3. Cycle the AIS motor by alternately pressing **Y**.
4. Deselect AIS Motor Test or press **N** to end the test.

### *Sensor Tests*

Selecting Continue To Sensor Test Menu Menu displays a menu of engine running sensor tests, which operate the same as those previously described for engine off sensor tests (see “Sensor Tests” on page 19). Selections vary for different vehicles, but all menus are similar.

As in Codes and Data, the values displayed in these tests may be default values used by the PCM in case of sensor failure.

**To conduct engine running sensor tests:**

1. Select **Continue To Sensor Test Menu**.
   A menu of individual tests displays (Figure 4-14).

```
Scroll To Select A Test
>61 Battery Temp Sensor (Volts)
 62 Oxygen Sensor (Volts)
 63 Charge Temp Sensor (Volts)
```

**Figure 4-14** *Sample Sensor Tests menu*

2. Select the desired test.
   A value for the selected test displays (Figure 4-15).

```
61 Battery Temp Sensor (Volts) = 2.5

Press Y For Next Semsor Test
Press N For Sensor Test Menu
```

**Figure 4-15** *Sample Battery Temperature Sensor test screen*

## Read IGN(+) at DLC

The Read IGN(+) AT DLC selection from the Functional Tests menu displays the ignition supply circuit to the power module (Figure 4-16). It runs from the battery, through the ignition switch, to the power module or to the SMEC or SBEC connector.

```
Turn Key On.  Ignition Supply Voltage At
DLC                     === 12.3 Volts
........................................
                        Press N To Exit
```

**Figure 4-16** *Sample ignition voltage at DLC display*

When selected, the supply, or battery, voltage at the diagnostic connector displays, which should be the same, or close to, vehicle battery voltage. Use this test to check for the following:

- A faulty ignition switch
- Bad connections
- Open fusible links
- Other problems in the voltage supply to the engine control system

## CDR Tester

The CDR tester mode is designed for a technician familiar with Chrysler Diagnostic Readout (CDR) test equipment. In this mode, the scan tool operates exactly like a CDR Tester or a diagnostic readout box (DRB).

In CDR mode, the 2-digit readout provided by the Chrysler tester is shown at the right of “Display” (Figure 4-17).

```
Y Button =
 Hold                    Display = ( 88 )
 ATM                     Hold = Off
 ATM+Hold                ATM =  Off
```

**Figure 4-17** *CDR Tester screen—2-digit readout*

Typical readouts include:

- 88 = start of codes or switch change of state
- 55 = end of codes
- 00 = switch change of state

Other numbers shown may be a fault code number, an ATM or switch test number, or a PCM data reading for a switch, sensor, or actuator. Refer to Chrysler service manuals for specific readout meanings and CDR test procedures.

**To use CDR Tester mode:**

1. Select **CDR Tester**.

   The CDR Tester screen displays (Figure 4-17).
2. Scroll to either **Hold**, **ATM**, or **ATM+Hold**.

   The **Y** button acts as the equivalent button on the Chrysler tester. Selecting ATM+Hold works as both buttons simultaneously.
3. Press **Y** to switch the selected function between On and Off.

## Fuel Pressure Test

Selecting Fuel Pressure Test from the Functional Tests menu energizes the auto shutdown (ASD) relay to operate the electric fuel pump and pressurize the fuel rail or throttle body, which allows you to check fuel system pressure.

Fuel pressure is limited to the relief pressure of the fuel pressure regulator. A regulator holds a specified pressure for a certain time.

If previous tests were performed, the PCM may be in the self-diagnostic mode, which is activated by turning the ignition key on-off-on-off-on. If so, the PCM cycles through ATM tests in the background during the fuel pressure test. This does not affect test results or PCM operation.

**NOTE:**
To avoid unnecessary actuator operation, it is best to crank the engine briefly, then turn the ignition off before testing.

**To conduct a fuel pressure test:**

1. Select **Fuel Pressure Test**.

   A test activation screen displays (Figure 4-18).

```
Turn Key On.  To Activate/Deactivate
Fuel Pump, Press Y.  Read Pressure With
Gauge.  Press N To Exit.
```

**Figure 4-18** *Fuel Pressure test activation screen*

2. Turn the ignition on with the engine off.
3. Press and hold **Y** to energize the relay and operate the pump.

   The fuel pump operation is shown on the bottom line (Figure 4-19).

```
Turn Key On.  To Activate Fuel Pump,
Press And Hold Y.  Read Pressure With
Gauge.  Press N To Exit.
 Fuel Pump On - Pressurizing System
```

**Figure 4-19** *Chrysler fuel pressure test screen—fuel pump operation*

4. Release the **Y** button to de-energize the relay.
5. Press **N** to exit and return to the Functional Tests menu.
6. Connect a pressure gauge to the fuel rail or throttle body to read regulated pressure or to test for a leaking pressure regulator. Refer to a Chrysler service manual for specifications and procedures.

   If the **Y** button is held down for more than a few seconds, the PCM recognizes that the auto shutdown relay is not turning on and off as expected and sets fault code 42. This is a false code that may be disregarded under these circumstances. If in doubt, clear the codes from the PCM, then recheck for codes. If code 42 does not reappear, it was a false code resulting from the fuel pressure test.

## 4.1.3 Functional Tests—1989 and Later

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

The Functional Tests menu for most 1989 and later vehicles (Figure 4-20), except Turbo II models, are different from the menu for 1988 and earlier models (see “Functional Tests—1988 and Earlier, 1989 Turbo II” on page 13).

```
Functional Test:      Module Info
>ATM Tests            Min Airflow Test
 AIS Motor Test       Fuel Pressure Test
 Read IGN(+) At DLC   Reset EMR Lamp
```

**Figure 4-20** *Sample late-model Chrysler Functional Tests menu*

The Read IGN(+) at DLC and Fuel Pressure Test selections work the same as explained in “Read IGN(+) at DLC” on page 20 and “Fuel Pressure Test” on page 21.

Other functional tests for 1989 and later vehicles are discussed in the following sections:

- “ATM Tests” on page 23
- “Module Info” on page 24
- “Minimum Airflow RPM” on page 25
- “Reset EMR Lamp” on page 25


**NOTE:**
Do not operate the DIS ATM tests after operating the fuel injector ATM tests. Start and run the engine to remove any residual air-fuel charge before operating DIS ATM tests.

## Engine-Off and Engine-Running Tests

The 1989 and later tests do not distinguish between engine-off and engine-running conditions. If a particular test cannot be performed with the engine either off or running, the scan tool either does not accept the test command or a lost communication message displays. If so, return to the test menu and make another selection, or either stop or start the engine for the selected test.

## ATM Tests

The ATM Tests selection is similar to that previously discussed for 1988 and earlier models (see “ATM Tests” on page 16) and must be performed with the engine off. However, there are some additional tests available and some different functions. Only the differences are explained here.

Test with the key on and engine off. The vehicle does not accept ATM test commands if the engine is running.

The ATM Exit menu offers two choices that require a yes or no selection (Figure 4-21):

- Exit ATM test mode and turn the actuator off.
- Exit the ATM test mode and leave the actuator on.

```
To Exit And Turn Off Actuator,
Press N.
To Exit And Leave Actuator On,
Press Y.
```

**Figure 4-21** *Sample Chrysler ATM test exit display*

During troubleshooting, leaving the actuator on is useful when you want to exit an ATM test so the scan tool may be used to monitor related engine data parameters or check a signal.

Making a selection returns you to the ATM test selection screen. Select a new ATM test to turn off an actuator that has been left on after exiting, or turn the ignition switch off.

### *Direct Ignition System (DIS) ATM Tests*

This selection, available on some 1990 and later engines with direct (distributorless) ignition systems, fires each ignition coil.

**WARNING**

An active test may fire a spark plug in a cylinder that contains an air-fuel charge. This may cause a backfire through the throttle body or cause a vehicle with a manual transmission to lunge if the transmission is in gear and the parking brake is not set.

**CAUTION**

Do not operate the DIS ATM tests after operating the fuel injector ATM tests. Start and run the engine to remove any residual air-fuel charge before operating DIS ATM tests.

### AIS Motor Test

Selecting AIS Motor Test runs a test that should be performed with the engine running.

**To conduct an AIS motor test:**

1. Select **AIS Motor Test**.

   The AIS Motor Test screen displays (Figure 4-22).

```
        **  AIS Motor Test  **
Scroll Resired Idle RPM.
Des Idle RPM____925    Engine RPM____1023
Press N For Functional Tests Menu
```

**Figure 4-22** *Sample AIS motor test screen*

2. Scroll to obtain the desired RPM.

   As you scroll, the PCM commands the AIS motor to extend and retract.

### Module Info

Selecting Module Info checks automatic vehicle ID at any time when testing a 1989 or later model. More importantly, it is used to double-check and verify a manually entered ID.

**To check the test vehicle ID:**

1. Select **Module Info**.

   A gathering information screen briefly displays, followed by one of two module information screens. If the module information check matches that of the vehicle ID already entered in the scan tool, the display is similar to Figure 4-23.

```
SBEC-II P/N: 52345008-B Emissions: CAL
Vehicle: 1991 Chrysler FWD Car        A/C
Engine: 3.0L V-6 MPI                  A/T
Press N To Exit.
```

**Figure 4-23** *Sample vehicle ID match screen*

   If the module information check does not match the vehicle ID entered in the scan tool, the display is similar to Figure 4-24. A selection is required to continue.

```
SBEC-II P/N: 52345008-B Emissions: CAL
Vehicle: 1991 Chrysler FWD Car       A/C
Engine: 3.0L V-6 MPI                 A/T
ID Mismatch.  Press Y For New, N For Old.
```

**Figure 4-24** *Sample vehicle ID mismatch screen*

2. When a screen like Figure 4-24 displays, press **Y** to overwrite the previous identification in memory and store the new, correct identification, or press **N** to ignore the new identification and continue to operate with the previously entered identification.

## Minimum Airflow RPM

Selecting Min Airflow RPM runs a test that is available for most 1989 and later models. When selected, the AIS motor retracts to close the throttle and obtain the minimum idle speed, and the air-fuel mixture is enriched (Figure 4-25).

```
  ** Minimum Airflow Idle Speed Test **
AIS Motor Closed And Fuel Renrichment
Provided.             Engine RPM_____924
Press N For Functional Tests Menu.
```

**Figure 4-25** *Sample minimum airflow RPM test display*

Refer to the appropriate Chrysler service manual for model specific test procedures and specifications.

## Reset EMR Lamp

Selecting Reset EMR Lamp resets the emission maintenance reminder (EMR) lamp on some 1989 and later vehicles which lights at approximately 60,000 miles to alert the driver that the vehicle should have emission-related services performed. The EMR lamp cannot be turned off manually; it must be reset through the PCM.

The Reset EMR Lamp selection is on the Functional Tests menu for all 1989–94 vehicles and some 1995 and later vehicles, but some of these models do not have an EMR lamp on the instrument panel even though EMR memory exists in the PCM. The scan tool resets this memory, though there is no instrument panel lamp to be affected.

**To reset the EMR lamp:**

1. Switch the ignition on without starting the engine.
2. Select **Reset EMR Lamp**.

   A confirmation screen displays.
3. Press **Y** to reset the lamp.

   When **Y** is pressed, a “resetting EMR lamp” message briefly displays, then the message changes to indicate the EMR lamp is reset (Figure 4-26).

```
Requested!  If Lamp Off, Reset Complete.
```

**Figure 4-26** *EMR lamp reset complete screen*

4. Press **N** to return to the Functional Tests menu.
5. If the ignition is off and the vehicle does not respond to the lamp reset request, a “no response” message displays. If so, press **N** to return to the menu and repeat the operation. If the vehicle repeatedly transmits no response, refer to Chrysler test procedures to diagnose the problem.

## 4.1.4 Codes and Data Selections

The Codes and Data selection on the Main Menu is available on all fuel-injected Chrysler vehicles. It is not available for carbureted engines. Because the scan tool does not affect PCM or engine operation, the vehicle can be driven in the Codes and Data mode.

The Codes and Data selection for Chrysler vehicles opens a display of DTCs and ECM data on some models. On others, it opens the Codes and Data Menu that offers up to three choices:

- Codes & Data
- Secondary Indicators
- 1 Trip Codes

Each choice offers a different way of viewing PCM data. Codes and Data is most often used because it displays all data available on the PCM data stream, including any codes.

### Default Values—1988 and Earlier

In the Codes and Data mode for 1988 and earlier vehicles, the scan tool displays the parameter values on which the PCM is operating. If certain sensors fail, the PCM substitutes a value from its own program for the faulty sensor signal. This is called a “default” value, and this is what the scan tool displays in Codes and Data.

If any parameter value in the Codes and Data display appears to be different from what you expect, select Engine-Off Sensor Tests on the Functional Tests menu and compare the reading for the same sensor.

In the Engine-off Sensor Test mode, the scan tool displays the actual sensor signal, not a default value. If the values for the same sensor are different in Codes and Data and the Engine-off Sensor Tests, the PCM is operating on a default value.

### Codes and Data

Selecting Codes and Data displays the PCM data list and trouble codes (Figure 4-27).

```
   RPM_1234  O2(V)__0.45  INJ(mS)__6.3
 **  Codes & Data.  OK To Drive  **
No Codes Present
IGN Cycles 1_____51   IGN Cycles 2_____51
```

**Figure 4-27** *Sample Chrysler Codes and Data screen*

The top line remains fixed and the second line is the test mode name, followed by the data list and any codes that may be present (Figure 4-28).

```
   RPM_1234  O2(V)__0.45  INJ(mS)__6.3
 **  Codes & Data.  OK To Drive  **
13 MAP Signal Not Changing At Startup
21 O2 Sensor Signal Not Present
```

**Figure 4-28** *Sample Chrysler Codes and Data display with codes present*

### *Fault Code Display—1989–95*

The fault code display for most 1989–95 Chrysler vehicles is unique. Instead of just displaying the fault message (code description) in full capital letters as shown in Figure 4-28, a longer message displays with words using lowercase and uppercase letters as shown below.

- 23 air Charge temp sensor Voltage too Low

Words in lowercase add descriptive content. Words in uppercase form the fault message as it appears in the 1989–95 Chrysler driveability manuals and the dealer Diagnostic Readout Box (DRB-II). The DRB-II displays a message but not a code number, as shown below.

- Charge Voltage Low

**NOTE:**
Most 1989–95 Chrysler driveability manuals index the fault messages that identify the test procedures alphabetically, not by code number.

**To get code numbers on 1989–95 vehicles:**

- Cycle the ignition key from the off to on positions three times.
  Codes are displayed by flashing the Check Engine lamp.

### *False Fault Codes*

Some Chrysler vehicles may display false fault codes in Codes and Data. These usually are the result of accessory circuits in the control system for options that are not installed on the vehicle. In these cases, the circuit is continuously open. If that circuit is included in the fault code library for the vehicle, the PCM transmits a code to the scan tool.

For example, a 1988 Dakota truck may have either a 3-speed or 4-speed automatic transmission. All models have the circuitry for a fourth gear overdrive solenoid, and the PCM may transmit a false code 45 for a truck with a 3-speed transmission. For trucks without a lockup torque converter, the PCM may transmit a false code 37 for the lockup solenoid.

To avoid confusion by false codes, always verify that the vehicle has the component for which the PCM transmits a code.

### Secondary (SEC.) Indicators

Secondary indicators are PCM-detected faults that are not stored in memory. Selecting SEC. Indicators only displays the faults when they are present (Figure 4-29). Intermittent faults may flicker in this mode.

```
       Vehicle Saxes Max Of 2 Indicators
      ***  Secondary Indicators  ***
P0601 Internal Controller Failure
P0340 No Cam Signal At PCM
```

**Figure 4-29** *Sample secondary indicators screen*

### 1 Trip Codes

One-trip codes are faults that occur once. If these faults occur a second time, the PCM sets a DTC and the scan tool removes the fault from the 1 Trip Code list.

Selecting 1 Trip Codes from the Codes and Data Menu displays a screen like Figure 4-30.

```
                 Code List
   ***  1 Trip Vehicle Fault Codes  ***
No Codes Present
[End Of List]
```

**Figure 4-30** *Sample 1 Trip Code screen*

## 4.1.5 Memory Resets

Selecting Memory Resets on the Codes and Data Exit menu for most 1990 and later Chrysler vehicles allows you to reset the adaptive memory for a number of electronically controlled systems (Figure 4-31).

```
>Clear Codes             All Adaptives
 Adaptive Fuel           IAC(AIS) Position
 Min Throttle            Battery Disconnect
 Cam/Crank In-Sync       Re-Learn Cam/Crank
```

**Figure 4-31** *Sample Chrysler Memory Reset menu*

Memory Resets selections are discussed in the following sections:

- “Clear Codes” on page 29
- “Adaptive Fuel Reset” on page 29
- “Minimum Throttle Reset” on page 30

- "Idle Air Control (IAC) Reset" on page 30
- "Cam/Crank In-Sync Reset" on page 30
- "All Adaptives Reset" on page 30
- "Battery Disconnect" on page 30
- "Relearn Cam/Crank" on page 31


## Clear Codes

For some 1990 and later vehicles, Clear Codes appears on the Memory Reset menu, for others this selection is on the Codes and Data Exit menu. On 1989 Turbo II and most 1987½ and 1988 models, Clear Codes appears on the Functional Tests Menu. In any case, it functions the same.

**To clear codes:**

1. Select **Clear Codes**.
   A fault code erase confirmation message displays (Figure 4-32).

```
Fault Code Erase Routine (KOEO):


AAre You Sure? Press Y Or N
```

**Figure 4-32** *Fault code erase confirmation message*

2. Press **Y** to select or **N** to cancel.
   When codes are cleared, the following screen displays (Figure 4-33).

```
Fault Code Erase Routine (KOEO):


Press N To Resume.
```

**Figure 4-33** *Fault codes cleared screen*

3. Press **N** to return to the Codes and Data display.
   If the code-clearing operation fails for any reason, repeat the procedure.

## Adaptive Fuel Reset

On vehicles with an Adaptive Fuel selection, the PCM is programmed with factory-set injector pulse-width (PW) values. To adapt to changes in driving conditions, fuel quality, engine wear, and other variables, the PCM adjusts the programmed values by increasing or decreasing injector PW.

This value may display on the Codes and Data list as added fuel in microseconds, fuel percent, or both. When Adaptive Fuel is selected, the adaptive fuel values return to their initial settings.

## Minimum Throttle Reset

On vehicles with a MIN (minimum) Throttle selection, the PCM is programmed with a factory-set closed throttle position. To adjust this value, the PCM monitors throttle position sensor voltage and interprets the lowest voltage received as the closed throttle position.

This value may also appear on the Codes and Data list as minimum TPS voltage. The minimum throttle reset returns the value to its initial setting.

## Idle Air Control (IAC) Reset

On vehicles with an IAC (AIS) Position selection, the PCM is programmed with a factory-set value for the automatic idle speed (AIS) motor step position. The PCM adjusts this value, which may display on the data list as AIS steps, as necessary.

Select IAC (AIS) Position to reset to the factory preset value.

## Cam/Crank In-Sync Reset

On vehicles with a Cam/Crank In-Sync selection, the PCM is programmed with a factory-set value for camshaft-to-crankshaft synchronization. This procedure is typically performed after internal engine repairs are made.

Select Cam/Crank In-Syn to reset to the factory preset values.

## All Adaptives Reset

When available, the All Adaptives selection simultaneously resets the adaptive fuel, minimum throttle, and the AIS motor values to their initial settings. This selection also clears the adaptive numerator, which requires the vehicle be driven to relearn.

The adaptive numerator is a PCM-calculated value unique to each engine. The PCM uses the adaptive numerator to accurately determine crankshaft position for misfire diagnosis.

For the engine to run properly, the PCM must accurately calculate a new adaptive numerator value. Do this by performing the adaptive numerator relearn procedure.

**To perform an adaptive numerator relearn:**

- While driving the vehicle on a level street without load, decelerate to a minimum of 20 MPH (32 KPH) at least three times without braking.

## Battery Disconnect

Selecting Battery Disconnect allows you to reset all PCM memories as if the battery had been disconnected. This also clears the adaptive numerator, which requires the vehicle be driven in order to relearn.

### Relearn Cam/Crank

The Relearn Cam/Crank selection resets PCM camshaft and crankshaft learned values. Perform this function only after replacing one or more of the following:

- Camshaft
- Camshaft position target magnet
- Camshaft position sensor
- Cylinder head
- Cylinder block
- Water pump
- PCM

## 4.1.6 System Tests

The System Tests selection from the Main Menu (CHRY ENG) is available on most 1994 or 1996 and later engines, except diesels. This selection does not display if it is unavailable for the identified vehicle.

Available system tests are discussed in the following sections:

- “Purge Vapors Test” on page 31
- “EGR Systems Test” on page 32
- “Read VIN” on page 32
- “Generator Field Test” on page 33
- “Misfire Counters” on page 34
- “Set Sync Signal Test” on page 34
- “Speed Control” on page 34
- “Theft Alarm Status—1990–95” on page 34
- “EVAP Monitoring Test” on page 35

### Purge Vapors Test

The Purge Vapors Test selection is available on 1994 and later models and displays various evaporative emissions parameters and allows manual control of the purge valve.

**To conduct a Purge Vapors test:**

1. Select **System tests > Purge Vapors Test**.

   The purge vapors test screen displays (Figure 4-34).

```
Purge Status___Norm   Engine RPM_____1538
* Y To Switch Between Norm, Flow & Block
No Codes Available In this Mode
UPSTRM O2S(V)__1.99   DWNSTRM O2S(V)_1.00
```

**Figure 4-34** *Sample Purge Vapors test screen*

2. Press **Y** to switch the state of the purge valve between normal, flow, and block.
   The selected purge valve state is shown as “Purge Status” on the display.

## EGR Systems Test

Selecting EGR Systems Test on 1994 and later models displays various parameters related to EGR control and operation and allows manual control of the EGR valve.

**To conduct an EGR Systems test:**

1. Select **System tests > EGR Systems Test**.
   The EGR systems test screen displays (Figure 4-35).

```
Purge Status___Norm    Engine RPM_____1217
* Y To Switch Between Norm, Flow & Block
No Codes Available In this Mode
MAN VAC(kPa)______19   IAC (Steps)______51
```

**Figure 4-35** *Sample EGR systems test screen*

2. Press **Y** to switch the state of the EGR valve between normal, flow, and block.
   The selected EGR valve state is shown as “EGR Status” on the display.

## Read VIN

Selecting Read VIN on 1996 and later models displays the VIN stored in the PCM. If a replacement PCM has not yet been programmed with a VIN, the scan tool guides you through the PCM VIN programming procedure.

Read this entire procedure before beginning. The PCM can only be programmed with a new VIN once! If a false VIN is programmed into the PCM, the PCM must be replaced with a new one.

**To display the VIN:**

1. Select **SYstem Tests > Read VIN**.
   If a VIN is already stored in the PCM, a “controller cannot be programmed” message appears, and you may press **N** to exit.
   If a VIN is not stored, the VIN entry screen displays (Figure 4-36). A carrot on the third line points to a VIN position on the second line.

```
PCM Requires VIN Reprogramming
Please Enter New VIN:  XXXXXXXXXXXXXXXX
                       ^
Press Y To Continue.
```

**Figure 4-36** *Chrysler PCM VIN entry screen*

2. Select each character of the vehicle VIN.

3. Press **N** to back up in the VIN entry sequence and make corrections, if necessary.

   After the 17th character is selected, a confirmation screen displays (Figure 4-37).

```
PCM Requires VIN Reprogramming
Please Enter New VIN:  1C3EJ56H2TN201213
Are You Sure You Want To Program The PCM
With The Above VIN?
```

**Figure 4-37** *Chrysler PCM VIN entry confirmation screen*

4. Before pressing **Y**, carefully compare the VIN that appears on the screen to the characters on the VIN plate.

---

**IMPORTANT:**
For the vehicle to run properly, the programmed VIN must match the VIN plate.

---

5. Press **Y** to permanently program the displayed VIN into the PCM, or **N** to return to the VIN entry screen.

   When **Y** is pressed, the PCM checks to verify that the entered VIN is a valid DaimlerChrysler Motors VIN.

   – If the PCM does not recognize the VIN as valid, a "the VIN that was entered is not valid!" message displays.
   – If the VIN is valid, a "VIN program successful!" message displays.

## Generator Field Test

Selecting Generator Field Test on 1996 and later models displays various parameters related to the vehicle charging system. It also allows manual control of the generator field.

**To conduct a Generator Field test:**

1. Select **System Tests > Generator Field Test**.

   The generator field test screen displays (Figure 4-38).

```
Generator Field_Full  Engine RPM____1561
* Y To Switch Between Norm, Full & Off
No Codes Available In this Mode
Battery Volts___13.1  Des Charge(V)__15.0
```

**Figure 4-38** *Sample generator field test screen*

2. Press **Y** to switch the generator field state between normal, full, and off.

   The selected field state is shown as "Generator Field" on the display.

## Misfire Counters

Selecting Misfire Counters on 1996 and later models displays the number of misfire occurrences for each individual cylinder and the PCM adaptive learn state for the present drive cycle (Figure 4-39).

```
Cyl 1 Misfires____1   Cyl 2 Misfires___0
  ***** OBD II Misfire Counters *****
No Codes Available In this Mode
Cyl 3 Misfires___0    Cyl 4 Misfires___0
```

**Figure 4-39** *Sample misfire counter screen*

## Set Sync Signal Test

Selecting Set Sync Signal Test on 1994 and later models resets fuel injection synchronization (Figure 4-40). This procedure is necessary when certain repairs are made, such as cylinder head removal or timing belt replacement.

```
Set Sync Test  *Engine Must Be Running*
Rotate Dist To Set Distributor(°) To 0
No Codes Available In this Mode
Distributor(°)____0   Engine RPM____1875
```

**Figure 4-40** *Sample set sync signal test screen*

The “Distributor(°)” value refers to fuel synchronization only. Ignition timing is PCM-controlled. Moving the distributor does not set timing.

## Speed Control

Selecting Speed Control on 1990–95 models displays the present speed control operating mode and the reason for the last system disengagement, or cutout. Four speed control parameters display on the speed control status screen as well. Other speed control parameters are available in Codes and Data mode for engine testing.

**To verify that the speed control system is operating properly:**

1. Road test the vehicle with the speed control status screen displayed.
2. Engage and disengage speed control to verify proper operation.

## Theft Alarm Status—1990–95

Selecting Theft Alarm Status Test on 1990–95 models displays the present communication link between the engine control module (ECM) and the theft alarm module (Figure 4-41). Use this test to determine if a no-start is the result of an unauthorized attempt to start the engine.

```
        ** Theft Alarm Status **
System Enabled        No Signal Received
Fuel Allowed
                      Press N To Exit
```

**Figure 4-41** *Sample theft alarm status screen*

The vehicle theft alarm (VTA) system monitors vehicle entry and ignition. During unauthorized entry, the VTA sends a message to the ECM that it is not OK to start the engine. The ECM responds by disabling electronic fuel injection after the engine starts.

### EVAP Monitoring Test

The EVAP Monitoring Test is available on most 2001 and later models. This test will force the PCM to run the evaporative system self test. The test can be used to confirm repairs made to the evaporative system without taking the vehicle on an EVAP drive cycle road test. If the system fails, the test DTCs will be set in Codes or 1 Trip Codes.

# 4.2 Testing Body and Transmission Systems

This section explains how to test 1988 and later models with Chrysler collision detection (CCD) or programmable communication interface (PCI) multiplex communication bus systems. Vehicles with bus communications have multiple electronic control functions, and each function has its own electronic control module (ECM).

## 4.2.1 Bus Communication System Modules

The number and type of bus communication modules used varies for different vehicles. The modules communicate and exchange data over a multiplex network that interconnect them. The network is a multiplex serial data bus. The scan tool, once connected to the bus diagnostic connector, communicates on the network for testing.

The bus communication modules and the functions they control include:

- **Body Computer**—The body computer, or body control module (BCM), controls driver information functions like door ajar and lamp failure indicators, fluid level indicators, and seat belt lamps and chimes. It also contains the electronic odometer circuitry.
- **Serial Bus Traveler**—The traveler is a driver information module that controls the electronic odometer and provides data on fuel consumption and mileage. The serial bus traveler shares some information with other modules on the bus system.
- **Stand-Alone Serial Bus Traveler**—The stand-alone traveler is used on Spirit and Acclaim models (A-bodies). It provides the same information as the serial bus traveler, but it is the only body module used on these models. It shares some data with the engine control module.
- **Electronic Vehicle Information Center (EVIC)**—The EVIC provides the same kind of driver information as the traveler but also includes information on time, outside temperature, and direction. The EVIC module shares data with the engine module and other body modules.

- **Electronic Temperature and Compass**—The electronic temperature and compass module provides the driver with vehicle direction and temperature information. It is located in the overhead console on some models. If the vehicle also has an EVIC module, the temperature and compass module sends information to the EVIC on the bus communication system.
- **Electronic Instrument Cluster**—On models with electronic instrumentation, the electronic instrument cluster module controls the speedometer, odometer, and other instruments. It receives most of its information from the BCM and the engine control module (ECM) on the bus system.
- **Electromechanical Instrument Cluster (MIC)**—On models that have an electrical instrument cluster with analog displays, the electromechanical instrument cluster module controls the speedometer, odometer, and other instruments. The MIC receives most of its information from the BCM and the ECM on the bus communication system.
- **Engine Node**—The engine node module monitors brake fluid level, engine coolant level, and engine oil level. This module transmits information to the BCM and electronic instrument panel on the bus communication system.
- **Air Suspension**—On vehicles that have electronically-controlled air suspension on the body system, the suspension module can be tested through the bus communication system.
- **Automatic Transmission**—On Chrysler electronically controlled transmissions (A604, 41TE, 42LE, and 45RFE), gear selection and clutch applications are controlled through solenoids and servos actuated by the electronic module. The transmission control module (TCM), or the powertrain control module (PCM), receives engine operating data from the engine control module on the bus communication system.

### Bus Module Identification

The scan tool automatically identifies the control modules on all OBD-II vehicles and on pre-OBD-II LH-models during the vehicle identification process.

**To automatically ID vehicles with separate bus communication connectors:**

1. Identify the vehicle through the engine connector.
2. Select the bus system to be tested.
3. Hook up to the bus connector.

## 4.2.2 ATM Tests

The actuator test mode (ATM) tests are available from the Main Menu for some BCMs, while transmission ATM tests are available from some TCM Functional Tests menu. Body system ATM tests are discussed below. Transmission ATM tests are described in “Quick Learn begin test screen” on page 38.

ATM tests are used to check the operation of switches, solenoids, relays, valves, and lamps controlled by the selected module. Specific ATM tests vary for different modules, but all operate in the same way.

For most ATM tests, the BCM pulses the actuator regularly for five minutes, or until **Y** or **N** is pressed. Switching time varies for different actuators: three seconds for some, four seconds for others, and so on. The second line alternates between “test is running” and “test is completed” as the actuator cycles.

The following ATM tests are exceptions to the general rules:

- **Headlamp doors open and closed**—Cycles between OPEN and CLOSE until ATM test is selected.
- **Power door locks**—Operates the door lock motors. This is a one-time test that does not automatically cycle.

**IMPORTANT:**
The power door lock ATM test for the BCM operates the motors to lock the doors, but an ATM test to unlock the doors may not be available. Do not lock the vehicle with the keys inside.

- **Mechanical instrument cluster**—Activates various analog gauges, such as speedometer, tachometer, and fuel. When active, these tests should momentarily deflect the gauge on the vehicle. They do not necessarily cause the gauges to go full scale.

**To conduct body ATM tests:**

1. Select **ATM Tests**.
   An ATM Tests menu displays (Figure 4-42).

```
Scroll To Select A Test
>Wiper Motor
 Courtesy Lamp
 Chime
```

**Figure 4-42** *Sample ATM Tests menu for the BCM*

2. Select the desired ATM test.
   When an ATM test is active, the actuator name displays on the top line (Figure 4-43).

```
Wiper Motor Test
Test Is running (Completed)
Press Y For Next Test.
Press N For Test Menu.
```

**Figure 4-43** *Sample ATM test in progress screen*

### 4.2.3 Functional Tests

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

Selecting Functional Tests opens a Functional Tests menu. Functional tests, including ATM tests, are available on the Main Menu.

Up to five functional tests are available on the menu, as described in the following sections:

- “ATM Tests” on page 23
- “EMCC Reset” on page 39

- “Pinion Factor” on page 40

## ATM Tests

The ATM Tests selection is used to check the operation of certain switches, solenoids, relays, valves, and lamps controlled by the TCM. Specific transmission ATM tests vary for different modules, but all operate as described in “ATM Tests” on page 36.

The ATM tests actuate solenoids in the transmission. The parking brake must be set during the tests. The shift lever must be in park to exit an ATM test. If the shift lever is not in park, the scan tool does not exit the test.

## Quick Learn

Selecting Quick Learn initiates a quick learn test and is usually performed when battery power to the PCM is interrupted. During normal operation, the transmission control module (TCM) continually monitors and “learns,” or updates, clutch volume index (CVI) values.

Newer clutches require less volume, or lower CVI, while worn clutches require more volume, or a higher CVI. If battery power is interrupted, the TCM reverts to baseline values and must “relearn” each clutch circuit.

The transmission learning that occurs during normal operation is intended to compensate for normal wear. However, simply driving the vehicle to “relearn” CVI values is time-consuming, and typically the transmission shift quality is poor. Quick learn allows the TCM to make coarse adjustments quickly, before the vehicle is driven.

**To initiate a quick learn test:**

1. Select **Quick Learn**.
   A “to begin test” screen displays (Figure 4-44).

```
Shift Lever Must Be In Park With Engine
Running.
To Begin Test, Press And Hold Brake.
                      [Press N To Exit]
```

**Figure 4-44** *Quick Learn begin test screen*

2. With the transmission in park and the engine running, press the brake pedal to begin.
   A shift request screen displays (Figure 4-45).

```
Do Not Release Brake!
Test In Progress.
Shift Transmission Into Neutral.
```

**Figure 4-45** *Quick Learn neutral shift request screen*

3. Continue holding the brake and move the shift lever into neutral to continue.
   Some transmission movement may be felt as the TCM corrects neutral shift pattern. Once complete, the display updates. A shift request screen displays (Figure 4-46).

```
Do Not Release Brake!
Test In Progress.
Shift Transmission Into OD.
```

**Figure 4-46** *Quick Learn OD shift request screen*

4. Continue holding the brake and move the shift lever into overdrive (OD) to continue.

   Again, movement in the transmission may be felt. After OD “learning” is complete, the display updates. A “quick learn test complete” message displays.

### *Other Messages During Quick Learn*

During the quick learn functional test, the TCM monitors various operating conditions to ensure accurate “learning.” These conditions include:

- Brake on/off switch
- Shift lever position
- Engine RPM
- Throttle angle
- Transmission oil temperature

If conditions are not what the TCM expects, the scan tool prompts you with various messages. For example, if the transmission temperature is too low when the test is selected, a wait message displays (Figure 4-47).

```
Transmission Not At Normal Operating
Temp.  Wait During Warmup...
                          [Press N To Exit]
```

**Figure 4-47** *Sample Quick Learn prompt message*

Similar messages display if the test is started without the brake pedal being pressed, or if the brake is released during testing. In addition, messages display if engine RPM goes too low, throttle angle goes too high, or the shift lever is not in the proper position.

## EMCC Reset

The EMCC Reset selection resets the electronically-modulated converter clutch (EMCC) logic program. The TCM on late-model vehicles with an A604 or A606 transmission uses an EMCC logic. The EMCC logic adapts, or learns, during the break-in period on a new vehicle, or after being reset on a vehicle in service.

During the first 500 miles after an EMCC reset, there is no EMCC. During miles 500 to 1500, the TCM gradually decreases EMCC from a 200 RPM to a 60 RPM slip.

**To reset the EMCC:**

1. Select **EMCC Reset**.

   A status screen displays (Figure 4-48).

```
        ****  EMCC Break-In  ****
Current Status:  Complete
Press Y To Reset Break-In Status.
Press N To Exit.
```

**Figure 4-48** *Sample EMCC status screen*

The second line indicates the status of the EMCC break-in period. During the first 1500 miles on a new vehicle, or after an EMCC reset, this line reads “in progress,” and then reads “complete” after 1500 miles.

2. Press **Y** to clear the learned EMCC values from memory

   A “sending command” message momentarily displays, followed by a “break-in started” message. This indicates the EMCC has reset.

## Battery Disconnect

Selecting Battery Disconnect momentarily interrupts the power supply (B+) signal to the TCM (Figure 4-49). Battery Disconnect is used to reset all of the TCM learned values, without interfering with the clock or radio presets.

```
     ****  Battery Disconnect  ****
Note:  Must Have Key On, Engine Off
Press Y To Perform Battery Disconnect.
Press N To Exit.
```

**Figure 4-49** *Sample battery disconnect screen*

## Pinion Factor

The TCM used on 1993–2001 models with a 41TE transmission and on 1998–2001 models with a 42LE transmission store a programmable value called pinion factor. The Pinion Factor selection provides a way to adjust speedometer calibration to compensate for a tire size change.

The Controller Antilock Brake (CAB) generates the vehicle speed based on the input from the rear wheel speed sensor, the differential size, and the size of the tires. If these variables are not programmed in, the speedometer will not work and the automatic transmission may exhibit erratic shift quality.

**To reprogram the pinion factor:**

1. Select **Pinion Factor**.

   A “tire size” screen displays.

2. Press **Y** if the displayed tire size is not correct.

   A tire size selection screen displays (Figure 4-50).

```
Scroll To select Tire Size
>P185/70 R14
 P195/65 R14
 P195/70 R14
```

**Figure 4-50** *Tire size selection menu*

3. Select the correct tire size.

   Pinion factor programming takes about ten seconds, then the “tire size” screen displays.

## 4.2.4 Codes and Data

The Codes and Data selection operates similarly to the Codes and Data mode for engine testing. It displays all of the available switch and sensor readings and module output commands, as well as any fault codes that may be present. Because the scan tool does not affect control module operation, the vehicle can be driven when in the Codes and Data mode.

A Codes and Data Menu selections for body and transmission systems are discussed in the following sections:


- “Codes Only and Data (No Codes)” on page 42
- “Clutch Volume Index (CVI) Display” on page 42
- “RPM Display” on page 43


A typical Codes and Data display is shown in Figure 4-51.

```
    Panel(V)___6.65   Fuel Level(V)___6.0
  **  Codes & Data.  OK To Drive  **
* HVAC Control Head Input Shorted To GND
IGN Cycles_______10   Evapo. Temp(V)__0.0
```

**Figure 4-51** *A typical BCM codes & data display*

All sensor and switch readings in Codes and Data are “live” values. The control modules do not substitute default values for failed components.

### Fault Codes

All fault codes—except those for the TCM—are hard codes. That is, the fault is present at the time of testing. If the fault is intermittent and goes away, the code disappears. These modules do not store soft codes.

```
    Engine RPM__1020  Turbine RPM___990
  **  Codes & Data.  OK To Drive  **
12 Battery Was Disconnected
16 Internal Trans Controler - ROM Fail
```

**Figure 4-52** *Sample fault code display*

The TCM does store soft codes for intermittent problems. A code that appears in the transmission Codes and Data or Codes Only display may be either hard or soft. Hard codes are present during testing, while soft codes are intermittent and setting conditions may not be present when testing.

## Codes Only and Data (No Codes)

The Codes Only and Data (No Codes) selections function like the Codes and Data in engine or ABS test menus (see “Codes and Data” on page 41), except that Codes Only shows codes without data and Data (No Codes) shows data without codes.

## Clutch Volume Index (CVI) Display

When available, selecting CVI Display displays wear parameters for the automatic transmission clutches. The numbers next to each parameter represent the volume of fluid required to pressurize each clutch circuit.

The CVI values change as the TCM “learns” or updates clutch fill volumes during normal use and wear. New clutches have the maximum amount of friction material. Therefore, newer clutches require less volume and have a lower CVI value.

The range of “normal wear” for CVI values are:

- LR Clutch = 35 to 83
- 2-4 Clutch = 20 to 70
- UD Clutch = 24 to 70
- OD Clutch = 48 to 150

The OD Clutch value varies per model year. Refer to the Fast-Track® Domestic Transmission Troubleshooter or the Chrysler Service Manual for correct OD clutch CVI values.

Besides clutch wear, factors that affect CVI values include:

- Incorrect fluid level
- High transmission temperature
- Restricted clutch or solenoid feed circuits
- Leaking valve bodies, lip seals, or rings
- Circuit leaks in pump housing or reaction shaft support
- Case porosity
- Damaged accumulator seal ring
- Clogged oil filter, faulty oil pump, or aerated fluid
- Inadequate clutch pack clearance
- Sticky regulator valve
- Bad clutch return spring

If battery power is interrupted, the TCM reverts to initial, or baseline, CVI values and the TCM must “relearn” each clutch circuit. Be aware, initial CVI values are not used during troubleshooting. They are startup values only.

**To “teach” clutch volumes to the transmission control module:**

1. Run the quick learn functional test

**NOTE:**
“The ATM tests actuate solenoids in the transmission. The parking brake must be set during the tests. The shift lever must be in park to exit an ATM test. If the shift lever is not in park, the scan tool does not exit the test.” on page 39

2. Road test and run through a complete up and down shift sequence.

   Avoid moving the throttle on steady acceleration upshifts. The TCM must also learn high-speed and low-speed kickdown shifts. Refer to Chrysler test procedures for more information. A typical CVI display is shown in Figure 4-53.

```
LR Clutch_________48   OD Clutch________61
     ** Clutch Volume Index Test **
No Codes Present
2-4 Clutch________33   UD Clutch________37
```

**Figure 4-53** *Sample CVI screen*

### RPM Display

Selecting RPM Display displays speed parameters available from the TCM. Values are based on sensor signals for engine speed, turbine acceleration, and output shaft speed data. The Engine RPM parameter is from the ignition system, all others are from the TCM. The TCM looks at the PRNODDL, hydraulic pressure, and speed sensors to determine automatic gear selection.

**To view speed parameters from the TCM:**

- Select **RPM Display** (Figure 4-54).

```
Engine RPM_____1250   Gear___________1ST
            ** RPM Display **
No Codes Available From This Mode
Input RPM______1250   PRNODDL________OPEN
```

**Figure 4-54** *Sample RPM display for the TCM*

## 4.3 Testing ABS Systems

This section explains the diagnostic functions available to test antilock brake systems (ABS) on 1991 and later Chrysler vehicles. Refer to Chrysler service procedures for complete test and repair information for these systems.

ABS diagnosis with the scan tool does not require opening the hydraulic system or disassembling mechanical parts. Complete ABS service, however, may require opening the hydraulic system. Any ABS hydraulic system operates with pressures of about 2000 psi or higher. The system must be completely depressurized before any hydraulic connection is opened. In most cases, depressurize the system by applying and releasing the brake pedal at least 25 times. Follow instructions from the vehicle and system manufacturers for information on hydraulic system service and safety.

### 4.3.1 ABS Control Systems

There are two indicator lamps on the instrument panel on most antilock brake systems: a red brake warning lamp, and an amber antilock warning lamp. Both lamps illuminate at vehicle startup and go out when the ABS self-diagnostics determine that the system is normal.

If the ABS controller detects a fault:

- The amber lamp illuminates until the fault is cleared, or the ignition is turned off, depending on the type of fault.
- The red lamp illuminates when the parking brake is applied, the fluid level is low, or a hydraulic failure occurs.

The amber lamp may also illuminate in tandem with the red brake lamp to indicate a more serious failure. When this occurs, antilock braking is disabled.

Before driving a vehicle with an ABS complaint, especially if the red brake warning lamp is on, test the brakes at low speed to make sure that the vehicle stops normally. An illuminated brake warning lamp may indicate reduced braking ability.

### 4.3.2 Chrysler ABS Tests Available

The scan tool performs ABS diagnostic tests on many 1991 and later Chrysler ABS-equipped vehicles. These vehicles have wheel speed sensors, as well as the red and amber indicator lamps on the instrument panel. If ABS is present on the test vehicle, the indicator lamps momentarily light when the ignition is turned on. The VIN model year and body code inform the scan tool which type of ABS is on the vehicle. If the VIN character for the test vehicle is not available, then the scan tool cannot test that particular system.

### 4.3.3 Codes and Data

The ABS Codes and Data selection operates similarly to Codes and Data for engine testing (see “Codes and Data” on page 26) and displays trouble codes and all information available on the ABS data stream. The ABS Codes and Data selection requires communication with the ABS ECM through the same diagnostic connector used for CCD testing.

**To ensure efficient communication with the ABS ECM when using Codes and Data:**

1. Be sure the ignition is switched off when entering the vehicle ID.
2. Switch the ignition on before selecting Codes and Data.
3. Switch the ignition off after completing the tests.

## Bendix Systems

A Codes and Data display is available for models with Bendix 4, ABX-4, Bendix 6 and Bendix 10. A typical Bendix ABS Codes and Data screen is shown in Figure 4-55.

```
     Pump_______OFF   MP Monitor(V)__13.2
    ** Codes & Data.  OK To Drive **
No Codes Present
System Relay_____ON   System RLY(V)__13.2
```

**Figure 4-55** *Sample Bendix 4 Codes and Data display*

In the ABS Codes and Data mode, the antilock functions of the Bendix systems are fully functional, and new trouble codes may set. The vehicle may also be driven for testing.

## Teves Systems

There are currently three Teves ABS systems used by Chrysler:

- Mark IV
- Mark IVg
- Mark 20

The ABS data parameters vary depending on which system is installed on the vehicle, however, the display is similar for all three (Figure 4-56).

```
     Brake SW___CLSD   Motor Speed_____OFF
    ** Codes & Data.  OK To Drive **
No Codes Present
FLS SW #2_______OPEN   PED TRVL SNS_____??
```

**Figure 4-56** *Sample Teves ABS Codes and Data display*

When in the ABS Codes and Data mode, the antilock functions of Teves systems are not fully functional. The vehicle can be driven safely for testing, new codes do not set.

## Kelsey-Hayes, TRW

Dodge trucks, SUVs, and full-sized vans currently use two different types of ABS:

- EBS-125 RWAL
- EBC-325 4WAL

In the ABS Codes and Data mode for these systems, the ABS is fully functional, and the vehicle may be driven for testing.

## 4.3.4 Functional Tests

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

A Functional Tests selection is available for Bendix 4, Bendix ABX-4, and all Teves systems (Figure 4-57). Functional tests for Bendix 6 and 10 systems are limited to the ATM tests. For these Bendix systems, an ATM Tests selection appears on the Main Menu (CHRY ABS) in place of the Functional Tests selection (Figure 4-58). Only the tests available for the identified vehicle display.

```
Main Menu (CHRY ABS)  Other Systems
>Functional Tests     Codes & Data
 Custom Setup
```

**Figure 4-57** *Functional Tests selection*

```
Main Menu (CHRY ABS)  Other Systems
>ATM Tests            Codes & Data
 Custom Setup
```

**Figure 4-58** *ATM Tests selection*

### ATM Tests—Bendix 4 and ABX-4 Systems

The ATM Tests selection for Bendix 4 and ABX-4 systems is available from the Functional Tests menu. For Bendix 6 and 10 systems, the ATM tests are available on the Main Menu (CHRY ABS). ATM tests are similar for all Bendix systems.

The ATM mode is used to check the operation of switches, solenoids, relays, valves, and lamps controlled by the ABS ECM. Specific ATM tests vary for different systems. All operate in the same way. For most ATM tests, the ABS ECM pulses the actuator regularly for 5 minutes, or until you stop the test. The actual cycle times vary depending on the ATM selected (three seconds for some, four seconds for others, etc.). The important thing is whether the selected actuator responds to the ABS ECM.

Hydraulic ATM tests vary slightly from the general rule of ATM operation. These tests cycle the selected ATM once. A hydraulic ATM cycle consists of a 250 millisecond pressure decay, then a 1 second pressure build.

The following is a complete list of Bendix 4 and ABX-4 ATM test selections:

- Stop All Tests
- ABS Warning light
- Motor pump Output
- All Outputs
- Lamp/Relay driver
- LF Build/Decay Valve
- LR Build/Decay Valve
- RF Build/Decay Valve

- RR Build/Decay Valve
- System Relay
- Left T.C. Isolate Valve
- Right T.C. Isolate Valve
- LF Hydraulic Test
- RF Hydraulic Test
- LR Hydraulic Test
- RR Hydraulic Test
- Rear Hydraulic Test

**To conduct ATM tests for Bendix 4 and ABX-4 systems:**

1. Select **Functional Tests**.

   The Functional Tests menu displays (Figure 4-59).

```
Functional Tests:
>ATM Tests
 Bleed Brakes (Primary)
 Bleed Brakes (Secondary)
```

**Figure 4-59** *Sample Bendix 4 or ABX-4 Functional Tests menu*

2. Select **ATM Tests**.

   The ATM tests screen displays (Figure 4-60).

```
Scroll To Select A Test-Engine Off Only!
>Stop All Tests
 ABS Warning Light
 System relay
```

**Figure 4-60** *Sample Bendix ATM test selection screen*

3. Select the desired ATM test.

## Brake Bleeding

The Brake Bleeding selection is available on Bendix 4 and ABX-4. The Chrysler recommended brake bleeding procedure must be followed in order to purge all the air from these systems.

Failure to follow proper brake bleeding procedures results in improper brake system operation, or brake system failure. Refer to Chrysler Service Manuals for proper brake bleeding procedures.

The Bendix 4 and ABX-4 systems must be manually bled, but in order to thoroughly purge these systems, certain solenoid valves must cycle while the brake pedal is held down. Do this only when instructed by a Bendix brake bleeding procedure in a Chrysler service manual.

**To cycle solenoid valves during a brake bleeding procedure:**

1. Select **Bleed Brakes**.

   The bleed brakes activation screen displays (Figure 4-61).

```
** Bendix - Bleed primary Circuit **
RF And LR Solenoids Will Alternately
Fire For 5 Seconds.
Press N To Exit.
```

**Figure 4-61** *Sample Bendix bleed brakes activation screen*

2. After 5 seconds an exit screen displays (Figure 4-62).

```
** Bendix - Bleed primary Circuit **

Press Y To Repeat Test.
Press N To Exit.
```

**Figure 4-62** *Sample Bendix bleed brakes exit screen*

Once the exit screen displays, you must choose whether to exit or repeat the test.

3. Press **Y** to continue cycling the solenoid valves.

## 4.3.5 ATM Tests—Teves Systems

The ATM mode is used to check the operation of switches, solenoids, relays, valves, and lamps controlled by the ABS ECM. Specific ATM tests vary by system, but all operate in the same way.

The complete list of available Teves ATM tests is shown in Figure 4-63.

```
LF Inlet Valve        Pump Motor
RF Inlet Valve        Rear Inlet Valve
LR Inlet Valve        Rear Outlet Valve
RR Inlet Valve        TC Valve #1
LF Outlet Valve       TC Valve #2
RF Outlet Valve       TC Warning lamp
LR Outlet Valve       TC Active lamp
RR Outlet Valve
```

**Figure 4-63** *Teves ATM tests*

### ABS Simulated Stop

The ABS Simulated Stop selection is available for Teves Mark IV and IVg systems. This selection is not available on Teves Mark 20 system. This mode is used to simulate an ABS stop without driving the vehicle.

**To simulate an ABS stop:**

1. Select **ABS Simulated Stop**.

   The ABS simulated stop screen displays (Figure 4-64).

```
         ** Simulated ABS Stop **
Brakes Must Be On.
Press & Hold Brake To Continue.
Press N To Abort Test.
```

**Figure 4-64** *Sample Teves ABS simulated stop screen*

2. Press the brake pedal to begin and "simulating" appears on the second line.

   A pulsation should be felt in the pedal.

## Bleed Brakes

Brake bleeding on Teves Mark IV, IVg, and 20 ABS consists of:

1. Manually bleeding the brakes.
2. Bleeding the hydraulic control unit (HC).
3. Repeating the manual brake bleed.

Chrysler recommended brake bleeding procedures must be followed for these systems. Refer to Chrysler service manuals for procedures.

Failure to follow proper brake bleeding procedures results in improper brake system operation or brake system failure.

When Bleed Brakes is selected, the scan tool cycles the various ABS components on in the proper order for system bleeding. Remember, the brake system must be manually bled before the functional test is selected.

**To select:**

1. Manually bleed the brakes.
2. Select **Bleed Brakes**.

   The "actuating motor" screen displays (Figure 4-65).

```
            ** Bleed Brakes **
Actuating Motor

Press N To Abort Test.
```

**Figure 4-65** *Sample Teves bleed brakes activation screen*

3. Once the ABS pump motor turns on, the second line of the display changes to read "actuating motor/outlet valves."

   Bleed the HCU while this message is on the screen. After the outlet valves cycle, the "actuating motor" screen displays again. At the end of the test sequence, "test is complete" displays on the second line.

## Hydraulic Test

Selecting Hydraulic Test from the Functional Tests menu allows you to actuate each of the solenoids individually as well as powering up the hydraulic pump motor and valves contained in the hydraulic control unit (HCU).

**NOTE:**
Chrysler recommends that the HCU be bled any time it is opened or replaced. You must bleed the brake system before and after actuating HCU bleeding.

When Hydraulic Test is selected, the ABS ECM begins by cycling the left front valves on and off. Once the left front valves have been cycled, the ECM begins to cycle to the next component in the sequence. This sequence continues until all of the valves and the pump motor have been cycled.

The complete hydraulic test cycle sequence is:

1. Left front valves
2. Right front valves
3. Left rear valves
4. Right rear valves
5. Pump motor

**To conduct a hydraulic test:**

1. Select **Hydraulic Test**.
   A test initialization screen displays (Figure 4-66).

```
      ** Hydraulic Valve Test **
Brakes Must Be On.
Press & Hold Brake To Continue.
Press N To Abort Test.
```

**Figure 4-66** *Sample Teves hydraulic test initialization screen*

2. Press the brake pedal and the first in a series of test screens displays (Figure 4-67).

```
      ** Hydraulic Valve Test **
Left Front Valves.
Continue Holding Brake.
Press N To Abort Test.
```

**Figure 4-67** *Sample Teves hydraulic test in progress screen*

   The screen updates automatically as each component cycles. At the end of the test sequence, “test is complete” displays on the second line.

## Clear Codes

**NOTE:**
ABS codes are cleared the same as engine codes, described on “Clear Codes” on page 16.

If code-clearing fails for any reason, previous codes reappear in the ABS Codes and Data display. If so, return to the Exit menu and repeat the clear codes operation. In addition, ABS codes are automatically cleared by the ABS controller after 50 ignition cycles.

# Chapter 5 Ford Operations

This chapter explains how to begin using the scan tool’s basic setup and test functions. This information is specific to Ford vehicles. For general scan tool functionality, see the user’s manual appropriate to your diagnostic tool.

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


- “Ford Testing” on page 68
- “Ford Data Parameters” on page 311
- “Ford Communications Problems” on page 716


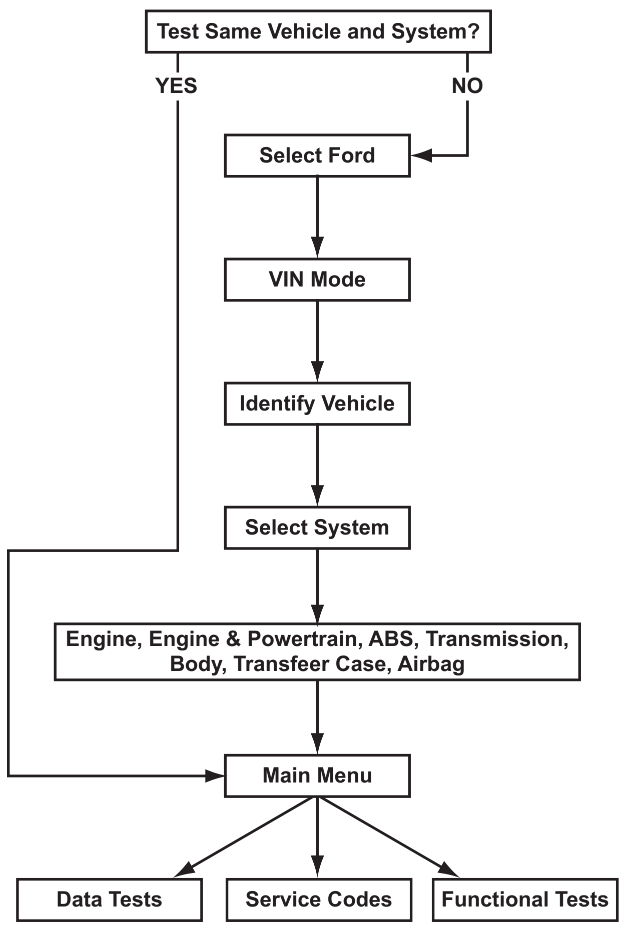


**Figure 5-1** *Basic Ford test routine*

# 5.1 Identifying a Vehicle

Selecting VIN Entry Mode from the Tester Mode Selection menu initiates the vehicle identification process. The scan tool identifies the vehicle being tested from certain characters of the vehicle identification number (VIN).

**Note the following when identifying a Ford vehicle:**

- Because of midyear manufacturing changes in engine computer systems, you should always enter a new identification when you test a different vehicle, even when two vehicles are the same year, model, and have the same engine and accessories installed.
- If an engine code does not appear on the list for a particular vehicle, try identifying the vehicle as one year earlier or later. Then look for the correct engine VIN code.

The vehicle ID process begins from the Software Confirmation menu (Figure 5-2).

```
>Ford Database (1983-2006)        V 60.0


Press Y To Continue
```

**Figure 5-2** *Sample Software Confirmation menu*

**To identify a vehicle:**

1. Press **Y** to confirm the software selection.
2. Select **VIN Entry Mode**.

   A vehicle ID request screen similar to Figure 5-3 displays.

```
Select 10th VIN Character
VIN: ---------4------
Vehicle: 2004
Engine:
```

**Figure 5-3** *Sample model year request*

3. Enter all VIN characters and press **Y** or **N** to answer any questions.

   When you are finished, a Vehicle ID Confirmation screen displays (Figure 5-4).

```
VIN: -F--A--2-4------
Vehicle: 2004 Ford Freestar
Engine: 4.2L V6 EEC-V SEFI
Press Y To Continue.  N For New ID.
```

**Figure 5-4** *Sample Vehicle ID Confirmation screen*

4. Press **Y** if the vehicle ID is correct or **N** to identify a different vehicle.

## 5.1.1 Identifying a 1980 EEC-III System

A few 1980 5.0L V8 engines were built with 1981 EEC-III control systems. These can be tested with the EEC-III programs in the Ford software. However, not all 1980 vehicles use the

17-character VIN sequence used on 1981 and later models. Therefore, you cannot identify a 1980 car to the scan tool using the VIN characters requested on the scan tool display.

Substitute the following characters to identify a 1980 EEC-III system:

**Table 5-1** *Substitute VIN characters for 1980 EEC-III systems*

| VIN | 5.0L Fuel-Injected | 5.0L Carbureted |
|---|---|---|
| 10th | B | B |
| 5th | P | F |
| 8th | F | F |

## 5.2 Selecting a System

Once the vehicle ID is confirmed, the System Selection menu specific to that vehicle displays (Figure 5-5). The scan tool contains Ford system tests that may include ABS and transmission control, as well as Generic Electronic Module (GEM) and other systems. Once the system to test is selected, a vehicle-specific test menu displays (Figure 5-5).

```
Select System:
>Engine & Powertrain
 ABS
 Airbag
```

**Figure 5-5** *Sample Ford System Selection menu*

Selecting a system may open additional menus that involve choosing options (Figure 5-6).

```
Select Vehicle Options:
>A/T With A/C
 A/T Without A/C
 M/T With A/C
```

**Figure 5-6** *Sample Ford Vehicle Options menu*

## 5.3 Connecting to the Vehicle

Once a vehicle has been identified and a system has been selected, a connection message displays, instructing you to use the test adapters supplied to connect the scan tool for testing (Figure 5-7).

```
Connect OBD-II With K-2 Key To DLC
Located under Left Side Of Dash.

Press Y To Continue.
```

**Figure 5-7** *Sample Ford connection message*

The following adapters are available to test Ford vehicles:

- **FORD-1A**—(Figure 5-8) Fits all EEC-IV and MCU connectors. Connect both the adapter and the single-wire pigtail for EEC-IV systems (Figure 5-16). MCU systems do not require the pigtail.
- **FORD-1B**—(Figure 5-9) Same as FORD-1A but without the pigtail.
- **FRD-4**—(Figure 5-10) A 3-lead male ABS adapter that is used on 1994–96 Econoline Vans with 4WABS (see "1994–96 Econoline Vans with 4WABS" on page 111 for details).
- **MULTI-1**—(Figure 5-11) Use to test Probe, Festiva, Tracer, Capri and any other vehicle with the Mazda Electronic Control System (MECS) as well as vehicles with EEC-III systems. You can also use the optional MULTI-2 adapter on earlier MECS systems.
- **OBD-II**—(Figure 5-12) Used for the 16-pin connector on EEC-V (OBD-II) vehicles. Ford vehicles use the K-2, K-2A, K-16, K-17, K-19, or K-20 Personality Key™ device (Figure 5-12).

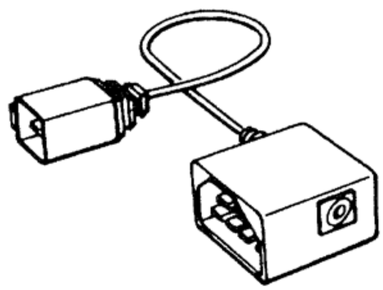

**Figure 5-8** *Ford-1A*

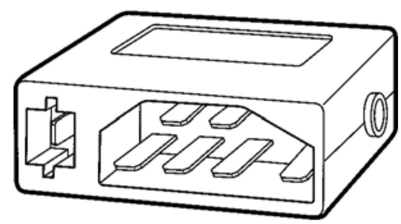

**Figure 5-9** *Ford 1B*

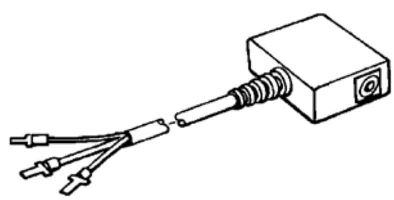

**Figure 5-10** *FRD-4*

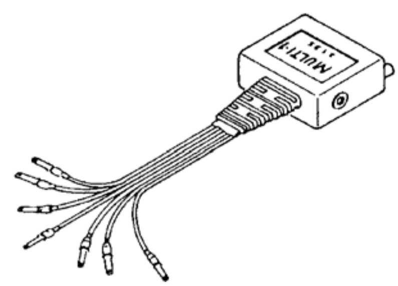

**Figure 5-11** *MULTI-1*

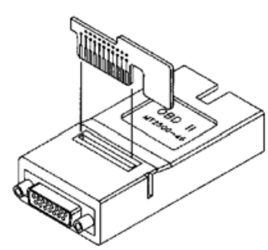

**Figure 5-12** *OBD-II adapter with a Personality Key™ device*

Note the following regarding Personality Key™ devices:

- K-16 = UART-based protocol (UBP) applications
- K-17 = high-speed CAN
- K-19 = medium speed CAN
- K-2A, K-2A, K-20 = all other applications

**To connect the scan tool to the test vehicle:**

1. Make sure the ignition is off.
2. Follow the on-screen instructions to connect the scan tool data cable to the test vehicle.
   a. Select the proper test adapter and attach it to the data cable.
   b. Connect the other end of the data cable to the scan tool data port.
   c. Connect the test adapter to the vehicle.
   Test adapters fit into the connectors only one way. Be sure the connector is installed securely.
3. Switch the ignition on.
4. Press **Y** to continue.
   The main menu for the selected system displays, and the tool is connected to the data stream.

## 5.3.1 Using the MULTI-1 Test Adapter

The MULTI-1 test adapter is used on the following connectors:

- Mazda Electronic Control System (MECS) 6-pin connector and Self-Test Input (STI) terminals (Figure 5-13)—this connector is in the passenger compartment on early Tracers. On all other models, it is underhood.
- MECS 17-pin connector (Figure 5-14)
- EEC-III diagnostic connector (Figure 5-15)—The EEC-III connector is in the right fender panel, near the TAB and TAD solenoids.

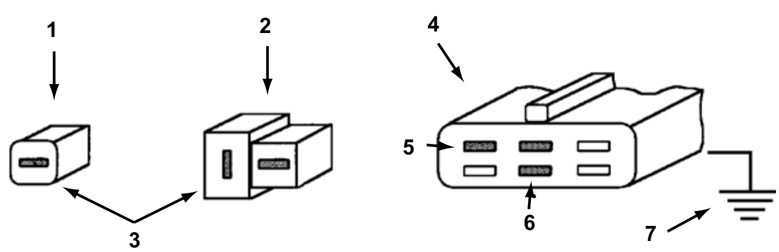


**Figure 5-13** *MECS 6-pin connector and STI terminals—uses the MULTI-1 adapter*

**1— STI terminal**
For all models except early Tracer.

**2— STI terminal**
For early Tracer (in engine compartment).

**3— Red MULTI-1 wire**

**4— 6-pin connector**

**5— Blue MULTI-1 wire**

**6— Brown MULTI-1 wire**

**7— Black MULTI-1 wire to chassis ground**

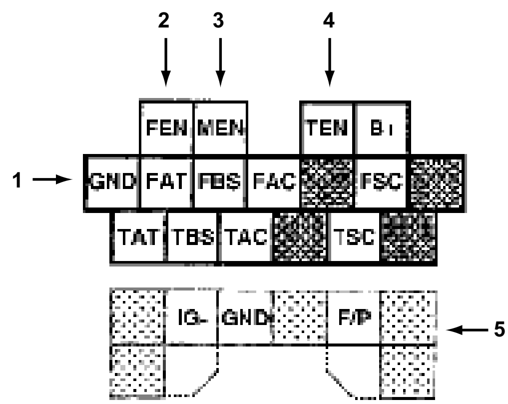


**Figure 5-14** *MECS 17-pin connector—uses the MULTI-1 adapter*

**1— Black MULTI-1 wire to chassis ground**
Use ground adapter.

**2— Blue MULTI-1 wire (engine STO)**

**3— Brown MULTI-1 wire**

**4— Red MULTI-1 wire (engine STI)**

**5— Not used**

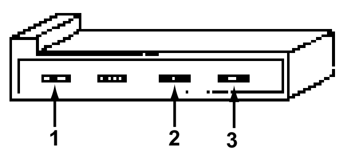


**Figure 5-15** *EEC-III connector—uses MULTI-1 adapter*

**1— Black MULTI-1 wire**

**2— Blue MULTI-1 wire**

**3— Brown MULTI-1 wire**

**NOTE:**
1983 5.0L trucks have a separate STI pigtail.

## 5.3.2 MCU EEC-IV and EEC-V Systems

See Figure 5-16 for microprocessor control unit (MCU) EEC-IV and EEC-V systems.

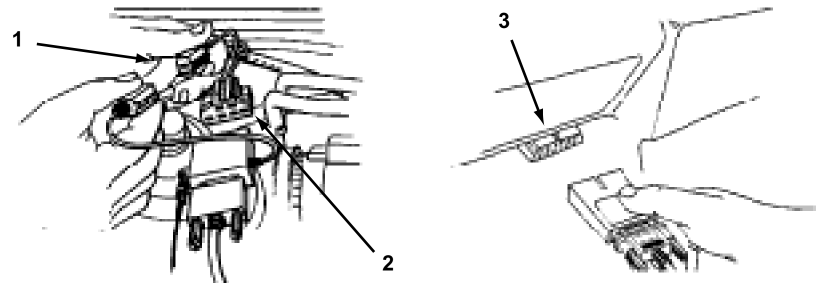


**Figure 5-16** *MCU systems do not require the pigtail connection*

**1— Pigtail EEC-IV only**

**2— EEC-IV and MCU connector**

**3— EEC-V (OBD-II) connector**

The Ford-1A, Ford-1B, FRD-4, and MULTI-1 adapters have a socket for connecting the cigarette lighter power cable or the battery power cable.

The engine diagnostic connector on all Ford vehicles except OBD-II is located under the hood (Figure 5-16). The scan tool will prompt you with the connector location when a connection is necessary.

**NOTE:**
Some 1994–95 Ford vehicles have an OBD-II style 16-pin DLC under the dash that only functions for the Generic Electronic Module (GEM) or ABS. This connector does not work for testing the engine, powertrain, or transmission modules. Check the VECI label to verify if the vehicle is not OBD-II compliant.

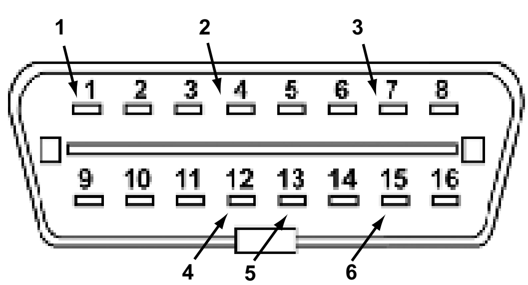


**Figure 5-17** *EEC-V data link connector—1994–95*

**1— Vehicle power (+)**

**2— Flash eprom supply**

**3— Data (–)**

**4— Power ground**

**5— Case ground**

**6— Data (+)**

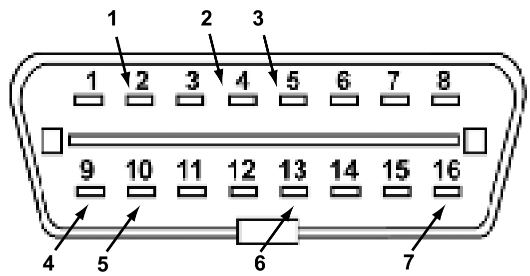


**Figure 5-18** *EEC-V data link connector—1996–2002 early model without UBP*

**1— Data bus +**

**2— Case ground**

**3— Power ground**

**4— ABS (Villager only)**

**5— Data bus –**

**6— Module programming signal**

**7— Battery B+**

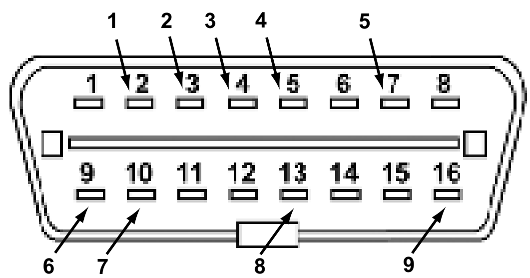


**Figure 5-19** *EEC-V data link connector—2002 and later model with UBP*

**1— SCP bus –**

**2— UBP**

**3— Case ground**

**4— Power ground**

**5— ISO K-line**

**6— ABS (Villager only)**

**7— SCP bus +**

**8— Module programming signal**

**9— Battery B+**

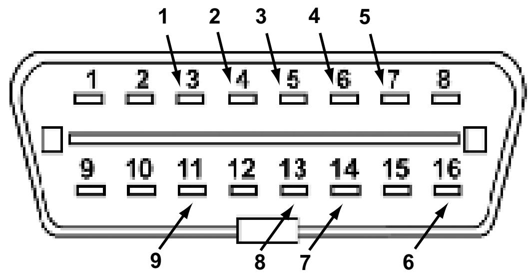


**Figure 5-20** *EEC-V data link connector—2003 and later model with CAN*

**1— CAN medium speed +**
**2— Case ground**
**3— Power ground**
**4— CAN high speed +**
**5— ISO K-line**
**6— Battery B+**
**7— CAN high speed –**
**8— Module programming signal**
**9— CAN medium speed –**

## 5.3.3 Mazda Electronic Control Systems (MECS)

There are two types of MECS diagnostic connectors available, the 6-pin (Figure 5-13) and the 17-pin (Figure 5-14).

The MECS system is used on the following models:

- 1994–97 Aspire with 1.3L engine
- 1991–94 Capri with 1.6L turbo and non-turbo engines
- 1992–96 Escort and Tracer with 1.8L engine
- 1988–93 Festiva with 1.3L engine
- 1989–95 Probe with 2.0L, 2.2L, and 2.5L engines
- 1988–91 Tracer with 1.6L engine

Do not connect the red lead of the MULTI-1 adapter to the vehicle tach terminal. It is important to properly identify the STI connector before connecting the red lead of the MULTI-1 adapter to the self-test input (STI) connector on the vehicle. Refer to “Identifying the STI Connector” on page 61 for more information.

### Using the MULTI-2 Adapter

The MULTI-2 adapter may be used instead of the MULTI-1 adapter to test some MECS systems. The MULTI-2 adapter 2B and 2E connectors plug into the Ford-Mazda test connectors (Figure 5-11). Also, some 1989 MECS systems deliver a high-impedance self-test output (STO) signal. The MULTI-2 adapter has a pull-up resistor that lets the scan tool read the code pulses clearly on these early systems.

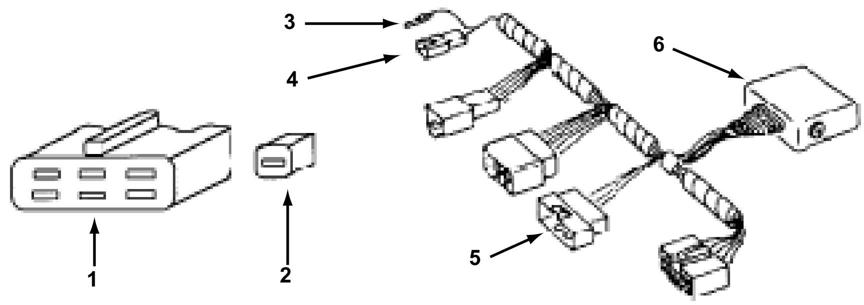


**Figure 5-21** *The MULTI-2 adapter with MECS connectors*

**1— 6-pin MECS connector**
**2— STI connector**
**3— Ground to chassis**
**4— 2E connector**
**5— 2B connector**
**6— MULTI-2 adapter**

**IMPORTANT:**
When using the MULTI-1 adapter, do not connect the scan tool to the MECS tach connector. Doing so may damage to the scan tool. See the “Identifying the STI Connector” section that follows.

## Identifying the STI Connector

Most Ford models with MECS have two similar, single-wire connectors in the engine compartment. One is the self-test input (STI) connector that triggers self-tests; the other is a tach connector. Identifying the STI connector may be difficult as connector color, wire color, and location vary by model. The scan tool display gives instructions to help locate the proper connector. Use to identify and locate the STI connector.

**NOTE:**
STI and tach circuits are integrated into the 17-pin diagnostic connector on 1991–93 Escort and Tracer and 1993 Probe (see Figure 5-14 on page 57). There are no single-pin connectors.

If you are still not sure whether you are connected to an STI or tach connector, follow the procedure below.

**To safely check which kind of connector you are connected to:**

1. Connect a 12 V test lamp between the connector and ground.
2. Crank the engine. Interpret as follows:
   - If the test light flashes, it is on the tach connector, *do not connect the scan tool here*.
   - If the test light does not flash while cranking and the engine runs, it is connected to the STI connector. Connect the scan tool here.

**Table 5-2** *STI connector identification*

| Model | Year | Engine | Test Connector | Wire Color | Connector | |
|---|---|---|---|---|---|---|
| | | | | | Color | Location |
| Capri | 1991–93 | 1.6L EFI & Turbo | STI | Y | Green | Left rear of engine compartment |
| | | | TACH | Y/BL | White | At ignition coil |
| Festiva | 1988–89 | 1.3L carb | STI | Y/BL | White | Left rear of engine compartment |
| | | | TACH | none | none | |
| | | 1.3L EFI | STI | Y/BL | White | |
| | | | TACH | Y/GRN | Black | |
| | 1990–93 | 1.3L EFI | STI | Y/GRN | Black | |
| | | | TACH | Y/GRN | White | |
| Probe | 1989 | 2.2L EFI w/turbo | STI | R/W | Black | Left rear of engine compartment |
| | | | TACH | Y/BL | White | |
| | | 2.2L EFI w/o turbo | STI | R/W | Black | |
| | | | TACH | none | none | |
| | 1990– 92 | 2.2L EFI w/turbo | STI | R/W | Black | |
| | | | TACH | Y | | |
| | | 2.2L EFI w/o turbo | STI | R/W | | |
| | | | TACH | Y/BL | | |
| Tracer | 1988–89 | 1.6L EFI | STI | Y | Green | Left rear of engine compartment |
| | | | TACH | Y/BL | White | At ignition coil |

## 5.3.4 Integrated Vehicle Speed Control (IVSC)

The Integrated Vehicle Speed Control system (IVSC) is the Ford computerized cruise control system, available as an option on:

- 1986–90 Taurus and Sable
- 1988–90 Crown Victoria, Grand Marquis, and Lincoln
- 1988–90 Thunderbird and Cougar

The IVSC is not used on 1991 and later models. Test procedures and code definitions for IVSC are available in the “Tests and Procedures” section of the Driveability Troubleshooter.

**To connect to an IVSC:**

1. Make sure the ignition is off.
2. Connect the data cable to the EEC-IV self-test connector in the engine compartment. Use the standard FORD-1 test adapter.

For IVSC testing, the single-wire STI pigtail of the FORD-1 adapter is not connected for the KOEO self-test, but the pigtail is connected for the KOER self-test.

## 5.3.5 ARC and ASARC

The Automatic Ride Control (ARC) system is used on some 1989 and later Thunderbird and Cougar models and includes electronic control of both the air suspension and the power steering. The Air Suspension Automatic Ride Control (ASARC) system, used on some 1988 and later Lincoln Continentals, provides electronic control of the front and rear air suspension.

On Lincoln models, the ASARC test connector is at the left rear of the trunk, behind a panel near the suspension on/off switch. The ARC test connector is under the hood on the right side of the firewall on Thunderbirds and Cougars. Refer to a service manual for the exact location.

Both test connectors are the same shape as the EEC-IV engine connector; use the standard FORD-1 adapter. If a mating connector is not found on the system harness, the single-wire pigtail connection is not needed.

**To connect to an ARC or ASARC:**

1. Make sure the ignition is off.
2. Connect the data cable to the ARC or ASARC test connector. Use the standard FORD-1 (A or B) test adapter.

## 5.3.6 4-Speed Electronic Automatic Transmission (4EAT)

The 4-Speed Electronic Automatic Transmission (4EAT) is available on some 1989 and later Probe and 1990 and later Escort and Tracer models. The 4EAT on the 1989 Probe with a 4-cylinder, non-turbo engine has a separate electronic control module and a separate test connector.

On the 1990–92 4-cylinder non-turbo Probe and the 1993 1.9L Escort, the 4EAT is integrated with the PCM engine control system. The system transmits transmission codes through the same connector and terminal as during engine tests. All other 1990 and later Probe, Tracer, and Escort models use a separate diagnostic connector or integrated underhood diagnostic connector (see Figure 5-23 on page 65) for the 4EAT.

On models with 1.6L, 2.2L, or 3.0L engines, the diagnostic connector is in the passenger compartment under the instrument panel by the TCM. On these models, the 4EAT connector is the same shape as the engine connector. Connect the MULTI-1 adapter as shown in Figure 5-22. Use Table 5-3 to locate the correct diagnostic connector.

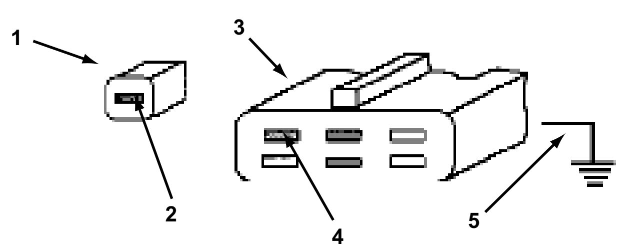


**Figure 5-22** *The 4EAT diagnostic connector for 1.6L, 1.9L, 2.2L, and 3.0L engines*

**1— STI connector**

**2— Red MULTI-1 wire**

**3— 6-pin 4EAT test connector**

**4— Blue MULTI-1 wire**

**5— Black MULTI-1 wire to chassis ground**

**Table 5-3** *4EAT diagnostic connector locations*

<table>
<tr><th>Vehicle</th><th>Engine</th><th>Year</th><th>Diagnostic Connector Locations</th></tr>
<tr><td>Capri</td><td>-</td><td>1991–94</td><td>4EAT STI & STO located behind the glove compartment (above and to the right) taped to the wire harness.</td></tr>
<tr><td rowspan="4">Escort/Tracer</td><td rowspan="2">1.8L</td><td>1991–92</td><td>4EAT STI and STO are integrated into one diagnostic connector along with the PCM. The connector is located on the left side of the engine compartment.</td></tr>
<tr><td>1993–94</td><td>4EAT integrated with PCM shares the same diagnostic connectors which are located on the left side of the engine compartment.</td></tr>
<tr><td rowspan="2">1.9L</td><td>1991–92</td><td>4EAT STO connector is located on the left side of the engine compartment near PCM self-test connectors. The STI for 4EAT is always grounded within the TCM.</td></tr>
<tr><td>1993</td><td>4EAT integrated with PCM shares the same diagnostic connectors which are located on the left side of the engine compartment.</td></tr>
<tr><td rowspan="6">Probe</td><td>2.0L</td><td>1993</td><td>4EAT module is integrated with the PCM control assembly and shares a multi-pin connector located in the left front corner of the engine compartment, near the battery.</td></tr>
<tr><td>2.2L non-turbo</td><td>1989</td><td>4EAT STI & STO located under the instrument panel on the left side of the steering column near the 4EAT module.</td></tr>
<tr><td>2.2L non-turbo</td><td>1990–92</td><td>4EAT integrated with PCM shares the same diagnostic connectors on the left side of the engine compartment.</td></tr>
<tr><td>2.2L turbo</td><td>1990–92</td><td>4EAT STI & STO located under the instrument panel on the left side of the steering column near the 4EAT module.</td></tr>
<tr><td>2.5L</td><td>1993–94</td><td>4EAT STI and STO pins are integrated into a multi-pin DLC, located in the left front corner of the engine compartment, near the battery.</td></tr>
<tr><td>3.0L</td><td>1990–92</td><td>4EAT STI & STO located under the instrument panel on the left side of the steering column near the 4EAT module.</td></tr>
</table>

Do not connect to the engine test connector in the engine compartment.

On models with a 1.8L, 2.0L, or 2.5L engine, the 4EAT is tested at the same diagnostic connector used for engine tests. However, the MULTI-1 connector must be connected to different terminals (Figure 5-23).

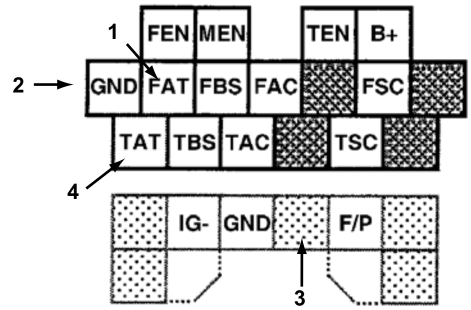


**Figure 5-23** *MECS 17-pin connector—uses the MULTI-1 adapter*

**1— Blue MULTI-1 wire (Trans STO)**

**2— Black MULTI-1 wire to chassis ground**
Use ground adapter.

**3— Not used**
No STI connection needed on 1.8L & 2.0L

**4— Red Multi-1 wire (Trans STI)**
2.5L only

**To connect to a 4EAT:**

1. Make sure the ignition is off.
2. Connect to the vehicle using the MULTI-1 test adapter.

## 5.3.7 Rear Antilock Brake System (RABS)

Some 1987 and later light trucks have Rear-only ABS (RABS).

There are two variants—RABS 1 and RABS 2—that use different-colored leads.

- RABS 1 uses a single pigtail-style test lead, usually a black wire with an orange stripe.
- RABS 2 uses the pigtail lead but is connected to a mating red wire for keep-alive memory.

The key must be on before disconnecting the red keep-alive memory wire.

These systems have code-setting capability, but do not communicate directly with the scan tool. If ABS or REAR ABS Only is selected on some models, the following message displays (Figure 5-24).

```
Manual Codes Available.  Use MULTI-1 With
Power Pac, Or PWR Cable With Black Wire
Connected To Ground Extension.
Press Y To Continue.
```

**Figure 5-24** *RABS connection message*

The connections described are for powering the scan tool so the user will be able to access code-gathering information. See Figure 5-25 and Table 5-4 for connector locations.

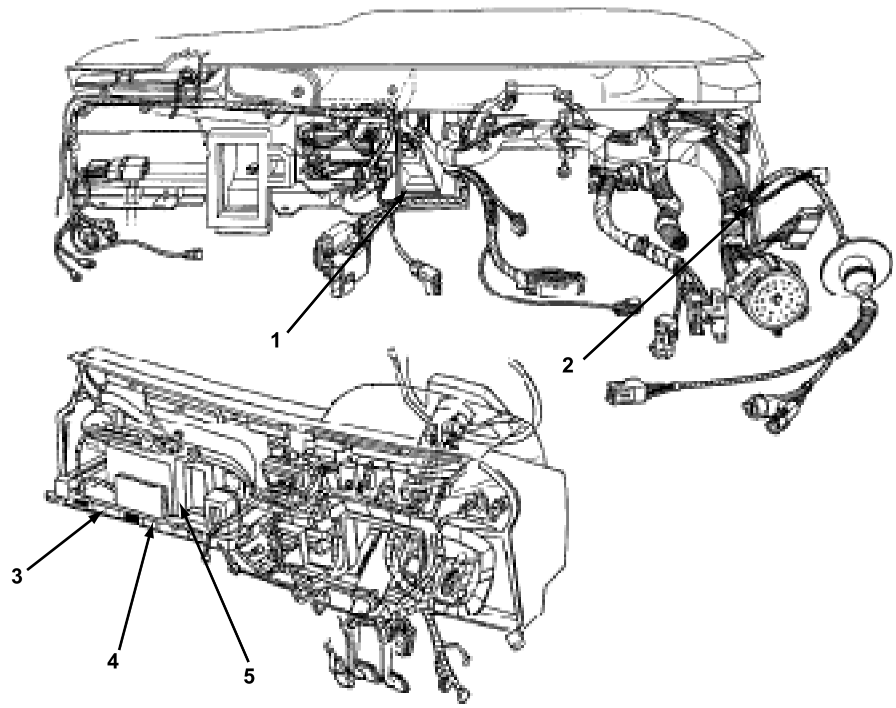


**Figure 5-25** *Sample RABS diagnostic connector locations*

**1— RABS module**
**2— RABS diagnostic test connector**
**3— RABS diagnostic test connector**
**4— PSOM test connector**
**5— RABS module**

**Table 5-4** *RABS diagnostic connector locations*

| Vehicle | Diagnostic Connector Location |
|---|---|
| Aerostar | In the main loom, under the dash near the ignition switch. |
| Bronco & F-Series | Behind the glovebox, near the RABS module or attached to the main loom about 6 inches from the bulkhead near the park brake pedal. |
| Econoline | Far right side of the dash, below the brace or near the RABS module wiring near the parking brake, or under the left side of the dash, taped to the main loom. |
| Explorer & Ranger | Near the emergency brake, on the left side of the dash attached to the main loom. (On late model Rangers, it may be behind the RH kick panel.) |

# 5.4 Ford Vehicles Without Self-Diagnostic Capability

The Ford vehicles listed below either do not have electronic engine control systems, or they have systems without self-diagnostic capabilities. They do not communicate with a scan tool.

**Table 5-5** *Ford vehicles without self-diagnostic capability*

| Year | Models |
|---|---|
| 1982 and earlier | Any with EEC-I or EEC-II. The scan tool can test 1980 and later EEC-III, EEC-IV, and MCU systems with test connectors. |
| 1982–83 | 3.3L, 6-cylinder carbureted engine (VIN code B for 1982; X for 1983). |
| 1983–85 | 1.6L, 4-cylinder carbureted Escort, Lynx, EXP, and LN7 (VIN codes 2 and 4). |
| 1986 | 1.9L, 4-cylinder carbureted Escort and Lynx (VIN code 9). |
| 1983–84 | 3.8L, V6 carbureted engine (VIN code 3 & C). |
| 1983–85 | 5.0L, V8 carbureted HO engine in Mustangs only (VIN codes F, 1983; M, 1984). Has a self-test connector, but no tests are available. |
| 1983–87 | 5.8L, V8 carbureted truck engines (VIN codes G for 1983–85; H for 1985–87). |
| 1981–87 | 7.5L, V8 carbureted truck engine (VIN code L). |
| 1989–95 | 7.3L, V8 Diesel (non-Powerstroke). scan tool tests automatic transmission only. |

# Chapter 6 Ford Testing

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

**NOTE:**
Specific selection and menu items may vary by year, make, and model.

- Engine & Powertrain
- Transmission
- Antilock Brake System (ABS)
- Airbag
- Body Systems
- GEM (Generic Control Module)
- CTM (Central Timer Module)
- FEM (Front Electronic Module)
- REM (Rear Electronic Module)
- PATS (Passive Anti-Theft System)
- RCM (Restraint Control Module)
- SCLM (Steering Column Lighting Module)
- ICM (Instrument Cluster Module)
- HEC (Hybrid Electronic Cluster)
- VIC (Virtual Image Cluster)
- 4X4
- Transfer case
- 4EAT (4-speed Electronic Automatic Transmission)
- ECS (Electronic Crash Sensor)
- IABM (Integrated Airbag Module)
- SRS (Supplemental Restraint System)

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


- "Ford Operations" on page 52
- "Ford Data Parameters" on page 311
- "Ford Communications Problems" on page 716


**NOTE:**
When testing optional systems, always consider that a specific test vehicle may not be equipped with a particular option. The menu choices for subsystems display whether or not the vehicle actually has the optional equipment installed. Attempting to communicate with a non-existent subsystem results in either a "no communication" message, or data values displayed as "N/A".

**IMPORTANT:**
Always verify that the correct Personality Key™ or CAN adapter is being used as directed by the on-screen massages

## 6.1 Testing Engine & Powertrain Systems

After selecting Engine & Powertrain from the System Selection menu, the Main Menu - PCM displays (Figure 6-1). Selections vary by model and year.

```
Main Menu - PCM         Movies
>Data Display           Custom Setup
 Codes Menu
 Functional Tests
```

**Figure 6-1** *Sample Ford Main Menu—PCM*

This section is divided into the following subsections:

- "Codes Menu" on page 69
- "EEC-IV Functional Tests" on page 81
- "Data Display" on page 109

Movies and Custom Setup options are discussed in detail in the manual for your scan tool.

### 6.1.1 Codes Menu

Selecting Codes Menu from the Main Menu - PCM gives you several options for working with diagnostic trouble codes (DTCs). There are slight differences between EEC-IV (Figure 6-2) and EEC-V/CAN (Figure 6-3) Codes menus.

```
Codes Menu              (Code Speed = Fast)
>KOEO Self-Test         Code Speed
 KOER Self-Test         Clear Codes
 Review Codes           Print Codes
```

**Figure 6-2** *Sample EEC-IV codes menu*

```
Codes Menu              Pending Codes
>KOEO Self-Test         Clear Codes
 KOER Self-Test         Memory Codes
```

**Figure 6-3** *Sample EEC-V/CAN codes menu*

Codes Menu options are discussed in the following sections:

- "KOEO Self-Test" on page 71
- "KOER Self-Test" on page 73
- "Code Speed" on page 77

- "Memory Codes" on page 78
- "Clear Codes" on page 78
- "Review Codes" on page 79
- "Print Codes" on page 80


## A Note about Service Codes

Ford refers to DTCs as "service codes," and classifies them as either on-demand codes or continuous codes.

- On-demand codes occur during either a key-on, engine-off (KOEO) self-test, or a key-on, engine-running (KOER) self-test.
- Continuous codes are memory codes from the PCM. These indicate intermittent problems that occurred in the past during normal vehicle operation. Memory codes cannot be set while running a self-test. Microprocessor Control Unit (MCU) and EEC-III systems do not have memory codes. Some DTCs only set as continuous codes.

During the KOEO self-test, EEC-IV systems transmit any on-demand codes first, followed by any continuous codes. An EEC-IV system does not transmit continuous codes during the KOER self-test, except on some 1983 Escort models with a 1.6L engine. An EEC-V/CAN system does not generate continuous codes during either the KOEO or KOER self-test. Instead, continuous memory codes are generated by selecting Codes Menu > Memory Codes.

To assist in diagnosing intermittent faults, engine-off and engine-running wiggle tests are available as functional tests on EEC-IV systems. These tests place the scan tool and PCM in a standby mode to allow checking for intermittent problems caused by wiggling electrical harnesses. If a fault occurs during a wiggle test, the PCM records it as a continuous code. The KOEO test must be run to read codes set during a wiggle test.

Earlier EEC-IV systems display DTCs as a 2-digit numerical code. Many 1991 and later EEC-IV vehicles transmit 3-digit service codes. An EEC-V system displays DTCs in the standard 5-digit OBD-II format.

Be aware that Ford DTC P1000 sets on an EEC-V/CAN system any time one of the following conditions is met:

- DTCs are cleared
- Readiness monitors have not successfully completed
- The vehicle battery is disconnected

Unless required by a mandated inspection and maintenance program, it is not necessary to clear DTC P1000 after a vehicle has been serviced. This code automatically clears upon the successful completion of all the readiness monitors. The only way to clear a DTC P1000 is through a Drive Cycle Test.

### *EEC-IV Ignition Key Cycles*

A basic guideline for Ford testing is to turn the ignition key off, wait 10 seconds, then turn the key back on before repeating any particular test. This is not absolutely required on all vehicles, but it is good practice in order to avoid erroneous self-test actions by the PCM.

Instructions on-screen tell when it is advisable to turn the key off and back on, or to restart the engine before proceeding. You may choose whether or not to follow these instructions. If test results appear erroneous or incomplete, or the PCM does not respond, switch the key off, wait 10 seconds, then restart the test.

## KOEO Self-Test

The KOEO Self-Test selection displays on-demand codes present with the ignition on and the engine not running. These are usually electrical open and short circuits and must be serviced first, before any other codes. On EEC-IV systems, the KOEO test displays continuous memory codes of intermittent faults from PCM memory. On an EEC-V/CAN system, the continuous memory codes are accessed by selecting Memory Codes. Memory Codes are serviced last, after any on-demand codes.

### *EEC-III KOEO Self-Tests*

The KOEO Self-Test selection on a Ford EEC-III system displays a checklist based on preliminary tests recommended by Ford. Ford advises these checks be completed before performing an engine-running test. These checks are also helpful for troubleshooting a no-start condition.

### *EEC-IV KOEO Self-Tests*

The KOEO Self-Test selection for EEC-IV systems displays on-demand codes that are present with the ignition on but the engine not running, as well as continuous codes of intermittent faults from PCM memory.

Any of the KOEO on-demand codes are usually the result of electrical open and short circuits and must be serviced before any other codes. Continuous codes should be serviced last, after any on-demand codes.

The scan tool displays on-demand codes first, followed by continuous memory codes. This is the order in which they must be repaired. If no codes are present, a “11 System Pass” message displays. If codes are present, they display by number and description (Figure 6-4).

```
Review Codes
33 EGR Valve Not Opening
71 Idle Tracking SW Stuck Or CKT Problem
95 Fuel Pump CKT Open - ECA To Ground
```

**Figure 6-4** *Sample EEC-IV Review Codes screen*

**To select a KOEO self-test for EEC-IV:**

1. Select **KOEO Self-Test**.

   The KOEO self-test confirmation screen displays.

2. Press **Y** and “self-test initiated wait for codes” displays.

   After 45 to 60 seconds when reading fast codes, or a minute or more for slow codes, a “review codes” screen should display (Figure 6-5). If the “wait for codes” message is on-screen for more than a few minutes, the test probably did not start. Refer to “Ford Communications Problems” on page 716 to diagnose the cause of a self-test failure.

```
Review Fast Codes
** Key On, Engine Off Codes-Fix First **
11 System Pass
** Continuous Memory Codes-Fix Last **
```

**Figure 6-5** *Sample EEC-IV screen with no codes present*

**NOTE:**
The last line reads “End of List” when you reach the end, but this does not necessarily mean that the test is complete, especially with slow codes.

### *EEC-V/CAN KOEO Self-Tests*

The KOEO self-test for EEC-V is similar to that for EEC-IV. The main difference is that the EEC-V is OBD-II compliant, so it transmits 5-digit DTCs. No memory codes, or “soft codes,” are gathered during the KOEO self-test with EEC-V/CAN.

Memory clearing, also called PCM reset, is required to switch off the MIL on EEC-V systems. Certain memory codes trigger the MIL, and they must be cleared to turn the lamp off. Drive symptoms may appear or disappear when the PCM is reset.

**To select a KOEO self-test for EEC-V systems:**

1. Select **KOEO Self-Test**.
   The KOEO self-test confirmation screen displays.
2. Press **Y** and a “self-test initiated wait for codes” message displays.
   The KOEO self-test takes about 30 to 60 seconds to complete, then the “service codes” screen should display (Figure 6-6). If the “wait for codes” message stays on the screen for more than 2 to 3 minutes, the self-test probably did not run. Refer to “Ford Communications Problems” on page 716 to diagnose the cause of a self-test failure.

```
** Key On, Engine Off Codes-Fix First **
******************01/10 ****************
P0100 MAF/VAF Circuit Fault
******************02/10 *****************
```

**Figure 6-6** *Sample EEC-V services codes screen*

### *MCU KOEO Self-Tests*

The KOEO self-test for an MCU system displays on-demand codes that are present with the ignition on and the engine not running. This is a limited function system that only controls fuel mixture at cruise speed. There is no idle speed, timing, or EGR control. Fuel corrections are made in response to O2S feedback.

KOEO self-tests for MCU systems and EEC-IV systems are similar (see “EEC-IV KOEO Self-Tests” on page 71), except MCU does not output continuous codes of intermittent faults and does not perform wiggle tests. Also, self-tests detect only MCU-related faults. Problems outside of the MCU control system do not set codes. Use the KOEO self-test for EEC-IV systems described on “EEC-IV KOEO Self-Tests” on page 71 to test an MCU system.

## KOER Self-Test

Selecting KOER Self-Test displays on-demand codes present with the engine running. Service these codes after KOEO on-demand codes and before memory codes. Most Ford vehicles do not perform a KOER test if any KOEO hard codes are present and uncorrected.

The entire engine-running test usually takes about 1 to 3 minutes for an EEC-V/CAN system or an EEC-IV system when reading fast codes. The time varies depending on the particular application and the number of codes. The test takes longer on EEC-IV systems with slow codes. The “self-test initiated wait for codes” message means that the scan tool attempted to start the test, but it does not mean the PCM responded. If the message stays on the screen for more than 2 to 3 minutes with no code response, the test probably did not start.

**NOTE:**
A rough-running engine may produce false KOER DTCs.

The scan tool displays only on-demand codes for faults present during the engine-running test. Diagnose and repair problems in the order in which codes display. Repair any KOEO on-demand codes first, before diagnosing codes from the KOER self-test.

If codes are not present, a “System Pass” message displays. If codes are present, they display by number and description (Figure 6-7).

```
Review Codes
33 EGR Valve Not Opening
71 Idle Tracking SW Stuck Or CKT Problem
95 Fuel Pump CKT Open - ECA To Ground
```

**Figure 6-7** *Sample KOER self-test review codes screen*

Other engine systems may require different operator actions during the engine-running test. Some MCU systems, for example, require that engine speed be held at a specified RPM during the test. The scan tool displays any special instructions when required.

### *EEC-III KOER Self-Test*

The KOER self-test is programmed into the PCM; codes recorded during the test display afterward. The EEC-III system has no long-term memory; it records and displays only on-demand codes. However, the scan tool stores codes for later review or printing. Repeating the EEC-III self-test erases memory and stores the codes from the latest test.

If the KOER self-test does not start, the display does not change when vacuum is released. If this happens, apply vacuum to the BMAP sensor again and release it quickly to trigger the test. If a test repeatedly will not start, refer to “Ford Communications Problems” on page 716.

In some cases, the EEC-III system may not complete the self-test if certain engine conditions are out of limits. For example, if the engine is not fully warm or if an engine coolant temperature (ECT) sensor circuit problem exists, the KOER self-test routine may stop before checking fuel control and air injection. The scan tool automatically displays any codes recorded and transmitted up to the point where the test stopped.

The code display is a valid report of system problems. Diagnose and correct the condition that caused the code. This may be as simple as ensuring that the engine is fully warm and repeating the test. After the problem is corrected, always repeat the test to be sure that the code is not reset and that no other codes are present.

**NOTE:**
A hand-operated vacuum pump is needed to trigger the KOER self-test on all EEC-III systems except 1983 5.0L trucks.

**To select an EEC-III KOER self-test (except 1983 5.0L trucks):**

1. With the ignition switched off, select **Service Codes > KOER Self-Test**.

   The test screen displays (Figure 6-8).

```
*Engine-Running Self-Test*
Start Engine And Run At 2000 RPM
For 2 Minutes, Or Until EGO Is Warm.
Press Y When Done.            [ 1.23]
```

**Figure 6-8** *Sample EEC-III KOER self-test screen*

2. Be sure the ignition has been off for 10 seconds; then start and run the engine at 2000 RPM for 2 minutes to reach normal operating temperature and enter closed loop.

   The timer at the lower right of the screen counts time as the engine warms up. If the engine is not fully warm, the self-test may not complete.
3. Press **Y** and an initiation message displays (Figure 6-9).

```
Initiate Self-Test By Applying 22”HG.
Vacuum On The Vent Port Of The BMAP
Sensor For 8 Seconds, Then Release.
```

**Figure 6-9** *Sample EEC-III KOER self-test initiation screen*

4. Apply 22 inHg of vacuum to the vent port of the barometric and manifold absolute pressure (BMAP) sensor. Hold vacuum for about 8 seconds; then release it. The vacuum release triggers the self-test.

   A “test initiated wait” message displays. The EEC-III system cycles through the self-test, and a code list displays at the end of the test:

   a. If no codes are present, “11 system pass” displays.

   b. If codes are present, they display in numerical order.

### *1983 EEC-III Carbureted Truck KOER Self-Tests*

A different method, rather than releasing BMAP sensor vacuum, is used to trigger a KOER self-tests on 1983 trucks with a 5.0L or 5.8L carbureted engine. Connect the MULTI-1 adapter as shown in Figure 6-10.

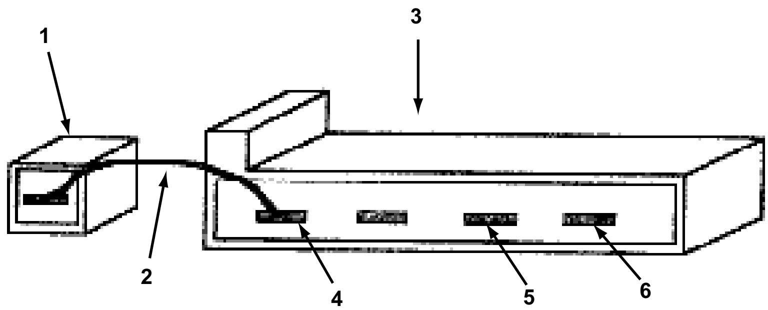


**Figure 6-10** *EEC-III test connector*

**1— STI pigtail**
**2— Jumper wire**
**3— EEC-III STI connector**
**4— Black MULTI-1 wire**
**5— Blue MULTI-1 wire**
**6— Brown MULTI-1 wire**

**To perform a KOER self-test on these models:**

- On trucks with a 5.0L 2-barrel (code F) engine, connect a jump wire from the STI pigtail (pink wire) to ground (Figure 6-10), wait 8 seconds, then disconnect the jump wire to start a self-test.
- For all other 5.0L carbureted truck engines, connect a jumper wire from the self-test input (STI) pigtail to the ground terminal in the EEC-III test connector for 8 seconds. Then, remove the jumper to start the test.
- On trucks with a 5.8L carbureted engine, route manifold vacuum to the tee in the thermactor air bypass valve line before running the test.

### *EEC-IV and EEC-V/CAN KOER Self-Tests*

On most 1988 and all 1989 and later models, the vehicle PCM does not enter the KOER self-test if any of the on-demand codes found during the KOEO self-test are not corrected. If KOEO on-demand codes are present, a “fix all hard codes” message displays when the KOER self-test is selected.

In some cases, the scan tool may display a message indicating that the cylinder identification cannot be found. If this happens, follow the procedure below.

**To check for on-demand codes that have not been repaired:**

1. Press **N** to return to the Codes Menu.
2. Select **Review Codes**.
3. If no uncorrected codes are present, momentarily disconnect the scan tool from the vehicle to recall the vehicle ID from memory. Verify that the ID entered is correct.

**To select a KOER self-test for EEC-IV and EEC-V/CAN:**

1. Select **KOER Self-Test**.
   The test screen displays (Figure 6-11).

```
Engine Running Self-Test
Start Engine.  Allow Engine To Reach
Norman Operating Temperature.
Press y When Engine Is Fully Warm. [0:00]
```

**Figure 6-11** *Sample EEC-V/CAN KOER self-test screen (EEC-IV is similar)*

An EEC-IV screen is similar to the EEC-V/CAN screen shown. Follow the on-screen instructions. The engine must be warm for test results to be valid. The timer at the right side of the bottom line counts minutes and seconds from when this test is selected. It counts to 9:59, then repeats from 0:00.

---

**IMPORTANT:**
Keep hands and test leads away from the fan and other engine parts during all engine running tests. Certain components may cycle on at any time during engine running tests.

---

2. Press **Y** after 2 minutes and a test initiation message displays (Figure 6-12).

```
Engine Running Self-Test
Start Engine And Run At Idle.  Do Not
Accelerate. Press Y To Continue Or
Press Y Before Starting Engine).
```

**Figure 6-12** *Sample KOER self-test initiation screen*

On an EEC-IV system, if you performed the engine-off test before the engine-running test, a “warning” message displays if the ignition was not switched off. This message means the self-test output (STO) circuit to the PCM is energized from a previous test. For some vehicles, you can ignore this message and press **Y** to enter the KOER test. If uncertain, turn the key off, wait 10 seconds, and test.

3. Press **Y** and “self-test initiated wait for codes” displays.

   You should hear engine speed change with most systems during the test if it progresses normally. Also, the screen changes and may make certain requests during the self-test. At the end of the KOER self-test, a code list displays.

### *Reading EEC-IV Slow Codes*

If you choose to read slow codes during the KOER test, it takes longer to receive all of the codes. LED #1 flashes as the scan tool receives code pulses. The LED flickers briefly as the PCM transmits fast codes. It then pulses evenly as the scan tool receives the slow codes.

The PCM transmits on-demand codes. All of the code digit pulses are one-half second on and one-half second off. A two-second pause is used to separate the digits of each code, and a four-second pause separates the codes from each other. The entire test may take several minutes. The time it takes to run depends on the length of the code list.

**IMPORTANT:**
Do not press N to exit a KOER test until the last code pulse is received. Wait at least 5 to 10 seconds after the last LED flash before pressing N to exit. Pressing N sooner interrupts the code transmission and not all codes are received. “End of List” does not necessarily mean that the test is over.

### *MCU KOER Self-Tests*

The KOER self-test for MCU systems displays on-demand codes that are present with the ignition on and the engine running. The MCU is a limited function system that only controls fuel mixture at cruise. There is no idle speed, timing, or EGR control. Fuel corrections are made in response to oxygen sensor feedback.

A KOER self-test for an MCU system is similar to that for an EEC-IV system (see “EEC-IV and EEC-V/CAN KOER Self-Tests” on page 75), except MCU does not output continuous codes and does not perform wiggle tests. In addition, the self-tests detect only MCU-related faults. Problems outside the MCU system do not set codes. Use EEC-IV and EEC-V KOEO self-test for procedures to test MCU.

**NOTE:**
MCU cylinders 4 and 6 require 2500 RPM before the test will initiate.

## Code Speed

Most EEC-IV systems transmit both slow codes and fast codes, and the scan tool reads either. The only difference between the slow and fast codes is the transmission speed from the system PCM. Typically, fast code transmission is the quickest and most accurate way to perform tests. However, some vehicles may not reliably transmit fast codes. On others, signal interference causes invalid service codes.

Use the Code Speed selection on the Codes Menu to choose the desired code-reading speed. On an EEC-IV vehicle, the Code Speed selection also allows choosing between automatic or manual clearing of continuous codes. Code speed selections remain as set until you change it, or until the internal battery is disconnected.

If you select Fast Codes w/Automatic Code Clearing, the scan tool automatically clears codes from the PCM after reading the fast code transmission cycle during the KOEO test. Select slow codes and you must manually clear codes using the Clear Codes selection on the Codes Menu.

Selecting Code Speed opens the Select Code Speed menu (Figure 6-13).

```
Select Code Speed     [Press N To Exit]
>Fast Codes W/Automatic Code Clearing
 Fast Codes (No Automatic Code Clearing)
 Slow Codes (No Automatic Code Clearing)
```

**Figure 6-13** *Sample Select Code Speed screen*

## Memory Codes

Available on power stroke diesel and EEC-V systems only, selecting Memory Codes displays the continuous codes of intermittent faults from PCM memory. These codes should be serviced last, after any on-demand codes. On EEC-IV systems, memory codes gather at the end of the KOEO self-test.

## Clear Codes

Clear Codes is available on EEC-IV and EEC-V/CAN systems only, this selection manually clears continuous codes from PCM memory. On EEC-IV systems, you have the option of clearing codes automatically after a KOEO self-test.

### *EEC-IV Code Clearing*

The Clear Codes selection for EEC-IV systems is used to manually erase the PCM memory. When selected, the scan tool repeats the KOEO test, then interrupts the self-test input line to clear the PCM.

Ford service procedures advise clearing all codes after making repairs and then repeating the self-test to verify the repair. Note that continuous codes displayed during a self-test are saved in scan tool memory. If codes are cleared and the problem does not reoccur for an on-demand code when a self-test is repeated, the PCM does not set the code. Repeating a self-test erases the code list from a previous test in memory—including continuous codes—and replaces it with a new list.

**NOTE:**
This manual code-clearing method must be used if the code speed selection is set to read slow codes or fast codes with auto code clear. See “Reading EEC-IV Slow Codes” on page 76 for more information.

**To clear codes on EEC-IV systems:**

1. Select **Clear Codes**.

   A confirmation screen displays (Figure 6-14).

```
*Clear Memory Codes*
Press Y, Then Turn Key On.  Do Not Start
The Engine.
```

**Figure 6-14** *Sample EEC-IV clear memory codes confirmation screen*

2. Press **Y** and switch the ignition on.

   The display changes to read “self-test initiated wait for code clearing.” After about 40 to 60 seconds, the “codes cleared” screen should display (Figure 6-15).

```
Codes Cleared
Press N To Exit.
```

**Figure 6-15** *Sample EEC-IV codes cleared message*

If the codes cleared message does not appear after about 1 minute, refer to "Ford Communications Problems" on page 716 to diagnose a vehicle self-test failure.

### *EEC-V/CAN Code Clearing*

The Clear Codes selection on EEC-V/CAN systems, which manually erases the PCM code memory, is similar to that for EEC-IV systems.

**NOTE:**
Before clearing codes on an EEC-V/CAN system, always check freeze frame data, pending DTCs, OBD-II Readiness Monitors, and Mode 06 Data.

**To clear codes on EEC-V/CAN:**

1. Select **Clear Codes**.

   A confirmation screen displays (Figure 6-16).

```
Clear Codes
 Key Must Be On With The Engine Off Or
 Running.  Press N To Exit Without
 Clearing.  Press Y To Clear Codes.
```

**Figure 6-16** *Sample EEC-V/CAN clear codes confirmation screen*

2. Press **Y**.

   A "self-test initiated" message displays. After about 40 to 60 seconds, the "codes cleared" screen should display (Figure 6-15). If the codes cleared message does not appear after about 1 minute, refer to "Ford Communications Problems" on page 716.

## Review Codes

The Review Codes selection is available on the Codes Menu after running a self-test. This selection is available on EEC-III, MCU, EEC-IV, and EEC-V/CAN systems.

**To review codes:**

1. Select **Review Codes**.
2. Repair faults in the order listed. Also, remember these points:
3. Review all codes until "end of list" appears.

4. Select Fast Codes w/Automatic Code Clearing for any EEC-IV system and the scan tool clears codes from the PCM automatically after a test but saves them in the scan tool memory.
5. The scan tool saves the codes from the most recent KOEO or KOER self-test for display in review codes. If a test is repeated, new codes replace previous ones.
6. Always record continuous memory codes after any EEC-IV test. They may be automatically cleared from the PCM, and subsequent tests may not display them.
7. If you are reading slow codes or fast codes without auto code clear on an EEC-IV system, the scan tool saves them in memory. However, the Clear Codes selection must be used to clear the PCM.

## Print Codes

The Print Codes selection prints the service code list from scan tool memory. All printouts of the code list include the vehicle ID.

**To print codes:**

1. Select **Print Codes**.

   A "printing wait" message displays. After printing is complete, the message clears.
2. Press **N** at any time during the printing process to abort printing.

   The display returns to the Codes Menu before the printing is complete. If the printer does not respond or fails, a "not responding" message displays (Figure 6-17). If the printer problem is corrected, or if the printer recovers, the display returns to the normal printing screen and the printer resumes printing.

```
Printing                            Wait.
Press N To Abort Printing.
Printer Not Responding.  Check Printer.
Check Printer Paper.
```

**Figure 6-17** *Sample printer not responding message*

## MECS Service Codes

Selecting Auto Code Read displays a screen like Figure 6-18.

```
            Ford 1983 - 2006
       ****  Gathering Codes  ****
  Waiting for codes. If no repsonse, try
  inducing code to check code gathering.
```

**Figure 6-18** *Sample gathering codes screen*

If multiple codes are received, the scan tool continues to add to the list. Scroll to view the numbers and titles of all codes. Code numbers appear on the top line in the order in which the ECM transmits them (Figure 6-19).

```
Ford 1983 - 2006
DTC List
Intake Air Temp Sensor Or Circuit
[02/04]
```

**Figure 6-19** *Sample Auto Code Read screen*

LEDs flash simultaneously with the codes as they are received by the scan tool.

**NOTE:**
Some vehicles transmit codes very slowly. Allow several seconds after receiving any code to ensure that no more codes follow.

## 6.1.2 EEC-IV Functional Tests

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

EEC-IV systems typically offer several functional tests (Figure 6-20).

```
Scroll To Select A Test.
>Computed Timing      Code Speed
 Wiggle (Engine Off)  Output State Check
 Wiggle (Running)     Idle Speed Adjust
```

**Figure 6-20** *Sample EEC-IV Functional Tests menu*

**NOTE:**
For EEC-IV vehicles, the ignition key should be switched off when selecting Functional Tests from the Main Menu - PCM.

This section includes the following functional tests for EEC-IV systems:


- “Computed Timing Test” on page 81
- “Wiggle (Engine Off) Test” on page 82
- “Wiggle (Engine Running) Test” on page 83
- “Output State Check” on page 84
- “Idle Speed Adjustment Test” on page 85
- “SEFI Cylinder Balance Test— 1986 to 1995 EEC-IV Engines Only” on page 86
- “LFC and HFC (Low and High Fan Control)” on page 88


### Computed Timing Test

The Computed Timing functional test checks ignition timing with the engine running at a controlled idle speed. It also verifies the ability of the PCM to advance and retard timing. Connect either a timing light or a magnetic timing meter to the engine before testing.

On most EEC-IV engines, the PCM advances timing 20° above the base timing setting. So if the base timing specification is 10° BTDC, expect to read 30° BTDC with a timing light or meter. Refer to Ford service manuals for timing specifications and test procedures.

**To conduct a computed timing test:**

1. Select **Computed Timing**.

   The “timing check” screen displays (Figure 6-21).

```
*Timing Check*  Start Engine And Check
Timing Within 2 Minutes
Timing Should Be Base +20°
Press N To Exit.
```

**Figure 6-21** *Computed timing check screen*

**NOTE:**
A “warning” message displays (Figure 6-22) if the timing check test is selected with the engine running or with the ignition switch on. This means the PCM self-test output (STO) circuit is still energized from a previous test. On some vehicles, this message can be ignored. If uncertain, turn the key off, wait 10 seconds, restart the engine, then enter the test.

```
WARNING:  Self-Test Output Is Energized.
If You have Run Any Self-Test, Turn Key
Off, Wait.  If No Test Has Been Run,
Press Y To Continue.
```

**Figure 6-22** *Sample self-test output energized warning*

2. With the engine warm and running at idle, press **Y** to start the test.
3. Check the timing with a timing light or timing meter within 2 minutes.

## Wiggle (Engine Off) Test

Selecting Wiggle (Engine Off) puts the EEC-IV system into a program that records intermittent service codes that occur as you wiggle or tap on various engine sensors, actuators, and wiring connectors with the ignition on and the engine off.

**To conduct a wiggle (engine off) test:**

1. Select **Wiggle (Engine Off)**.

   The test initiation screen displays (Figure 6-23).

```
*Wiggle Test - Key On, Engine Off*
Turn Key On.  Do Not Start Engine.
With Key On, Press Y To Continue
.........................................
```

**Figure 6-23** *Sample engine off wiggle test initiation screen*

2. Switch the key on and press **Y**.

   After a brief startup message, the test displays (Figure 6-24).

```
Move, Wiggle, And Tap The Harness,
Sensors, And Connectors.  Do Not Turn
Key Off During Test! Press N To Exit
.......................................
```

**Figure 6-24** *Sample engine off wiggle test screen*

3. Wiggle or tap the engine sensors, actuators, and wiring connectors.

   The bottom line of the screen is blank until a fault occurs and a code sets. If a code sets, the bottom line displays a “memory code stored–run KOEO test” message. Always check for memory DTCs after a wiggle test.

**NOTE:**
Do not wiggle the test adapter loose from the self-test connector during this test or a false code may set. Always exit the test before turning off the ignition or a false code may result.

**To read the service codes from a wiggle test:**

- Select **Codes Menu > KOEO Self-Test**.

## Wiggle (Engine Running) Test

Selecting Wiggle (Engine Running) from the EEC-IV Functional Tests menu places the EEC-IV system into a program that records intermittent service codes as you wiggle or tap on engine sensors, actuators, and wiring connectors with the engine running.

The test is not valid for the following engines because the self-test output line continuously switches from high to low, which could mask any faults detected by the Wiggle test:

- 1984–85 1.6L
- 1984–85 2.3L SVO
- 1985–86 2.3L turbo
- 1986 3.0L

**To conduct a wiggle (engine running) test:**

1. Select **Wiggle (Engine Running)**.

   The test instruction screen displays (Figure 6-25).

```
*Wiggle Test - Engine Running*
Start Engine And Run At Idle.  Do Not
Accelerate.  Press Y To Continue Or
Press Y Before Starting Engine).
```

**Figure 6-25** *Sample engine running wiggle test instruction screen*

2. If the engine is running, a warning message displays. Switch the engine off, wait 10 seconds, then restart the test. Otherwise, start and run the engine at idle speed.
3. Once the engine is fully warm, press **Y** to enter the test.

The screen momentarily displays a test initiated message, then switches to the test screen (Figure 6-26).

```
Move, Wiggle, And Tap The Harness,
Sensors, And Connectors.  Do Not Turn
Key Off During Test! Press N To Exit
.......................................
```

**Figure 6-26** *Sample engine running wiggle test screen*

4. Wiggle or tap on sensors, actuators, and wiring connectors.

   The bottom line of the screen is blank until a fault occurs and a code sets. When a code sets, the bottom line reads “memory code stored–run KOEO test,” but this message only appears during a fault. Always check for memory DTCs after a wiggle test.

**NOTE:**
Do not wiggle the test adapter loose from the self-test connector during this test, or a false code may set. Always exit the test before turning off the ignition.

**To read the service codes from a wiggle test:**

- Select **Codes Menu > KOEO Self-Test**.

## Output State Check

Selecting Output State Check from the EEC-IV Functional Tests menu allows you to switch the PCM signals to the engine actuators on and off to take voltmeter readings. If the engine is running, turn it off before selecting the output state test.

**NOTE:**
The EEC-V menu selection is Output State Test instead of Output State Check for EEC-IV systems. This difference is with terminology only; the function is the same.

**To conduct an output state test:**

1. Select **Output State Check**.

   The test initiation screen displays (Figure 6-27).

```
*Output State Test*
Press Y, Then Turn Key On.  Do Not Start
The Engine.
```

**Figure 6-27** *Sample output state test initiation screen*

2. Following the screen instructions, switch the ignition on with the engine off, then press **Y**.

**IMPORTANT:**
When the test begins, all actuators (except IAC and fuel injectors) should be off and the control circuits from the PCM should be high (above 10 V). Use the DVOM or lab scope to check actuators.

A “self-test initiated” screen displays, followed by the test screen (Figure 6-28).

```
TTo Toggle Actuators On/Off, Snap The
Throttle.  Check The Actuators
Individually With A DVOM.
**  Actuators Off  **
```

**Figure 6-28** *Sample output state test screen*

3. Press the accelerator to wide open throttle (WOT) to switch all engine actuators from off to on or from on to off.

   All of the actuators stay on or off until the throttle is pressed again. As the actuators change state, the bottom line of the display shows if they are on or off.

## Idle Speed Adjustment Test

The Idle Speed Adjust functional test allows you to adjust the idle speed for certain 1990 and later engines. Before adjusting idle speed, make sure the throttle body and idle speed control (ISC) device are clean, and the throttle linkage is not sticking or binding. Certain throttle bodies and ISC devices cannot be cleaned. Refer to Fast-Track® Troubleshooter, Ford Reference F051 for throttle body cleaning information.

Also, switch all accessories off and make sure the O2S is working properly, ignition timing is correct, and there are no vacuum leaks. Place the transmission in park or neutral before selecting the test.

A command from the scan tool starts the engine-running test, and a signal from the EEC-IV PCM indicates when the test is complete. During this waiting period, the cylinder identification displays along with instructions to press the brake pedal, turn the steering wheel, or snap the throttle. These actions are not necessary, however, doing them speeds the self-test.

**IMPORTANT:**
If any service codes other than “11–no faults present” are displayed after the engine-running test, correct any code problems before proceeding with the idle adjustment.

**To conduct an idle speed adjustment test:**

1. Select **Idle Speed Adjust**.

   The test initiation screen displays (Figure 6-29). If another test was performed before this one, a “warning” screen may display because the self-test output (STO) circuit is still energized from the previous test. For some vehicles, it is safe to ignore this message and enter the test. If you are uncertain, turn the key off, wait 10 seconds, and restart the engine before entering the test.

```
*Idle Speed Adjustment*
Start Engine And Run AT 2000 RPM
FOR 2 Minutes, Or until EGO Is Warm.
Press Y When Done.                [0:00]
```

**Figure 6-29** *Sample idle speed adjust test initiation screen*

2. Start the engine and run at 2000 RPM for two minutes.

There is a clock displayed in the lower right corner of the screen. Skip this warm-up if the engine is already warm.

3. Press **Y** and the “test initiated” screen displays.

   Once the test is complete, the scan tool sends a start-idle-test signal to the PCM. The screen changes as the scan tool waits for a response from the PCM (Figure 6-30). Some 1991 5.8L truck engines do not have the idle speed test.

```
Engine Running Test Complete.  Ready For
Idle Speed Test.  If No Response In 15
Seconds, Idle Test May Not Be Available
In This EEC.
```

**Figure 6-30** *Sample idle speed adjust test complete screen*

   When the idle speed test signal is received from the PCM, the throttle stop screw adjustment screen displays (Figure 6-31). The display indicates if idle speed is too high, too low, or correct. If the display reads “TPS out of adjustment—fix first,” the throttle position sensor must be fixed to proceed. If idle speed is correct, skip to the last step.

```
Turn Throttle Stop Screw To Adjust RPM.
Press N When Done And RPM Is In Spec.
Current Condition Is:
**  Idle RPM________975
```

**Figure 6-31** *Sample idle speed adjust throttle stop screen*

   Ten minutes after the idle speed test signal is received, the PCM stops communicating. Normally, this is enough time to complete the adjustment. If not, return to the Functional Tests menu and repeat.

4. Turn the throttle stop until “idle RPM correct” displays.
5. Press **N** when the idle RPM is correct.

   An instruction and verification screen displays (Figure 6-32).

```
Run Engine AT 1500 RPM For 10 Seconds.
When Done, Press Y To Recheck Base Idle,
Or Press N To Exit.               [0:00]
```

**Figure 6-32** *Sample idle speed adjust verification screen*

6. Run the engine at 1500 RPM for 10 seconds, return to idle, and press **Y**.

   An idle RPM correct message should display. If not, repeat the idle speed adjustment.

7. When the idle is properly adjusted, press **N** to exit.

## SEFI Cylinder Balance Test— 1986 to 1995 EEC-IV Engines Only

The cylinder balance test, used only on EEC-IV models with sequential electronic fuel-injection (SEFI), is actually a functional test. However, it is entered at the end of a KOER self-test. The test isolates a weak cylinder. The PCM begins the test by fixing the idle speed control duty cycle and allowing the engine to stabilize. The PCM then records and stores the engine speed for future reference. Depending on the engine, the PCM:

1. Shuts off fuel to a specific cylinder.
2. Allows the engine to stabilize.
3. Records and stores engine speed.
4. Switches the fuel back on.

This process repeats for each remaining cylinder in descending order.

**Table 6-1** *SEFI Cylinder Balance Application Chart*

| Year | Engine |
|---|---|
| 1986 to 1988 | 5.0l Thunderbird/Cougar, Lincoln Town Car, Lincoln Mark VII, Crown Victoria/Grand Marquis |
| 1989 to 1990 | 3.0L SHO Taurus, 3.8L Taurus/Sable, Lincoln Continental, Thunderbird/ Cougar, 5.0L Thunderbird/Cougar, Lincoln Town Car, Lincoln Mark VII, Crown Victoria/Grand Marquis |
| 1991 | All Except: 2.3L Tempo, Topaz, Mustang, 3.0L Probe, all Truck engines |
| 1992 | All Except: 2.3L Mustang, 3.0L Probe, 2.3L, 2.9L, & 4.0L Ranger, 4.0L Aerostar and Explorer, 4.9L, 5.0L, 5.8L Truck |
| 1993 | All Except: 2.0L Probe, 2.3L Mustang & Ranger, Non-California 4.0L Ranger, Explorer, Aerostar, 4.9L, 5.8L, 7.0L & 7.5L Truck engines |
| 1994 | All Except: Non-California 2.3L & 4.0L Ranger, Explorer, Aerostar |
| 1995 | All Except: 4.9L, 5.8L, 7.0L & 7.5L Truck engines |

**To perform the SEFI Cylinder Balance Test on 1986 to 1987 models:**

1. Perform a KOER self-test.
2. After the last *repeated* service code is received, wait approximately 10 seconds.
3. Lightly depress throttle and release.

   You will notice a RPM rise and cylinder deactivation when the test starts. The test will run for approximately 90 seconds.
4. Repeat the test as needed by lightly tapping the throttle after the last *repeated* service code.

### *1988 to 1995 models*

The SEFI Cylinder Balance Test on 1988 to 1995 models has three levels of sensitivity:

- First Level—65% gross misfires.
- Second Level—43% partially contributing.
- Third Level—20% partially contributing.

**To perform a First Level SEFI Cylinder Balance Test on 1988 to 1995 models:**

1. Perform a KOER self-test.
2. After the last *repeated* service code is received, wait approximately 10 seconds.
3. Lightly depress throttle and release.

   You will notice a RPM rise and cylinder deactivation when the test starts. The test will run for approximately 90 seconds.

**To perform a Second Level SEFI Cylinder Balance Test on 1988 to 1995 models:**

1. Perform a First Level SEFI Cylinder Balance Test.
2. After the last repeated Cylinder Balance test pass code 90, re-enter the test within 2 minutes by lightly depressing and releasing the throttle. The second level testing will now complete.

**To perform a Second Level SEFI Cylinder Balance Test on 1988 to 1995 models:**

1. Perform a Second Level SEFI Cylinder Balance Test.
2. After the last repeated Cylinder Balance test pass code 90, re-enter the test within 2 minutes by lightly depressing and releasing the throttle. The third level testing will now complete.

**Table 6-2** *SEFI Cylinder Balance DTC Chart*

| Service Code | 90 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 77* |
|---|---|---|---|---|---|---|---|---|---|---|
| Cylinder Number | Pass | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Rerun Test |
| Injector Number | Pass | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| PCM pin # | | 58 | 59 | 12 | 13 | 14 | 15 | 42 | 52 | |

**Table 6-3** *1988 to 1995 SEFI 3 Levels. Example With #3 Cylinder*

| Level 1 | Level 2 | Level 3 | Indication |
|---|---|---|---|
| 90 | X | X | All cylinders contributing equally. |
| 30 | 90 | X | Indicates a weak cylinder. Cylinder is firing but not contributing as much as the others. |
| 30 | 30 | 90 | Same as above but more severe. |
| 30 | 30 | 30 | Very weak or dead cylinder. |

### LFC and HFC (Low and High Fan Control)

The LFC and HFC (Low Fan Control and High Fan Control) functional test allows manual control of the engine cooling fans during KOEO engine fan testing in 1992 to 1995 Escorts and 1.9L Tracers with EEC-IV systems.

**To perform a LFC and HFC test:**

1. Select engine Functional Tests from the PCM main menu.
2. Select Output State Check
3. When the output state is ready, depress and hold the throttle down.
4. Wait for the MIL to flash once (10 seconds) and release the throttle for low speed.
5. Wait for the MIL to flash twice (15 seconds) and release the throttle for high speed.
6. Depress and release the throttle to cycle fans on and off.

## 6.1.3 Non-Powerstroke Diesel 7.3L Functional Tests

This section includes the following functional tests:

- “Wiggle (Engine Running) Test” on page 89
- “Output State Check” on page 90
- “Fuel Injection Pump Lever Test—7.3L Non-Powerstroke Diesel” on page 90

## Wiggle (Engine Running) Test

Selecting Wiggle (Engine Running) places the PCM system into a program that records intermittent service codes as you wiggle or tap on engine sensors, actuators, and wiring connectors with the engine running.

**To conduct a wiggle (engine running) test:**

1. Select **Wiggle (Engine Running)**.

   The test instruction screen displays (Figure 6-33).

```
*Wiggle Test - Engine Running*
Start Engine And Run At Idle.  Do Not
Accelerate.  Press Y To Continue Or
Press Y Before Starting Engine).
```

**Figure 6-33** *Sample engine running wiggle test instruction screen*

2. If the engine is running, a warning message displays. Switch the engine off, wait 10 seconds, then restart the test. Otherwise, start and run the engine at idle speed.
3. Once the engine is fully warm, press **Y** to enter the test.

   The screen momentarily displays a test initiated message, then switches to the test screen (Figure 6-34).

```
Move, Wiggle, And Tap The harness,
Sensors, And Connectors.  Do Not Turn
Key Off During Test! Press N To Exit
........................................
```

**Figure 6-34** *Sample engine running wiggle test screen*

4. Wiggle or tap on sensors, actuators, and wiring connectors.

   The bottom line of the screen is blank until a fault occurs and a code sets. When a code sets, the bottom line reads “memory code stored–run KOEO test,” but this message only appears during a fault. Always check for memory DTCs after a wiggle test.

**NOTE:**
Do not wiggle the test adapter loose from the self-test connector during this test, or a false code may set. Always exit the test before turning off the ignition.

**To read the service codes from a wiggle test:**

- Select **Codes Menu > KOEO Self-Test**.

## Output State Check

Selecting Output State Check from the Functional Tests menu allows you to switch the PCM signals to the engine actuators on and off to take voltmeter readings. If the engine is running, turn it off before selecting the output state test.

**NOTE:**
The EEC-V menu selection is Output State Test instead of Output State Check for EEC-IV systems. This difference is with terminology only; the function is the same.

**To conduct an output state test:**

1. Select **Output State Check**.

   The test initiation screen displays (Figure 6-35).

```
*Output State Test*
Press Y, Then Turn Key On.  Do Not Start
The Engine.
```

**Figure 6-35** *Sample output state test initiation screen*

2. Following the screen instructions, switch the ignition on with the engine off, then press **Y**.

**IMPORTANT:**
When the test begins, all actuators (except IAC and fuel injectors) should be off and the control circuits from the PCM should be high (above 10 V). Use the DVOM or lab scope to check actuators.

A “self-test initiated” screen displays, followed by the test screen (Figure 6-36).

```
To Toggle Actuators On/Off, Snap the
Throttle.  Check The Actuators
Individually With A DVOM.
**  Actuators Off  **
```

**Figure 6-36** *Sample output state test screen*

3. Press the accelerator to wide open throttle (WOT) to switch all engine actuators from off to on or from on to off.

   All of the actuators stay on or off until the throttle is pressed again. As the actuators change state, the bottom line of the display shows if they are on or off.

## Fuel Injection Pump Lever Test—7.3L Non-Powerstroke Diesel

The FIPL Adjust selection is available on trucks with a 7.3L non-Powerstroke Diesel engine, an E4OD transmission, and an EEC-IV transmission control system.

The FIPL adjust test allows for FIPL sensor inspection and adjustment. Improper adjustment causes harsh upshifts and transmission damage.

**NOTE:**
Use a 0.515-inch gauge block (Ford tool T83-78200-AH, or equivalent) when performing this test. See Transmission Troubleshooter Reference F1002 for tool dimensions and usage.

The FIPL sensor attaches to the diesel injection pump and is operated by the throttle lever (Figure 6-37). The FIPL sensor transmits a signal to the transmission electronic control (TEC) module that varies in proportion to the amount of fuel being delivered by the pump. An FIPL sensor operates much like the throttle position sensor on a gasoline engine. The TEC uses the FIPL signal to control shifting and torque capacity, which results in line pressure changes. This is similar to a vacuum modulator or throttle valve linkage operation on a conventional automatic transmission.

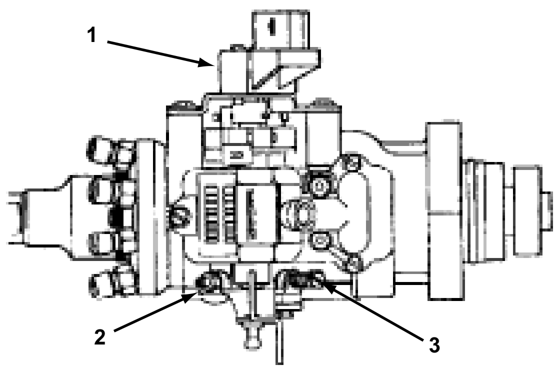


**Figure 6-37** *Sample diesel fuel injection pump top view*

**1— Fuel Injection Pump Lever (FIPL) sensor**

**2— Maximum throttle travel screw (do not adjust)**

**3— Low idle adjust screw**

Two people are required to perform this test, one inside the vehicle to operate the scan tool and hold the throttle down, and one to make adjustments inside the engine compartment.

**IMPORTANT:**
Do not release the throttle with the gauge block in place, as the gauge block can fall inside the intake valley, making it difficult to retrieve.

**NOTE:**
When the FIPL sensor malfunctions, the TCM detects an out-of-limit signal and goes to a backup mode to protect the transmission. In this mode, the TEC commands maximum throttle valve (TV) pressure for a single shift schedule regardless of throttle position—equivalent to a heavy, but not wide open, throttle. Harsh upshifts, particularly noticeable at light throttle, result. An intermittent or erratic signal or an incorrectly adjusted FIPL sensor may not be detected by the TEC, resulting in shifting problems and possible transmission damage.

**To conduct a FIPL adjust test:**

1. Select **FIPL Adjust**.

   The tool installation screen displays (Figure 6-38).

```
Insert 0.515” Gauge Block Between FIPL
Travel Screw And Gauge Boss.  Hold
Throttle Open Against Gauge Block.
Press Y To Continue.
```

**Figure 6-38** *Gauge block installation screen*

2. Insert the 0.515-inch gauge block between the gauge boss and the maximum throttle travel screw (Figure 6-39). Hold the throttle open against the gauge block to keep it in place.

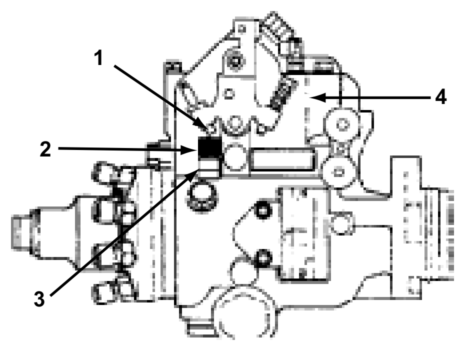


**Figure 6-39** *Gauge block installation (right side view)*

**1— Fuel pump lever travel screw (do not adjust)**

**2— Gauge block**

**3— Gauge boss**

**4— Low idle adjust screw**

On F-series trucks, the throttle return spring may be used to hold the throttle lever open. To do this:

a. Release the throttle and remove the throttle cable from the throttle lever on the right side of the pump.
b. Remove the throttle return spring.
c. Install one end of the spring over the throttle lever ball stud and the other end over the throttle cable support bracket.

3. After inserting the gauge block, press **Y**.

   The FIPL adjustment screen displays (Figure 6-40).

```
*FIPL Adjustment*
Press Y Then Turn Key On.  Do Not Start
The Engine.
Hold Throttle Down During Entire Test.
```

**Figure 6-40** *Sample FIPL adjustment screen*

4. Without starting the engine. Hold the throttle down, press **Y**, and turn the ignition on.

   A “self test initiated” screen displays, the scan tool starts the KOEO test, then waits for a signal from the PCM indicating that the vehicle is ready for FIPL adjustment. The display indicates when the FIPL adjust test is complete (Figure 6-41).

```
Engine Off Test Complete.  Ready For
FIPL Adjustment.  Without Releasing
The Throttle, Press The Overdrive Cancel
Switch Once To Start FIPL Adjustment.
```

**Figure 6-41** *Sample engine off test complete screen*

**IMPORTANT:**
Do not turn the key off until the FIPL Adjust test is complete and the engine off test complete message displays on the screen. Doing so gives inaccurate test results.

5. Press the overdrive cancel switch once to begin the FIPL test (Figure 6-42). The overdrive cancel switch is on the end of the shift lever or the instrument panel.

```
If Necessary, Loosen FIPL Sensor Screws,
And Rotate Sensor To Correct Setting.
Current Condition Is:
** FIPL Setting Is____________**
```

**Figure 6-42** *Sample FIPL adjustment screen*

Ten minutes after the overdrive-cancel switch is pressed, the PCM stops communicating with the scan tool. Normally, this is enough time to complete the test and adjustment. If not, exit the test, go to the Functional Tests menu, and repeat this procedure.

**IMPORTANT:**
Incorrect FIPL sensor adjustment may result in transmission damage. The sensor is attached to the pump with tamperproof screws. Do not move the mounting bracket. Only adjust the clearance between the sensor-to-bracket screws and the sensor.

6. If needed, adjust the FIPL sensor as follows and refer to Figure 6-43.
   a. Loosen the two FIPL sensor attachment screws.
   b. Slowly rotate the sensor until the display indicates the setting is correct. The FIPL sensor rotates slightly in either direction. Rotate the FIPL first one way, and then the other until properly adjusted. If the sensor cannot be properly adjusted, replace it.
   c. Tighten the screws to 75 to 90 inch-pounds of torque.
   d. Remove the gauge block and cycle the throttle lever from idle to WOT five times.
   e. Use the gauge block and verify the FIPL setting. If further adjustment is necessary, repeat the procedure.

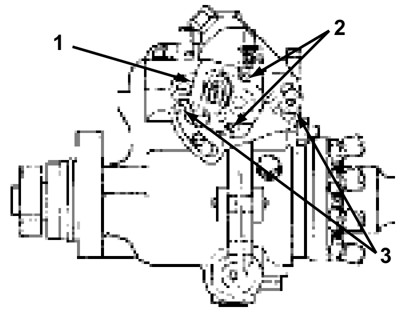


**Figure 6-43** *Adjusting the FIPL sensor (left side view)*

**1— Fuel Injection Pump Lever (FIPL) sensor**

**2— FIPL attachment screws (do not over-tighten)**

**3— FIPL bracket screws (do not adjust)**

7. When the FIPL setting is correct, press N.
8. Remove the gauge block and attach the throttle return spring and throttle cable in the proper locations.
9. Press **N** to end the FIPL test.
10. After testing, drive the vehicle to check throttle operation and transmission shifting.

## 6.1.4 EEC-V Functional Tests (OBD II)

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

The EEC-V Functional Tests menu offers various selections for vehicles with gasoline engines including:

- “Output State Test” on page 94
- “Module Identification Test” on page 95
- “Bypass EVAP System Cold Soak” on page 96
- “EVAP System Test” on page 96
- “Interactive Bi-directional Functional Tests— EEC V (OBD II)” on page 96
- “Testing Transmission Systems and Functional Tests” on page 98

### Output State Test

An output state test allows you to switch PCM signals to the engine actuators on and off so they can be tested with a DVOM or lab scope. The engine must be off before the test is selected. Output state tests for gasoline and diesel systems are slightly different.

During an output state test, actuators stay on or off until you switch them. Actuators default to their normal state after 10 minutes, after the vehicle is started, or after cycling the ignition switches off and on.

**CAUTION**

Make sure the fuel system is intact and not being serviced before proceeding. Selecting all outputs on causes the electric fuel pump to briefly energize. Also, make sure fan blades are clear of obstruction before selecting low or high speed fan on.

**To conduct an output state test on a vehicle with a gasoline engine:**

1. Select **Output State Test**.

   A test activation screen displays.

2. Press **Y** and the test list displays (Figure 6-44).

```
>Normally On Outputs Off
 All Outputs On        Low Fan On Only
 High Fan On Only
```

**Figure 6-44** *Sample EEC-V gasoline engine output state tests*

3. Select the desired test.

   If the vehicle performs the test, “activated” displays to the right of the selected test.

   If the vehicle does not perform the test, “error” displays to the right of the selected test.

4. Take circuit readings while the test is activated.

## Module Identification Test

The Module ID selection from the EEC-V Functional Tests menu displays the PCM module software file, part number, and, if available, the VIN of the vehicle.

**To conduct a Module ID test:**

1. Select **Module ID Test**.

   An identification screen displays (Figure 6-45). If a module does not store VIN information, “not available” displays on the third line.

```
  Software File:  CCAQAB3.HEX
Module Part #:  F4WFBD
          VIN:  XXXXXXXXXXXXXXXX
 Copyright Ford Motor Co. 1993
```

**Figure 6-45** *Sample EEC-V module identification screen*

2. Press **Y** to print the screen, or press **N** to exit.

### Bypass EVAP System Cold Soak

```
Select Test:
>Bypass EVAP System Cold Soak Time
 EVAP System Test
 Output System Test
```

**Figure 6-46** *Typical functional test EVAP selection*

Selecting the EVAP system cold soak bypass test allows the OBD 'EVAP running loss drive cycle' to proceed for the purpose of evaporative system fault verification. This functional test is designed to bypass the 'engine off cold soak timer' that otherwise requires an engine off waiting period (for instance, 6 hours) before the EVAP monitor is available. Do not shut the ignition off once the EVAP bypass mode is enabled, or the EVAP cold soak timer will be reset. Certain conditions, such as the correct fuel level, are required for successful EVAP system testing.

---

**IMPORTANT:**
Performing this procedure will clear the PCM of any stored diagnostic information and reset the Readiness Monitor Status. It is recommended to gather any desired diagnostic information such as memory DTCs or Freeze Frame Data before testing. Follow the factory recommendations for specific EVAP system drive cycle procedures.

---

### EVAP System Test

Selecting EVAP System test initiates a functional leak check of the evaporative emission system. The test routine manipulates EVAP control solenoids and engine RPM for the purpose of detecting system leaks that are 0.040" or larger. For accurate results, the test requires that the engine is running as well as other operating conditions such as the correct fuel level input. The EVAP system test does not affect the OBD EVAP monitor readiness status and is only designed to function as an automated system leak test. The test is not designed to set or clear any specific trouble codes. The scan tool may report any conditions that are preventing successful leak testing, such as low fuel level, or engine RPM out of range. When testing is complete, either a 'system pass' or specific fault detected message will display. Certain conditions (for instance, the amount of vapor present in the EVAP system) may cause various engine responses such as low idle or stalling. These are normal and do not affect overall test results.

---

**IMPORTANT:**
If the EVAP system test is repeated, a waiting period (at least 90 seconds) is recommended to prevent a possible false leak condition.

---

### Interactive Bi-directional Functional Tests— EEC V (OBD II)

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

### *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:**

- Select Scroll Data.

  The last two lines display the data list for the test vehicle (Figure 6-47).

```
>SSA_SS1
 On Off Scroll Data  Exit
 RPM___________908    SSA_SS1_________OFF
 SSB_SS2_______OFF    TCC(%)___________25
```

**Figure 6-47** *Sample functional test data list selection screen*

### *Functional Test Operation*

There are four general types of functional test operations:

- **Information Tests**—These are read-only tests. For instance, select Module ID 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,” “enab/disa”, “excd/norm”, “pass/fail,” “lean/rich,” “high/norm,” or “rev/fwd” may be used to name states (Figure 6-48).
- **Variable Control Tests**—These tests command a certain value for a system or component. For instance, the “Electronic Pressure Control, test allows the scan tool to vary EPC in 15 percent increments up to 90 percent (Figure 6-49).
- **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.

```
>SSA_SS1
 On Off Scroll Data  Exit
 RPM___________908    SSA_SS1_________OFF
 SSB_SS2_______OFF    TCC(%)___________25
```

**Figure 6-48** *Sample shift solenoid functional test*

#### Variable Control Test

Figure 6-49 is an example of a typical variable control test.

```
>Electronic Pressure Control            0
 >0 Scroll Data  Exit
 RPM___________630    SSA_SS1_________OFF
 EPC(kPa)_______127   TCC(%)___________25
```

**Figure 6-49** *Typical electronic pressure control% functional test screen*

Selecting Test from this screen changes the display to show the commanded duty cycle of the Electronic Pressure Control solenoid as a percentage, starting with zero (Figure 6-50).

```
>Electronic Pressure Control           0
 >0 Scroll Data  Exit
 RPM___________630    SSA_SS1_________OFF
 EPC(kPa)_______127   TCC(%)___________25
```

**Figure 6-50** *Typical electronic pressure control% functional test screen*

During a variable control test, scroll to increase or decrease the variable control value. In the above example, scrolling instantaneously changes the Electronic Pressure Control solenoid opening by varying the duty cycle in increments of 15%. The duty cycle commanded by the scan tool is in the upper right corner of the screen (Figure 6-51). Other tests act similarly.

```
>Electronic Pressure Control          15
 >15 Scroll Data  Exit
 RPM___________630    SSA_SS1_________OFF
 EPC(kPa)_______127   TCC(%)___________25
```

**Figure 6-51** *Typical electronic pressure control% functional test screen*

## Testing Transmission Systems and Functional Tests

The majority of Ford transmission and engine systems are integrated into a single PCM controller. Code output and Data display include faults and information for both engine and transmission. 2004 and later models may use a separate TCM (transmission control module) which must be tested separately. Ford transmission testing menu selections vary by year and model.

### *Transmission test menu locations*

**2003 and earlier** transmission tests are available by selecting Engine & Powertrain from the system menus (Figure 6-52).

```
Select System
>Engine & Powertrain
 Antilock Brakes
 Airbag
```

**Figure 6-52** *Typical 2003 and earlier system menu*

Transmission tests are integrated into the PCM menu (Figure 6-53).

```
Main Menu (PCM)         Generic Functions
 Data Display           Movies
 Codes Menu             Custom Setup
>Functional Tests                    F501
```

**Figure 6-53** *Typical 2003 and earlier main menu*

**2004 and later** transmission tests are available in a separate menu selection (Figure 6-54).

```
Select System              Airbag
 Engine & Powertrain        Body Systems
>Transmission
 Antilock Brakes
```

**Figure 6-54** *Typical 2004 and later system menu*

Transmission tests are available at the transmission main menu (Figure 6-55).

```
Main Menu (Trans)            Custom Setup
 Data Display               Movies
 Codes Menu
>Functional Tests                        F501
```

**Figure 6-55** *Typical 2004 and later main menu*

### *Transmission Functional Tests*

- Interactive bi-directional functional testing is available on most OBD-II vehicles.
- The tests include Bench Mode, Drive Mode, and Clear or Stop Transmission Adaptive Tables.
- Transmission functional tests allow the technician to command certain parameters to control the transmission.
- For example the Scanner can be used to shift the transmission only when a gear change is commanded (if 1st gear is commanded, the transmission will remain in 1st gear until the next gear is selected).
- Another example, the Scanner can command a shift solenoid to turn on or off.

```
Activation Time Limit Exceeded
Press Y Or N To Continue
```

**Figure 6-56** *Typical test aborted due to PCM function message*

```
Cannot Perform Test/Function,
Conditions Incorrect - Check Shop Manual
For Proper Test/Function Requirements.
Press N or Y To Return To Test Menu.
```

**Figure 6-57** *Typical test aborted due to inappropriate conditions message*

**CAUTION**

Do not enter a functional test while conducting a road test unless the road test requires it. The PCM makes changes to transmission shift scheduling, the ignition timing, fuel delivery, and other vehicle functions, which may affect engine operation and vehicle control. 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 (Figure 6-56). This does not indicate a problem with the scan tool. Some safety limits are engineered into the PCM to prevent a functional test from enabling under certain inappropriate conditions (Figure 6-56). Always use caution when controlling the automatic transmission to prevent injuries and damage.

Two functional tests are available to test transmission systems:

- “Trans Bench Mode” on page 100
- “Trans Drive Mode” on page 101

**To navigate to transmission functional test:**

- Select Functional Test from the main menu, Trans Bench Mode and Trans Drive Mode will display as menu selections (Figure 6-58).

```
Main Menu (Trans)     Movies
 Data                 Troubleshooter
 Codes Menu           Custom Setup
>Functional Tests
```

**Figure 6-58** *Typical transmission main menu*

### Trans Bench Mode

The Trans Bench Mode allow users to command various transmission solenoids on or off or vary a PWM signal. Electrical tests, data value collection, and other measurements may be performed during Trans Bench Mode testing.

Trans Bench Mode operates only when:

- Digital TR sensor is operational and no digital TR sensor DTCs are present.
- Vehicle speed sensor is operational and no VSS sensor DTCs are present.
- Transmission range selector lever is in P.
- Key is ON.
- Engine is Off.

Trans Bench Mode command values:

- OFF—turns the solenoid Off.
- ON—turns the solenoid ON.

**To use Trans Bench Mode to test a transmission component:**

1. Select Trans Bench Mode from the menu (Figure 6-59).

```
Select Test                    Module ID
>Trans Bench Mode
 Trans Drive Mode
 Clear Trans Tables
```

**Figure 6-59** *Typical transmission test Bench Mode selection*

A component (solenoid) selection menu displays (Figure 6-60).

```
Select Component, Engine Off Only:
>SSA_SS1
 SSB_SS23
 TCC Solenoid                       [v]
```

**Figure 6-60** *Component selection menu*

2. Select a solenoid.
   A functional test menu displays (Figure 6-61).

```
SSA_SS1                              Off
>ON  Off Scroll Data Exit
 RPM_____________908   SSA_SS1________ON
 SSB_SS2__________OFF   TCC(%)_________25
```

**Figure 6-61** *Typical shift solenoid control test with shift solenoid Off*

3. Turn the solenoid ON by pressing **Y**. Turn the solenoid Off by pressing **Y** again (Figure 6-62).

```
SSA_SS1                              ON
 ON >OFF Scroll Data Exit
 RPM_____________908   SSA_SS1________ON
 SSB_SS2__________OFF   TCC(%)_________25
```

**Figure 6-62** *Typical shift solenoid control test with shift solenoid ON*

### Trans Drive Mode

The Trans Drive Mode is a bi-directional functional test that allows the scan tool to control the main functions of the transmission. Gear shift, torque converter clutch and shift solenoids can be controlled. For example, the scan tool Trans Drive Mode allows the technician to command the torque converter clutch to engage while monitoring the actual converter slip or disengage the torque converter clutch while testing the transmission upshifts and downshifts.

Trans Drive Mode operates only when:

- Digital TR sensor is operational.
- No digital TR sensor DTCs are present.
- Vehicle speed sensor is operational.
- No VSS sensor DTCs are present.
- Engine is ON.
- TCC is Off.
- Transmission range selector lever is in O/D.
- Vehicle speed is greater than 3.2 km/h (2mph)

Trans Drive Mode command values:

- 1—PCM selects 1st gear.
- 2—PCM selects 2nd gear.
- 3—PCM selects 3rd gear.
- 4—PCM selects 4th gear.

**To use Trans Drive Mode to test a transmission component:**

1. Select Trans Bench Mode from the menu (Figure 6-63).

```
Select Test                      Module ID
 Output State Test
 Trans Bench Mode
>Trans Drive Mode
```

**Figure 6-63** *Typical transmission test Drive Mode selection*

A component (solenoid) selection menu displays (Figure 6-64).

```
Select Component:
>Gear Command
 Electronic Pressure Control
 TCC Solenoid                      [v]
```

**Figure 6-64** *Component selection menu*

2. Select a solenoid.

   A functional test menu displays (Figure 6-65).

```
Gear Command                           1
>Test Scroll Data Exit
 RPM_____________908   SSA_SS1________ON
 SSB_SS2__________OFF   TCC(%)_________25
```

**Figure 6-65** *Typical gear command test selection*

3. Select a test by pressing **Y** (Figure 6-66).

```
Gear Command                           1
 *1   Scroll Data Exit
 RPM_____________908   SSA_SS1________ON
 SSB_SS2__________OFF   TCC(%)_________25
```

**Figure 6-66** *Typical gear command test selection*

4. Scroll to select the desired gear command and Press **Y** to select the scroll data.

### Clear Trans Tables, Stop Trans Adaptive Learning, Stop Use of Trans Adaptive, Enable Trans Table

Selecting transmission functional tests lets you clear, block or enable the transmission adaptive tables. During the normal vehicle operation, or repeated drive cycle, the ECM or TCM stores the transmission adaptive information in KAM tables. This stored adaptive information may affect the way the vehicle operates. Clearing or stopping the transmission tables eliminates any information that you no longer want to the vehicle to use when driving. Transmission adaptive functions are only applicable to certain vehicles with specific transmissions. A validation message may display if the test or function selected is not supported or the test conditions are not correct (for instance if the vehicle is moving).

Typical functional test sequence is shown in Figure 6-67, Figure 6-68, Figure 6-69:

```
Select Test
 Trans Bench Mode
 Trans Drive Mode
>Clear Trans Tables
```

**Figure 6-67** *Typical transmission clear trans table selection*

```
This function Clears Adapt Tables Used By
The Transmission.
Key On Engine Off. Transmission in Park.
Press Y: Continue Or N: Exit
```

**Figure 6-68** *Typical trans functional test ready message*

```
Test/Function Completed.
Trans Adapt Tables Cleared.

Press N To Exit
```

**Figure 6-69** *Typical trans functional test confirmation message*

### *Operating Conditions and Vehicle Requirements*

- Each test mode has a unique set of vehicle operating requirements.
- Certain conditions must be satisfied for a transmission functional test to operate properly.
- The presence of DTCs (including non-transmission DTCs) or other system faults may affect functional testing.
- If vehicle requirements are not met when sending a functional test command, the Scanner will display an error message (Figure 6-57).
- When the error message is received, functional test is aborted and must be restarted.

### *Before Initiating a Functional Test*

- Select Codes Menu and perform the KOEO and KOER Self Tests (engine and transmission may have to be tested separately).
- Service DTCs, including non-transmission DTCs.
- Service any digital TR Sensor DTCs and verify the TR sensor is operational.
- Service all vehicle speed DTCs and verify the VSS source is operational.

### *Potential Vehicle Speed Sources (Varies By Application)*

- Anti-lock braking system (ABS or RABS).
- Output shaft speed sensor (OSS).
- Vehicle speed sensor (VSS).

- Transfer case speed sensor (4x4 equipped)

## 6.1.5 Powerstroke Diesel Functional Tests

The following functional tests are available for trucks with 7.3L Powerstroke diesel engines:

- Output State test
- Injector Buzz test
- Glow Plug test
- Cylinder Contribution test
- Switch test

Two functional tests are currently available for 6.0L direct injection turbo (DIT) diesel engine:

- Injector Buzz test
- Glow Plug Engine Running test

### Output State Test

An output state test allows you to switch PCM signals to the engine actuators on and off so they can be tested with a DVOM or lab scope. The engine must be off before the test is selected. Output state tests for gasoline and diesel systems are slightly different.

During an output state test, actuators stay on or off until you switch them. Actuators default to their normal state after 10 minutes, after the vehicle is started, or after cycling the ignition switches off and on.

**CAUTION**

Make sure the fuel system is intact and not being serviced before proceeding. Selecting all outputs on causes the electric fuel pump to briefly energize. Also, make sure fan blades are clear of obstruction before selecting low or high speed fan on.

**To conduct an output state test on a vehicle with a Powerstroke 7.3L diesel engine:**

1. Select **Output State Test**.

   A test activation screen displays (Figure 6-70).

```
KOEO Output State Self-Test
Depress/Release Accelerator Pedal To
Cycle Outputs.  No Codes Available.
Depress Brake Pedal Or Press N To Exit.
```

**Figure 6-70** *Sample EEC-V diesel engine output state test*

2. Press and release the accelerator pedal to cycle the output state of relays, solenoids, the transmission control indicator lamp (TCIL), the fuel delivery command signal (FDCS), the cylinder identification (CID) signal, the wait-to-start lamp, and the electronic feedback (EF) signal from the injector drive module (IDM).
3. Take circuit readings while the test is activated.

4. Press **N** or the brake pedal to exit.

## Module Identification Test

The Module ID selection from the Powerstroke Diesel Functional Test menu displays the PCM module software file, part number, and, if available, the VIN of the vehicle.

**To conduct a Module ID test:**

1. Select **Module ID Test**.

   An identification screen displays (Figure 6-71). If a module does not store VIN information, “not available” displays on the third line.

```
  Software File:  CCAQAB3.HEX
Module Part #:  F4WFBD
          VIN:  XXXXXXXXXXXXXXXX
 Copyright Ford Motor Co. 1993
```

**Figure 6-71** *Sample EEC-V module identification screen*

2. Press **Y** to print the screen, or press **N** to exit.

## Injector Buzz Test

The injector buzz test performs an operational check of the injector solenoids and valves on 6.0L and 7.3L diesel engines. The engine must be off to run the injector buzz test.

**CAUTION**

Make sure the fuel system is intact and that no fittings or connections are open for service before proceeding with the injector buzz test.

**To conduct an injector buzz test:**

1. Select **Injector Buzz Test**.

   An instruction screen displays (Figure 6-72). Make sure all accessories, including auxiliary powertrain control, are shut off.

```
Turn Off A/C And All Accessories
 Including Auxiliary Powertrain Control
 (RPM Control), If Equipped.
 Press Y To Continue
```

**Figure 6-72** *Sample EEC-V diesel engine injector buzz screen*

2. Press **Y** and switch the ignition on.
3. Press **Y** again to begin the test and “self-test initiated” displays.

This means the scan tool attempted to start the test. It does not mean that the PCM responded. If the message stays on-screen for more than several minutes, the test probably did not start. Refer to “Ford Communications Problems” on page 716 to diagnose the cause of a self-test failure.

During the test, all injectors buzz together for about two seconds, then each injector buzzes individually in cylinder sequence, 1 through 8, for about one second. At the end of the test, a service code list displays (Figure 6-73).

```
Service Codes:
**  On Demand Self-Test Codes  **
P1111 System Pass
**  End Of List  **
```

**Figure 6-73** *The injector buzz test service code list*

## Glow Plug Test/Glow Plug Engine Running Test

The glow plug test checks of the glow plugs on 6.0L and 7.3L EEC-V diesel engines.

**NOTE:**
The vehicle batteries must be in good condition and the charging system working properly before testing. During the test, battery voltage must be above 11.8 V and below 14.0 V. Connect a DMM to the battery to monitor voltage. If necessary, raise the engine speed during the test to maintain battery voltage.

**To conduct a glow plug test:**

1. Select **Glow Plug Test** or **Glow Plug Engine Running Test**.

   A “turn off accessories” message displays. Make sure all accessories, including auxiliary power control, are off before beginning the test.

2. Press **Y**.

   The begin test screen displays (Figure 6-44).

```
Auto Trans In Park Or Manual Trans In
 Neutral.  Battery Voltage Must Be 12V
 To 14V, Start Engine, Raise RPM If
Necessary.  Press Y To Begin Test.
```

**Figure 6-74** *Sample EEC-V diesel glow plug test*

3. Press **Y**.

   The “self-test initiated” message displays, which means the scan tool has attempted to start the test. It does not mean the vehicle responded. If the message remains on-screen for more than several minutes, the test probably did not start. Refer to “Ford Communications Problems” on page 716 to diagnose the cause of a vehicle self-test failure. When the PCM finishes the test, a service code list automatically displays.

## Cylinder Contribution Test

The cylinder contribution test monitors individual cylinders and injectors to determine if all are contributing equally to engine performance.

The PCM first checks each cylinder sequentially, 1 through 8, to make sure they are all contributing. The test checks for cylinder-to-cylinder decrease in speed and sets a code if the decrease is too high. A fault must be present at the time of testing for the KOER Cylinder Contribution Self Test to detect a fault, so the engine operating condition at which the idle is worst will produce the best test results.

Note the following when performing a Cylinder Contribution test:

- Only California vehicles will set a Continuous Misfire DTC. Both 49-state and California vehicles will set a KOER Cylinder Contribution Test (CCT) code for a low or non-contributing cylinder. If any CCT or Misfire codes are set, diagnose those codes first.
- Late-model Powerstroke Diesel engines run this test without any obvious cylinder shorting or RPM change. Test results are the same.

Possible causes of a misfiring cylinder are:

- Broken compression rings
- Leaking or bent valves
- Bent push rods
- Bent connecting rods
- Damaged rocker arms
- Faulty injector

Before starting repairs, perform basic engine diagnostic tests. If all systems are operating within specifications, the injector may not be functioning properly and may need replacement. Also be sure to check the solenoids and wiring. Verify that the KOEO Injector Electrical Self-Test has passed.

To ensure proper test results, the following conditions must be met:

- Engine oil temperature is above 68°F (20°C)
- A/C is off

**To conduct a cylinder contribution test:**

1. Select **Cylinder Contribution Test**.

   A “turn off accessories” message displays. All accessories, including the auxiliary power control, must be off before beginning the test.
2. Press **Y**.

   The begin test screen displays (Figure 6-75).

```
Engine Must Be Running And At Normal
Operating Temp.  After Testing, Cycle
Key To Off Before Driving Or Running
Any Other Test.  Press Y To Continue.
```

**Figure 6-75** *Sample EEC-V diesel cylinder contribution test*

3. Press **Y**.

The “self-test initiated” message displays. This message means the scan tool attempted to start the test. It does not mean the vehicle responded. If the message stays on the screen more than several minutes, the test probably did not start. See “Ford Communications Problems” on page 716 to diagnose the cause.

During the test, some changes in engine RPM may occur. However, a weak cylinder has little effect on idle quality during the test.

When the PCM finishes the test, a service code list displays.

## Switch Test

Selecting Switch Test initiates a key-on, engine running test of various driver input circuits. This test is available for 7.3L diesel engines only.

**CAUTION**

Always chock the vehicle wheels before performing an engine running switch test. This test requires parking brake apply and release.

**To conduct a switch test:**

1. Press **Y**.

   A test initiation screen displays (Figure 6-76).

```
KOER Switch Test:  Press Y To Continue
 Then Depress/Release:  Accelerator To
 Start, Parking Brake, Speed Control
 Switches, TCS Or Clutch, Brake To Stop.
```

**Figure 6-76** *Sample EEC-V diesel switch test*

2. Press **Y** to continue.

   Verify the engine is running, then perform the driver inputs in the following order:

   a. Press and release the accelerator to start the test.
   b. Set and release the parking brake.
   c. Press and release the speed control switches.
   d. Press and release either the TCS switch or the clutch pedal.
   e. Press and release the brake pedal.

3. When the PCM finishes the test, a code list automatically displays.

**NOTE:**
False codes may set if the test sequence is followed improperly. Allow about 1 second between activation of each switch.

## 6.1.6 Data Display

The Data Display test selection is available on the Main Menu - PCM of many 1990 and later Ford vehicles with an EEC-IV powertrain control module (PCM) and DCL, and also on most 1994 and later vehicles with an EEC-V PCM.

```
 RPM___800  O2S1(mV)__684  O2S1(mV)__684
Navigate Up/Down For Data. OK To Drive.
  FOR Codes, Perform KOEO/KOER Tests
TP(V)___________1.00   TP Mode_________C/T
```

**Figure 6-77** *Sample EEC-IV data display*

```
RPM_____800 Driveability DTC Count__2
 Factory PID IS Displayed In Uppercase
   Vehicle May Not Support All PIDs
TP(V)__________1.00    Load(%)_________C/T
```

**Figure 6-78** *Sample EEC-V data display*

These tests display the input and output signals from switches, sensors, and actuators. The speed at which the scan tool operates and displays data depends on the number of data parameters and how busy the vehicle control system is. This affects how quickly data changes on the screen, and the length of time it takes to display a movie. Differences in scan tool operation may be noticed from vehicle to vehicle. The data readings may appear to change almost instantly on some models, while they occur much slower on another vehicle. Certain parameters (especially switches) only change state if held in position.

The Data Display selection requires the scan tool to communicate with the PCM. The ignition must be on to establish communication. If communication is not established within 5 seconds of the ignition switching on a “no communication” message displays (Figure 6-79).

```
No Communication.  Is Key On?  Is DLC
Connected?  Wait 15 Seconds.
Press N To Check Vehicle Identification.
```

**Figure 6-79** *Sample “no communication” message*

This message stays on the screen until communication is established, or the **N** button is pressed. Whenever communication is established, the display goes to the selected function.

### EEC-V/CAN Data Display

When Data Display is selected on an EEC-V system, the Data Menu menu displays. This allows you to select groups of parameters for viewing (Figure 6-80).

```
Data Menu:
>Driveability         Emissions
 Fuel                 Oxygen Sensors
 Transmission         Accessories
```

**Figure 6-80** *Sample EEC-V/CAN data group selection*

Selecting any of the Data Menu menu items causes the Custom Data menu to display (Figure 6-81). This feature allows you to customize the data list by selecting which data parameters to display. Eliminating unneeded parameters results in a faster display update rate. The fewer parameters displayed, the faster the update rate.

```
Scroll & Press Y To Select/Deselect
>Display Data
 *Select/Deselect All
 *TP(V)
```

**Figure 6-81** *Sample EEC-V/CAN custom data list*

When the Custom Data menu is first entered, all parameters are selected, as denoted by the asterisk that appears before them. Custom data list selections are retained in scan tool memory until a new vehicle ID is entered or another vehicle control system is selected.

Be aware, this may limit Troubleshooter operation with tips that display data parameters.

**NOTE:**
For some vehicles, it may be necessary to access the Custom Data menu from the Exit menu.

**To select custom data:**

1. Select the parameter name to select or deselect it as noted by the appearance or disappearance of the asterisk.
2. To deselect all, select **Select/Deselect All**.
3. After selecting the desired parameters, press **N** to display the custom data list.

## 6.2 Testing ABS Systems

Antilock brake systems (ABS) are available on many 1987 and later Ford, Lincoln, and Mercury vehicles. When a system malfunction occurs, the ABS electronic control module (ECM) illuminates the ABS warning lamp on the instrument panel.

On some systems, the ABS ECM stores service codes in memory for most malfunctions. These codes transmit to a scan tool through either the OBD-II DLC or the ABS test connector. In addition, some late-model ABS modules provide data stream information. Data stream information displays when the ABS control system provides it.

**NOTE:**
The following sections apply to ABS systems on vehicles with or without traction control.

After selecting ABS from the System Selection menu, the Main Menu - ABS displays (Figure 6-82). Selections vary by model and year.

```
Main Menu(ABS)          Movies
>Data                   Troubleshooter
 Codes Menu             Custom Setup
 Functional Tests
```

**Figure 6-82** *Sample Ford Main Menu—ABS*

This section is divided into the following subsections:



The Movies and Custom Setup options are discussed in detail in the user manual for your diagnostic tool.

## 6.2.1 1994–96 Econoline Vans with 4WABS

The FRD-4 test adapter is used for ABS testing on the 1994–96 Econoline with 4-Wheel Antilock Brakes (4WABS). A special connection message displays if one of these vehicles is identified (Figure 6-83).

**NOTE:**
Some 1997 Econolines also require the FRD-4 test adapter.

```
Connect FRD-4 Adapter To ABS Self-Test
Connector Located Underhood On Left Side
Near Master Cyllinder Or LF Side Of Dash.
Press Y To Continue.
```

**Figure 6-83** *1994–96 Econoline connection message*

**To connect the FRD-4 adapter for these vehicles:**

1. Turn the ignition switch to the off position.
2. Attach the FRD-4 test adapter to the data cable.
3. On the underhood ABS connector near the master cylinder, insert the red wire of the FRD-4 adapter into pin 571, which is a black wire with an orange tracer (Figure 6-84).

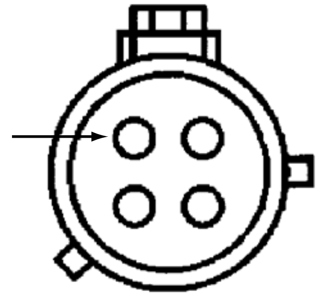

**Figure 6-84** *Connector pin 571 on ABS DLC for 1994–96 Econoline with 4WABS*

4. Attach the Ground adapter to the black wire on the FRD-4 adapter (Figure 6-85).

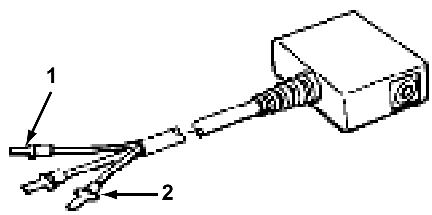


**Figure 6-85** *FRD-4 adapter*

**1— Black wire (to ground)**

**2— Red wire (to DLC Pin 571)**

5. Connect the other end of the ground adapter to a known good ground (the green wire on the FRD-4 adapter is not used).

## 6.2.2 Codes Menu

During a KOEO self-test, the ABS ECM transmits on-demand codes (see "A Note about Service Codes" on page 70 for a description of on-demand codes). On most systems, continuous codes are gathered by selecting Memory Codes from the Codes Menu. Some early systems gather continuous codes automatically at the end of the KOEO self-test.

The Codes Menu displays when Codes Menu is selected from the Main Menu - ABS (Figure 6-86). Menu selections are:

- **KOEO Self-Test**—This test displays on-demand codes present with the ignition on, but the engine not running. These are usually electrical open and short circuits and must be serviced first, before any continuous codes. On some early systems, the KOEO test displays continuous codes. For these vehicles, the Memory Codes selection below does not appear.
- **Memory Codes**—Available on late-model systems only, this selection displays continuous codes of intermittent faults from ABS module. Memory codes should be serviced last, after any other codes generated by the KOEO self-test.
- **Clear Codes**—Clears continuous memory codes from the ABS ECM memory.
- **How To Get Codes**—Only available on early systems with RABS, this selection gives instructions for manually gathering and clearing ABS codes.
- **Review Codes**—Allows you to view gathered codes.
- **Print Codes**—Allows you to print gathered codes.

```
Codes Menu             Review Codes
>KOEO Self-Test        Print Codes
 Memory Codes          Clear Codes
```

**Figure 6-86** *Sample Ford ABS Codes Menu*

## KOEO Self-Test

Selecting KOEO Self-Test initiates a self-test for ABS that is similar to that for engine testing. See “KOEO Self-Test” on page 71 for details.

**To conduct a KOEO self-test:**

1. Select **KOEO Self-Test**.

   A “key on” verification screen displays.
2. Make sure the ignition is switched on, then press **Y** select **Continue**.

---

**NOTE:**
Some systems require the ignition to be cycled on after selecting **Continue** pressing the Y button. Follow scan tool screen instructions.

---

   A self-test initiated message displays. This message means the scan tool attempted to start the test, it does not mean the vehicle responded. If the message stays on the screen more than a few minutes, the test probably did not start. Refer to “Ford Communications Problems” on page 716.
3. At the end of the test, the service code list displays (Figure 6-87).

```
Engine Running Self-Test
Start Engine And Run At Idle.  Do Not
Accelerate.  Press Y To Continue Or
Press Y Before Starting Engine).
```

**Figure 6-87** *Sample ABS service code list*

   If no codes are detected during the test a “P0000 no faults present” message displays.

## Memory Codes

The Memory Codes selection displays continuous codes of intermittent faults from the ABS ECM. Some early-model vehicles automatically gather memory codes at the end of the KOEO self-test. Continuous codes should be serviced last, after servicing any on-demand codes found during the KOEO self-test.

**To gather memory codes:**

1. Select **Memory Codes**.

   A “key on” verification screen displays. Make sure the ignition is switched on.
2. Press **Y** to continue.

A self-test initiated screen displays. This message means the scan tool attempted to start the test, it does not mean the vehicle responded. If the message stays on the screen more than a few minutes, the test did not start. Refer to "Ford Communications Problems" on page 716 to diagnose the cause of a self-test failure.

When the ABS ECM finishes the test, the service code list displays. If no codes are detected during the test a "P0000 no faults present" message displays (Figure 6-88).

```
Service Codes
** Continuous Memory Codes-Fix Last **
P0000 No Codes Present
** End Of List **
```

**Figure 6-88** *Sample ABS memory code list*

## Clear Codes

Selecting Clear Codes from the Codes Menu erases any continuous codes from the ABS ECM.

On some systems, the KOEO test repeats and the scan tool then interrupts the self-test input line to clear ABS memory. Some early systems require the vehicle to be driven above 25 MPH (40 KPH) to clear codes.

If the Codes Cleared does not appear after about one minute of completing a test, refer to "Ford Communications Problems" on page 716 to diagnose a vehicle self-test failure.

**Note the following when clearing codes:**

- Some systems prioritize DTCs. After repairing and clearing a DTC, always recheck for additional faults that may be present.
- Only continuous codes can be cleared. Codes that reappear when the KOEO self-test is repeated are on-demand codes that must be serviced. Be aware that certain codes, such as those for the wheel speed sensors and the pump motor, only set while the vehicle is being driven.

**To clear the codes:**

1. Select **Clear Codes**.

   A "key on" verification screen displays. Make sure the ignition is switched on.
2. Press **Y** to continue.

   A self-test initiated screen displays.

```
          Self-Test Initiated
Wait For Code Clearing.
```

**Figure 6-89** *Sample code clearing in progress screen*

3. When the test finishes a codes cleared screen displays.

```
            Codes Cleared

Press N To Exit.
```

**Figure 6-90** *Sample ABS codes cleared message*

### *Clearing Scan Tool Code Memory*

The scan tool retains codes in its memory, which can be cleared doing any of the following:

- Repeat the test, which overwrites the previous code.
- Select a different system for testing.
- Enter a new vehicle ID.

## Review Codes

Return to the service code menu from the KOEO self-test or memory code test and Review Codes appears as a selection.

```
Codes Menu
>KOEO Self-Test       Memory Codes
                      Clear Codes
 Review Codes         Print Codes
```

**Figure 6-91** *Review Codes available on the menu*

When this selection is available, it indicates recorded codes are in scan tool memory.

**To review codes:**

1. Select **Review Codes**.

   A code list, similar to the lists displayed at the end of the self-tests, displays.
2. Fix the problems in the order listed. Also, remember these important points:
3. Review all codes until “end of list” appears.
4. The scan tool saves codes from the most recent test for display under review codes. On a re-test, codes from the previous test are replaced with a new list.
5. Always record continuous memory codes after any test.
6. If Memory Codes was selected, the scan tool saves the codes in memory, but the Clear Codes selection must be used to clear the ABS module memory.

## Print Codes

See the Scanner User’s Manual for information on printing.

A Print Codes selection is also available on the Codes Menu following either a KOEO self-test or a memory code test. All printouts of the code list include the vehicle ID.

**To print the service code list from memory:**

1. Connect the scan tool to a compatible printer.
2. Select **Print Codes**.

## 6.2.3 Data Display

The Data Display selection for ABS systems operates similarly to Data Display for Ford engine testing. See “Data Display” on page 116 for details.

```
                  ABS Data
LF_WSPD(MPH)______3   RF_WSPD(MPH)______3
LR_WSPD(MPH)______3   RR_WSPD(MPH)______3
CCNTABS___________0   BOO ABS_________OFF
```

**Figure 6-92** *Sample Ford ABS data list*

**NOTE:**
ABS functions are disabled during data communication. If the vehicle is driven, ABS is not functional. ABS lamp may flash rapidly during data transmission.

### ABS Data Communication Guidelines

**Follow these steps to enter and exit ABS data:**

1. Be sure the ignition is off when entering the vehicle ID.
2. Turn the ignition on.
3. Select **Data Display**.
4. Turn the ignition off after completing ABS data tests.

## 6.2.4 ABS Systems Without Serial Data

Certain models produced prior to 2002 only provide trouble codes for diagnosis. These systems do not provide serial data stream information or functional tests. There are two basic categories:

- “4 Wheel Anti-lock (Cars and SUVs)” on page 116
- “Rear Anti-lock/RABS (Trucks and SUVs)” on page 118

### 4 Wheel Anti-lock (Cars and SUVs)

The anti-lock brake control module monitors system operation and can store diagnostic trouble codes (DTCs) in its memory. The diagnostic functions only provide DTC output. It is important to understand that the anti-lock brake control module cannot recognize some failures. Therefore, if a symptom exists and no DTCs are stored by the anti-lock brake control module, other diagnostic steps must be followed.

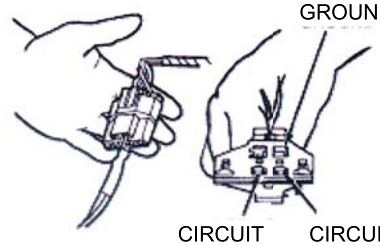


**Figure 6-93** *Typical 4 Wheel Anti-lock data connector*

### *Code Reading*

**To read codes:**

1. Connect the scan tool using a Ford 1A or 1B adapter to the ABS data link connector located in the engine compartment or trunk. The scan tool provides specific locations (Figure 6-94).

```
Connect FORD-1A or 1B Adapter To DLC
Located In Engine Compartment
On Right Shock Tower
Press Y Or N To Continue
```

**Figure 6-94** *Typical ABS connector screen*

The ABS main menu displays.

```
Main Menu (ABS)
>Codes Menu
 Troubleshooter
 Custom Setup                        F507
```

**Figure 6-95** *Typical ABS main menu*

2. Select the Codes Menu.

```
Codes Menu
>KOEO Self-Test
 Clear Codes
```

**Figure 6-96** *Typical ABS codes menu*

3. Select KOEO Self-Test.
4. Turn the ignition switch to the ON position.

```
On Demand Self Test
 Press Y, Then Turn Key On. Do Not Start
 The Engine. Press Y To Continue
```

**Figure 6-97** *Typical ABS self-test menu*

At this time, any stored DTCs will be transmitted and displayed on the scan tool (DTCs, if present, will also flash out on the ABS lamp during the self test).

The amber ABS lamp should go out immediately after cycling the ignition on, indicating that self-test has initiated.

```
Self-Test Initiated... Wait FOR Codes.

If No Response In 45 Seconds And Dash
Warning Lamps Off, No Codes Present.
```

**Figure 6-98** *Typical ABS self-test initiated screen*

If no DTCs are stored (ABS lamp goes out and does not flash). The scan tool display will remain unchanged.

5. DTC transmission may take 15 seconds each, leave test initiated until all codes are output.

**To clear codes:**

1. The 4 wheel ABS system includes an automatic code clearing function.
2. DTCs will remain in the ABS ECU until they are transmitted to the scan tool or flashed out on the amber warning lamp.
3. After the DTCs are transmitted, you must test drive the vehicle above 25 mph.
4. Any memory DTCs that were stored in the ABS ECU will be cleared at this time.
5. A DTC that does not clear after road testing represents a hard fault.

## Rear Anti-lock/RABS (Trucks and SUVs)

### *How To Get Codes (RABS Systems)*

This selection displays only when testing rear antilock brake systems (RABS) and provides information on diagnostic connector locations, code-flashing methods, code definitions, and basic code-clearing.

A RABS consists of the following:

- RABS module
- RABS valve
- Diagnostic connector
- Yellow antilock warning light
- Speed sensor
- Exciter ring (located in the rear differential housing)

The RABS module performs system tests and self-tests during startup and normal operation. If a problem is found, RABS is deactivated, the ABS lamp comes on, and a code may set.

A RABS-I vehicle only stores codes while the ignition is on. If a DTC is present, the ABS or RABS lamp goes on (no "pass" code). A RABS-II vehicle is equipped with a keep alive memory. DTCs remain in memory until the diagnostic connector is disconnected and the ignition is cycled off. A system with no detected faults transmits DTC 16. A base brake fault such as low fluid may cause the ABS lamp and possibly the red brake warning lamp to go on without storing a DTC. For information, refer to the Snap-on ABS Troubleshooter Cartridge.

DTCs consist of short flashes followed by a series of long flashes. Count all flashes to read a DTC. A DTC will flash continuously until the key is turned off. It is best to read a DTC several times and disregard the first code output because part of the code may be lost when code output begins. On RABS-I or RABS-II, only one DTC is output at a time.

**NOTE:**
The ABS lamp will be on if a DTC is present. Leave the ignition on for the test or the DTC will be erased.

**To access flash codes on a vehicle with RABS-I:**

1. Locate the RABS connector (see "Rear Antilock Brake System (RABS)" on page 65) and attach a jump wire to the black/orange wire.
2. Touch the jump wire to ground for 2 seconds and release.

   The ABS lamp should go out and then start the code flash sequence. A memory DTC is cleared whenever the ignition is cycled off.

**To output additional codes:**

1. Repair the code.
2. Restore the diagnostic connector.
3. Test drive the vehicle.
4. Repeat the procedure above to re-test.

**To access flash codes on a vehicle with RABS-II:**

1. Locate the RABS connector (see "Rear Antilock Brake System (RABS)" on page 65) and disconnect the mating connector with the key on.
2. Attach a jump wire to the black/orange wire.
3. Touch the jump wire to ground for 2 seconds and release.

   The ABS lamp flashes a DTC. To see additional codes, use the procedure for RABS-I.

**NOTE:**
RABS-II has the ability to retain the last failure DTC in memory, even if it occurs intermittently

**To clear a memory DTC on a vehicle with RABS-II:**

1. Disconnect the keep-alive memory power feed wire from the diagnostic connector.
2. Switch the ignition key off.
3. Reconnect the keep-alive memory power supply wire to the diagnostic connector lead after diagnosis is completed.

## 6.2.5 ABS Functional Tests

A Functional Test selection is available for certain Ford ABS systems (only ABS systems that are accessed through the OBD II data connector). For these systems, a Functional Tests selection appears on the menu.

```
Main Menu (ABS)          Movies
 Data                    Troubleshooter
 Codes Menu              Custom Setup
>Functional Tests
```

**Figure 6-99** *Typical ABS main menu*

Select Functional Tests to display the Select Test menu.

```
Select Test:
>Bleed Brakes
 Pump Motor Test
```

**Figure 6-100** *Typical ABS selection menu*

### Bleed Brakes Functional Test

The Bleed Brakes selection is available on certain Ford ABS systems. The Ford recommended brake bleeding procedure must be followed in order to purge all the air from these systems. The Bleed Brakes selection is only used to bleed the hydraulic control unit (HCU). Whenever the hydraulic control unit is removed, air enters the system and bleeding of the entire system is required.

**CAUTION**

Failure to follow proper brake bleeding procedures may result in improper brake system operation or brake system failure. Refer to the Ford Service Manual for proper brake bleeding procedures.

**IMPORTANT:**
The ABS system must be manually bled, but in order to thoroughly purge these systems, certain solenoid valves must cycle while the brake pedal is held down. Perform the ABS Bleed Brakes functional test only when directed by a brake bleeding procedure in a Ford Service Manual.

#### *Typical Bleed Brakes Test*

During a Bleed Brakes functional test, the following instructions are typically displayed on the scan tool to prepare the vehicle for the automatic brake bleeding sequence. During the ABS bleeding sequence, he scan tool will display instructions for depressing and releasing the brake pedal as necessary.

```
Automated Brake Bleed Procedure - Refer
To Service Information For Instructions.
If DTCS Are Present, Test Will Not Run.
Press Y To Continue, N To Exit.
```

**Figure 6-101** *Typical ABS bleed brakes message*

```
Battery Must Be Fully Charged. Check
Fluid Level. Set Park Brake. Place
Trans In Park/Neutral. Vehicle Speed
Must Be Zero. Press Y To Continue.
```

**Figure 6-102** *Typical ABS bleed brakes message*

Press Y to initiate the automated brake bleeding sequence. When the following message appears, depress and hold the brake pedal as directed.

```
Depress Brake Pedal
```

**Figure 6-103** *Start of ANS bleed sequence*

The ABS module will automatically activate the hydraulic control valves. Continue holding the brake pedal as directed during the valve activation (approximately three seconds). Clicking noises from the hydraulic control unit may be noticed during this portion of the ABS bleed.

```
Depress Brake Pedal
Activating Valves, Please Wait...
```

**Figure 6-104** *Typical ABS hydraulic valve activation screen*

The Release Brake Pedal message will automatically appear at the completion of the valve activation sequence.

```
Release Brake Pedal
```

**Figure 6-105** *Typical ABS release pedal message*

When the brake pedal is released, the ABS pump motor will be automatically energized for approximately 20 seconds.

```
Release Brake Pedal
ENERGIZING Pump Motor, Please Wait...
```

**Figure 6-106** *Typical ABS pump motor activation screen*

At the completion of the pump motor activation cycle, the ABS bleed sequence will repeat up to three times. Follow the on-screen messages until the Test Is Complete message displays.

```
Test Is Complete.
Press Y Or N To Exit.
```

**Figure 6-107** *Selecting ABS bleed exit message*

## ABS Pump Motor Test

During a Pump Motor Test, the following instructions are typically displayed on the scan tool to prepare the vehicle for the automatic pump motor test sequence.

```
Select Test:
 Bleed Brakes
>Pump Motor Test
```

**Figure 6-108** *Selecting ABD pump motor test*

If there are any ABS DTCs present at this time, the Pump Motor Test will not continue.

```
Automated Brake Bleed Procedure
If DTCS Are Present, Test Will Not Run.
Follow On Screen Instructions.
Press Y To Continue, N To Exit.
```

**Figure 6-109** *Typical ABS pump motor test message*

Pressing **Y** automatically starts the ABS Pump Motor Test.

```
Battery Must Be Fully Charged. Check
Fluid Level. Set Park Brake. Place Trans
In Park/Neutral. Vehicle Speed Must Be
Zero. Press Y To Continue.
```

**Figure 6-110** *Typical ABS pump motor test message*

The ABS pump motor will automatically run for about 15 seconds.

```
Test In Progress, Please Wait...
```

**Figure 6-111** *Typical ABS pump motor test in progress message*

When the pump motor test is complete, the following message displays.

```
Test Is Complete
Press Y Or N To Exit.
```

**Figure 6-112** *Typical ABS pump motor test completed message*

## 6.3 Air Suspension and Automatic Ride Control Systems

The following table includes vehicles equipped with air ride suspension, automatic load leveling, electronic variable orifice power steering, and electronic shock damping systems that require the use of Super Star II Emulation Mode.

**NOTE:**
Super Star II Emulation Mode has been removed from the Ford Main Menu and is now located in the Branch Menu as applicable to the system.

Diagnosing these systems involves a series of automatic tests, code gathering, functional tests and manual tests.

**Table 6-4** *Air suspension and ride control applications*

| Vehicle | Year | System |
|---|---|---|
| Crown Victoria/Grand Marquis | 1992 to 2002 | RAS Rear Air Suspension |
| | 1991 to 2002 | EVO Electronic Variable Orifice |
| Lincoln Town Car | 1992 to 2002 | RAS Rear Air Suspension |
| | 1991 to 2002 | EVO Electronic Variable Orifice |
| Lincoln Continental | 1988 to 1994 | ASARC Air Suspension Automatic Ride Control |
| | | Dual Action Strut Control |
| Lincoln Mark VIII | 1993 to 1998 | SSM Steering and Suspension Module |
| | 1993 to 1998 | EVO Electronic Variable Orifice |
| | 1993 to 1994 | SDC Shock Damping Control |
| Thunderbird/Cougar | 1989 to 1995 | ARC Automatic Ride Control |
| | | EVO Electronic Variable Orifice |

## 6.3.1 Air Suspension (EVO) and Automatic Ride Control Systems (ASARC)

It is recommended to check the system thoroughly before performing an on-board diagnostic test. The following chart lists general inspection items that may not generate a DTC.

**Table 6-5** *General Inspection Items*

| Mechanical Inspection | Electrical Inspection |
|---|---|
| Shock absorber failure | Open fuses |
| Leaks from air lines or air springs | Air suspension fuse or breaker |
| Ruptured air springs | Loose or corroded connections |
| Damaged height sensor | Air suspension switch Off |
| Height sensor disconnected | |

**WARNING**

To prevent injury, always follow manufacturer procedures when servicing suspension systems.

### Air Suspension Switch

**CAUTION**

The air suspension switch must be turned to the Off position when the vehicle is hoisted, jacked, towed, jump-started, or raised off the ground, to avoid unnecessary operation of the system and possible damage to the air suspension system components.

## 6.3.2 Super Star II Emulation Mode

The Super Star II Emulation Mode configures the scan tool to operate similar the Ford factory tester. This mode is only available for certain systems, such as speed control, automatic ride control, air suspension, and the 4EAT transmission. Super Star II Mode appears as an option on the system main when available.

The following example shows how to navigate to the Super Star II Test Emulation Mode for testing an Air Suspension/Automatic Ride Control system.

**To enter Super Star II Emulation mode:**

1. Select **Air Suspension/Elect Variable Orifice** from the system menu (Figure 6-113).

```
Select System:
 Engine & Powertrain
 Antilock Brakes
>Air Suspension/Elect Variable Orifice
```

**Figure 6-113** *Sample system selection menu*

2. Follow the screen instructions to connect to the test vehicle (Figure 6-114).

```
Connect: Ford 1-A or 1-B Adapter
Location: RH side of engine compartment,
top of wheel well.
Press Y: Continue
```

**Figure 6-114** *Sample connection message*

3. Press **Y** to continue.
4. Select **Super Star II Mode** from the system main menu (Figure 6-115).

```
Main Menu (ARS/EVO)
 Read First
>Super Star II Mode
```

**Figure 6-115** *Sample system main menu*

The Super Star II operating screen displays (Figure 6-150).

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Hold ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-116** *Sample Super Star Emulation Mode*

**1— Select FORD**

**2— Test is STI grounded, Hold is STI ungrounded**

**3— Live is for testing, Review is to scroll through DTCs**

See “Super Star II Emulation Mode” on page 147 for additional information.

## 6.3.3 Rear Air Suspension (RAS), Electronic Variable Orifice (EVO)

Rear air suspension is a computer controlled suspension and the electronic variable orifice is a power steering and effort control. One ECU controls both steering and suspension functions.

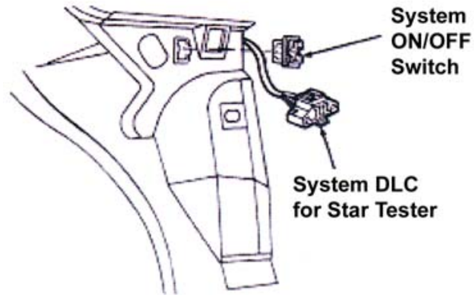


**Figure 6-117** *DLC location*

## RAS/EVO—1992 to 2002 Crown Victoria, 1992 to 2002 Grand Marquis, and 1991 to 1998 Lincoln Town Car

### *Diagnostic Test Descriptions*

There are three main diagnostic steps available:

1. Auto/Manual Diagnostic Check
   - Auto test—detects electrical faults, raises and lowers the vehicle to verify the 3 height sensor states (trim, high, low) can be reached.
   - Manual test—requires interactive steering and door switch inputs.
2. Functional Test
   - Use only if Auto/Manual DTCs do not identify a concern (diagnostic aid).
   - The functional test will overheat the compressor if used excessively.
   - The auto/manual test must be completed first.
   - Each test requires that [Test] is selected for the entire test.
3. Drive Cycle Diagnostic Test (1995 & later)
   - Use to duplicate a DTC while driving.

**To perform the auto/manual test:**

1. **Auto Test:** Turn the ignition Off.
2. Remove excessive loads from the truck.
3. Turn the Air Suspension Switch Off and then ON.
4. Select Super Star II Emulation Mode with the Hold and Live options selected.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Hold ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-118** *Sample Super Star Emulation Mode*

5. Connect the scan tool using a Ford 1A or 1B adapter to the ARC DLC in the trunk.
6. Start the engine, or connect the battery charger, and wait at least 2 seconds.
7. Select Test.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Test ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-119** *Sample Super Star Emulation Mode*

8. Within 20 seconds a DTC 10 (Auto Mode in progress) should appear.
9. Auto test runs for 2 to 3 minutes.
10. A DTC 80 at this time indicates insufficient battery voltage, DTC 13 (auto test failed) will appear if a shorted or open circuit is detected
11. **Manual Test:** After a DTC 12 (or 13) appears, open and close each door and turn the steering wheel 1/4 turn in each direction. This can be performed in any sequence.
12. Select Hold (Figure 6-118). Wait 2 seconds and then select Test (Figure 6-119).
13. Within 20 seconds any DTCs detected will be displayed. DTCs appear sequentially for 15 seconds each and will continue to cycle until Hold is selected or the ignition is turned Off. This exits the auto test.

### *Functional Tests*

The functional test is used if the auto/manual test does not identify a symptom. Functional tests are only available after the auto/manual test has transmitted its DTCs. Leave the scan tool connected and vehicle running to enter Functional Tests.

**To perform a functional test:**

1. Select Hold and wait at least 20 seconds (Figure 6-118).
2. Select Test (Figure 6-119).
3. The functional tests are numbered and will sequentially appear (similar to DTCs) for 15 seconds each (Table 6-6).

**Table 6-6** *Air suspension functional test identification*

| Test ID | Description |
|---|---|
| 23 | Vent Rear. |
| 26 | Compress Rear. |
| 31 | Cycle Compressor on and off repeatedly. |
| 32 | Cycle vent solenoid valve on and off repeatedly. |
| 33 | Cycle air spring solenoid valves on and off repeatedly. |

4. If the functional test ID numbers do not appear, repeat steps 1 and 2.
5. To select a functional test, select Hold within 4 seconds from the appearance of the functional test’s ID number (23, 26, 31, 32, or 33).
6. Exit the functional test by disconnecting the scan tool and turning the ignition off.

- The functional test will continue as long as Hold is selected.
- To exit the functional test, select Test.
- A new functional test can now be selected, tests can also be repeated as necessary.
- Reminder: avoid compressor overheating.

## RAS / EVO Drive Cycle Diagnostic Test (1995 to 2002 Crown Victoria, 1995 to 2002 Grand Marquis, and 1995 to 1998 Lincoln Town Car)

**To perform a drive cycle diagnostic test:**

1. Drive vehicle over 25 MPH to verify the VSS operation.
2. Park the vehicle and turn the ignition Off.
3. Connect the scan tool to the DLC on the right hand side of the trunk.
4. Select the Super Star II Emulation Mode with the Hold and Live options selected.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Hold ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-120** *Sample Super Star Emulation Mode*

5. Wait 3 seconds and select Test.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Test ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-121** *Sample Super Star Emulation Mode*

   Memory DTCs display.

   DTC 15 indicates that no errors are stored in the ECU memory.

6. To exit the test, select Hold.
7. Disconnect the scan tool from the DLC.
8. See Table 6-7 for rear air suspension or EVO DTC descriptions.

**To clear stored DTCs.**

1. Perform a drive cycle diagnostic test as outlined above.
2. Select Hold (Figure 6-120).
3. Wait 2 seconds.
4. Select Test (Figure 6-121).

   DTC 35 displays indicating memory is erased.

5. Exit by selecting Hold (Figure 6-120).

**Table 6-7** *Rear Air Suspension EVO DTC definitions for 1992 to 2002 Crown Victoria, 1992 to 2002 Grand Marquis, and 1991 to 1998 Lincoln Town Car (part 1 of 2)*

| DTC | Description |
|---|---|
| 10 | Diagnostics Entered, Auto Test in Progress |
| 11 | Vehicle Passes |
| 12 | Auto Tested Passed, Perform Manual Inputs. |
| 13 | Auto Test Failed, Perform Manual Inputs. |
| 15 | No Drive Cycle Errors Detected (1995 & later only) |

**Table 6-7** *Rear Air Suspension EVO DTC definitions for 1992 to 2002 Crown Victoria, 1992 to 2002 Grand Marquis, and 1991 to 1998 Lincoln Town Car (part 2 of 2)*

| DTC | Description |
|---|---|
| 16 | EVO Error Code Short Circuit. |
| 17 | EVO Error Code Open Circuit. |
| 18 | EVO Error Code Bad Valve. |
| 23 | Functional Test, Vent Rear. |
| 26 | Functional Test, Compress Rear. |
| 28 | No Description Available. |
| 31 | Functional Test, Air Compressor Relay Toggle. |
| 32 | Functional Test, Vent Solenoid Toggle. |
| 33 | Functional Test, Air Spring Solenoid Toggle. |
| 35 | Drive Cycle Error Codes Erased OK (1995 & later only). |
| 39 | Compressor Relay Circuit Shorted to Battery. |
| 40 | Compress or Relay Control Circuit Short to Ground, (1995 & later only). |
| 42 | Air Spring Solenoid Circuit Shorted to Ground or Brown Fuse. |
| 43 | Air Spring Solenoid Circuit Shorted to Battery. |
| 44 | Vent Solenoid Circuit Shorted to Battery. |
| 45 | Air Compressor Relay Circuit or Vent Solenoid Circuit Shorted to Ground. |
| 46 | Height Sensor Power Supply Circuit Shorted to Ground or Battery. |
| 51 | Unable to Detect Lowering of Rear. |
| 54 | Unable to Detect Raising of Rear. |
| 55 | Speed Greater than 15 MPH (24KPH) Not Detected (1997 & later only). |
| 60 | Service Switch Shorted to Battery (1997 & later only). |
| 61 | Service Switch Shorted to Ground or Open (1997 & later only). |
| 68 | Height Sensor Output Circuit Shorted to Ground. |
| 70 | Replace Control Module. |
| 71 | Open Height Sensor Circuit. |
| 72 | Four Open and Closed Door Signals Not Detected. |
| 74 | EVO Error Code Steering Wheel Rotation Not Detected. |
| 80 | Insufficient Battery Voltage to Run Diagnostics. |
| — | Unable to Enter Auto Test or Warning Light Remains On After Vehicle Passes (Code 11) |

## 6.3.4 Air Suspension Automatic Ride Control (ASARC) Dual Action Electronic Strut Control for 1988 to 1994 Lincoln Continental

The Air Suspension Automatic Ride Control (ASARC) Dual Action Strut Control for 1988 to 1994 Lincoln Continental includes three sections:

1. Drive Cycle Diagnostic Test.
2. Auto/Manual Diagnostic Test.
3. Spring Fill Diagnostics.

## Drive Cycle Diagnostics

The Drive Cycle Diagnostics will light the Check SUSPENSION warning indicator in the message center if a malfunction is detected in the system while driving the vehicle. Up to 32 diagnostic trouble codes (DTC) will remain stored in memory for up to one hour after the ignition switch is turned Off. The air suspension service switch in the luggage compartment must remain ON during this time. The DTCs should be written down at this time. If the vehicle has not been driven in over an hour or the air suspension service switch has been turned Off, the vehicle must be driven with the air suspension switch ON to try to duplicate the condition.

**To perform a drive cycle diagnostics test:**

1. Verify Air Suspension switch is in the ON position. The switch is located in the trunk.
2. Drive the vehicle over 15 MPH (24KPH) for over 4 minutes.
3. Park the vehicle and turn the ignition Off.
4. Turn the head lamps off to conserve battery power.
5. Connect the scan tool to the DLC located on the ride-hand side of the trunk.
6. Select Super Star II Emulation Mode.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Hold ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-122** *Sample Super Star Emulation Mode*

7. Wait 5 seconds, select Test.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Test ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-123** *Sample Super Star Emulation Mode*

8. Drive Cycle DTCs will display after 20 seconds.
9. Refer to DTC chart for code descriptions.
10. Disconnect the scan tool from the DLC.

## Automatic and Manual Mode Testing, Spring Fill Diagnostics

**IMPORTANT:**
Do not lean on the vehicle or open doors while DTC 10 is displayed. This will introduce false errors into the test results. Remove any excess vehicle loads, vehicles should be at curb weight.

**To test in Automatic Mode:**

1. Connect the battery charger to the power the vehicle during testing.
2. Turn the air suspension switch Off and then ON again. The switch is located in the trunk.
3. Select Super Star Emulation Mode.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Hold ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-124** *Sample Super Star Emulation Mode*

4. Connect the scan tool using a Ford 1A or Ford 1B adapter to the DLC located on the left side of the trunk area.
5. With the ignition Off, wait ten seconds.
6. Cycle the ignition ON with the brake pedal and accessories Off.
7. Wait a minimum of 5 seconds and select Test.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Test ][ None ]
Code Display         =[Live ][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-125** *Sample Super Star Emulation Mode*

8. Within 20 seconds a DTC should appear, diagnose all DTCs displayed except for DTC 10.
9. DTC 10 indicates that the automatic diagnosis is in progress. Do not touch or lean on the vehicle while the DTC 10 is displayed. If no faults are present, the test will take 3 to 4 minutes. If faults are present, test may take up to 14 minutes.
10. When a DTC 12 or 13 appears, the auto test is completed. Leave the scan tool connected to perform the following manual test. (DTC 12 = Auto Test Passes, DTC 13 = Auto Test Failed.)

**To test in Manual Mode (only after automatic mode testing)**

1. Open the driver-side door and sit in the driver seat, leaving the door open.
2. Press the accelerator to the floor and then release it.
3. Press the brake pedal to the floor (press hard) and then release it.
4. Turn the steering wheel a minimum of 1/4 turn in both directions.
5. Exit the vehicle and close the driver-side door.
6. Open and close the other three vehicle doors, one at a time.
7. Select Hold (Figure 6-124).
8. Wait 5 seconds and select Test (Figure 6-125).
9. The DTCs will be displayed on the scan tool. The list will continue to repeat as long as Test is selected. Codes will display for about 15 seconds each.
10. Select Review to view all of the DTCs.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Test ][ None ]
Code Display         =[Review][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-126** *Sample Super Star Emulation Mode*

- DTC 11 indicates that the vehicle has passed the Auto Test.
- If DTC 55 was output in the Drive Cycle Diagnostics Test, include it with the Auto Test DTC list.
- A drive cycle DTC that is not duplicate in the Auto Test should be considered a memory fault.

- Refer to the Table 6-9 for DTC descriptions (follow the recommended DTC repair priority.)
- To exit diagnostics, switch the ignition off (leave the battery charger on for the Spring Fill Test).

## Spring Fill Diagnostics Test

**CAUTION**

This test will inflate and deflate the air springs. Remove any vehicle loads, vehicle should be at curb weight with all accessories off.

The Spring Fill Diagnostics test allows a technician to fill or vent each air spring individually.

**To perform the spring fill diagnostics test:**

1. Connect a battery charger to maintain the battery level.
2. Connect the scan tool to the DLC in the left side of the trunk area.
3. Select Hold.
4. Turn the air suspension switch Off and then ON. The switch is located in the trunk area.
5. Turn the ignition Off and wait ten seconds.
6. Hold the brake pedal down hard and cycle the ignition switch to ON.
7. Wait five seconds and release the brake pedal.
8. Wait a minimum of 5 seconds and then select Test.
9. DTCs will display within 20 seconds.
10. DTCs 21 through 28 are the individual Spring Fill Tests and indicate that the Spring Fill Tests have been entered. Any other DTC indicates an inability to enter the test and must be diagnosed separately.
11. Select and activate any desired Spring Fill Test by selecting Hold after the desired Spring Fill Test has been displayed for 2 to 5 seconds.
12. The selected test will run as long as Hold is selected.
13. Selecting Test will stop the test and continue the DTC test selection.
14. Refer to Table 6-8 and Table 6-9 for DTC descriptions.

**Table 6-8** *Spring Fill Diagnostic DTCs*

| DTC | Description |
|---|---|
| 21 | Vent RF air spring |
| 22 | Vent LF air spring |
| 23 | Vent RR air spring |
| 24 | Inflate RF air spring |
| 25 | Inflate LF air spring |
| 26 | Inflate RR air spring |
| 27 | Vent LR air spring |
| 28 | Inflate LR air spring |

**Table 6-9** *Air suspension automatic ride control DTC definitions (part 1 of 2)*

| Code | Description | Service Priority |
|---|---|---|
| 10 | Auto test entered. | N/A |
| 11 | System Checked out OK | N/A |
| 12 | Auto test completed, No faults detected. Perform manual tests. | N/A |
| 13 | Auto test completed, Faults detected. Perform manuals tests. | N/A |
| 15 | No faults detected. | N/A |
| 21 | Vent RF air spring | N/A |
| 22 | Vent LF air spring | N/A |
| 23 | Vent RR air spring | N/A |
| 24 | Inflate RF air spring | N/A |
| 25 | Inflate LF air spring | N/A |
| 26 | Inflate RR air spring | N/A |
| 27 | Vent LR air spring | N/A |
| 28 | Inflate LR air spring | N/A |
| 31 | Air Compressor Toggle. | N/A |
| 32 | Vent Solenoid Valve Toggle. | N/A |
| 33 | Air Spring Solenoid Valve Toggle. | N/A |
| 34 | Shock Actuator Toggle (Firm/Soft) | N/A |
| 35 | Door Open & Closed Detection | N/A |
| 40 | Short - Left Front Air Spring Solenoid Valve Circuit | 2nd |
| 41 | Short - Right Front Air Spring Solenoid Valve Circuit | 2nd |
| 42 | Short - Left Rear Air Spring Solenoid Valve Circuit | 2nd |
| 43 | Short - Right Rear Air Spring Solenoid Valve Circuit | 2nd |
| 44 | Short - Vent Solenoid Valve Circuit | 2nd |
| 45 | Short - Air Compressor Relay Circuit. | 2nd |
| 46 | Short - Height Sensor Power Supply Circuit. | 2nd |
| 47 | Short in Soft Electric Shock Absorber Actuator Relay Circuit. | 2nd |
| 48 | Short in Firm Electronic Shock Absorber Actuator Relay Circuit. | 2nd |
| 49 | Unable to Detect Lowering of RF Corner. | 5th |
| 50 | Unable to Detect Lowering of LF Corner. | 5th |
| 51 | Unable to Detect Lowering of RR Corner or Rear of Vehicle. | 5th |
| 52 | Unable to Detect Raising of RF Corner. | 6th |
| 53 | Unable to Detect Raising of LF Corner. | 6th |
| 54 | Unable to Detect Raising of RR Corner or Rear of Vehicle. | 6th |
| 55 | Speed greater than 24KPH (15MPH) not detected. | 7th |
| 56 | Soft Not Detected - Left Rear Shock Actuator Circuit. | 4th |
| 57 | Soft Not Detected - Right Front Shock Actuator Circuit. | 4th |
| 58 | Soft Not Detected - Left Front Shock Actuator Circuit. | 4th |
| 59 | Soft Not Detected - Right Rear Shock Actuator Circuit. | 4th |

**Table 6-9** *Air suspension automatic ride control DTC definitions (part 2 of 2)*

| Code | Description | Service Priority |
|---|---|---|
| 60 | Firm Not Detected - Left Rear Shock Actuator Circuit. | 4th |
| 61 | Firm Not Detected - Right Front Shock Actuator Circuit. | 4th |
| 62 | Firm Not Detected - Left Front Shock Actuator Circuit. | 4th |
| 63 | Firm Not Detected - Right Rear Shock Actuator Circuit. | 4th |
| 64 | Soft Not Detected - All Shock Actuator Circuits. | 4th |
| 65 | Firm Not Detected - All Shock Actuator Circuits. | 4th |
| 66 | Short - Right Front Height Sensor Circuit. | 2nd |
| 67 | Short - Left Front Height Sensor Circuit. | 2nd |
| 68 | Short - Rear Height Sensor Circuit. | 2nd |
| 69 | Open - Right Front Height Sensor Circuit. | 3rd |
| 70 | Open - Left Front Height Sensor Circuit. | 3rd |
| 71 | Open - Rear Height Sensor Circuit. | 3rd |
| 72 | At Least Four Open & Closed Signals Not Detected. | 7th |
| 73 | Brake Pressure Switch Differential Valve Warning Lamp Activation Not Detected. | 7th |
| 74 | Steering Wheel Rotations Not Detected. | 7th |
| 75 | Accelerator Signal Not Detected. | 7th |
| 78 | Unable to Detect Lowering of Left Rear Corner. | 5th |
| 79 | Unable to Detect Raising of the Left Rear Corner. | 6th |
| 80 | Insufficient Battery Voltage to Run Diagnostics. | 1st |

## Shock Damping Control (SDC) for 1993 to 1994 Lincoln Mark VIII

**To diagnose the SDC:**

1. The system performs an on-board diagnostic test when initiated by the scan tool.
2. Turn the ignition switch to the Off position.
3. Connect the scan tool using a Ford 1A or Ford 1B adapter to the SDC DLC located near the right-hand deck lid hinge.
4. Select Super Star II Emulation Mode.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Test ][ None ]
Code Display         =[Review][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-127** *Sample Super Star Emulation Mode*

5. Start engine and perform the following diagnostic steps within 20 seconds of starting the engine:
- Wait 10 seconds.
- Select Hold and within 5 seconds select Test.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Hold ][ None ]
Code Display         =[Review][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-128** *Sample Super Star Emulation Mode*

- Press the brake pedal very hard within 9 seconds.
- The shock damping control module will perform on-board diagnostics and report DTCs to the scan tool (Table 6-10).

**Table 6-10** *Shock damping control DTC*

| Test Code | Description |
|---|---|
| 11 | System OK |
| 10 | Fault in LH rear actuator circuit. |
| 20 | Fault in FH rear actuator circuit. |
| 70 | Replace shock damping control module |
| 12 | Soft relay short to ground or open circuit |
| 13 | Hard relay short to ground or open circuit |
| 22 | Soft relay short to battery |
| 23 | Hard relay short to battery |
| 31 | Brake input not seen by module |

## Automatic Ride Control (ARC), Electronic Variable Orifice (EVO) for 1989 to 1995 Thunder Bird/Cougar

### *DLC Location*

The DLC is located in back of the right-hand shock tower cover and is marked ‘ARC/EVO’.

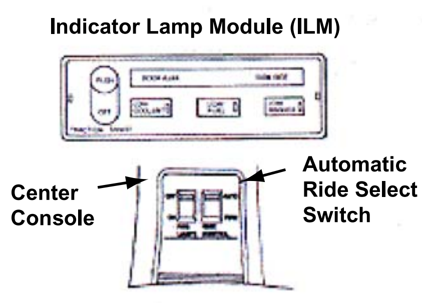


**Figure 6-129** *Typical firm ride switch and warning lamp*

**To perform the diagnostic mode test:**

1. Turn the ignition and all accessories Off.
2. Set the shock select switch to the Auto position.
3. Select Super Star II Emulation Mode (Figure 6-130).
4. Connect the scan tool using the Ford 1A or Ford 1B adapter to the DLC near the rear of the right-hand shock tower.
5. Select Test.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Test ][ None ]
Code Display         =[Review][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-130** *Sample Super Star Emulation Mode*

6. Start the engine and wait 5 seconds. Perform the following tests within 20 seconds.
7. Select Hold.

```
ECA Manufacturer     =[FORD ][Code:Speed]
Test/Hold            =[Hold ][ None ]
Code Display         =[Review][      ]
Navigate To Selection Press Y To Change
```

**Figure 6-131** *Sample Super Star Emulation Mode*

8. Within 5 seconds, select Test.
9. As the self-test routine proceeds, DTCs transmit to the scanner and pulse out on the FIRM RIDE lamp.
10. DTCs will repeat 2 times.
11. If DTC 11 shows, continue with the Test option to continue with the Quick Test.

**Table 6-11** *Automatic ride control and EVO DTC descriptions*

| DTC | Description |
|---|---|
| 11 | No problem yet (continue to manual tests) |
| 10 | Fault in LH rear actuator circuit |
| 20 | Fault in RH rear actuator circuit |
| 30 | Fault in RH front actuator circuit |
| 40 | Fault in LH front actuator circuit |
| 50 | Short in soft relay |
| 60 | EVO steering open |
| 70 | Replace automatic ride control module |
| 12 | Soft relay short to ground or open circuit |
| 13 | Hard relay short to ground or open circuit |
| 14 | Fault in relay control circuit |
| 15 | FIRM RIDE lamp short to ground or open circuit |
| 16 | EVO steering circuit short |

**Table 6-11** *Automatic ride control and EVO DTC descriptions*

| DTC | Description |
|---|---|
| 22 | Soft relay short to battery |
| 23 | Hard relay short to battery |
| 25 | FIRM RIDE lamp short to battery ground |
| 26 | EVO steering valve bad |
| 00 | FIRM RIDE indicator lamp circuit |

### *Manual Tests*

Perform manual tests only if DTC 11 is received in the diagnostic mode test.

**Table 6-12** *Automatic ride control and EVO DVC manual test procedures (part 1 of 2)*

| Test Step | Result | Action |
|---|---|---|
| **Check Steering Sensor** | | |
| 1. Wait for the FIRM RIDE lamp to stop flashing. | FIRM RIDE lamp comes on for 5 seconds. | Proceed to next step. |
| 2. With the vehicle at rest and the engine running, turn the steering wheel from lock to lock, 3 full turns, or until the FIRM RIDE lamp comes on. | FIRM RIDE lamp does not turn on. | Fault in steering sensor circuit. |
| **Speed Sensor Check** | | |
| 1. Wait for the FIRM RIDE lamp to stop flashing. | FIRM RIDE lamp turns on and stays on until the vehicle speed drops below 29 KPH/ 18MPH (1995 models, 19 KPH/12MPH). | Proceed to the next step. |
| 2. Drive the vehicle above 29 KPH/ 18MPH (1995 models, 19 KPH/ 12MPH). | FIRM RIDE lamp does not turn on. | Fault in the speed sensor circuit. |
| **Remaining Tests** | | |
| 1. Stop the vehicle and turn the engine off. Verify that the FIRM RIDE switch is set to AUTO. | FIRM RIDE lamp turns on and stays on. | Proceed to the next step. |
| 2. Cycle the ignition to RUN with the engine Off. | FIRM RIDE lamp turns on and stays on even though switch is in the AUTO position. | False Firm Signal. |
| 3. Wait until the FIRM RIDE lamp turns off (about 4 seconds). | FIRM RIDE lamp turns on for 4 seconds then flashes a DTC. | Record DTC and refer to the DTC chart. |
| **Check Brake Sensor** | | |
| 1. Verify that the shock selector switch is set to AUTO. | FIRM RIDE lamp turns on. | Proceed to the next step. |
| 2. After the FIRM RIDE lamp turns off, depress the brake pedal until the FIRM RIDE lamp turns on. | FIRM RIDE lamp does not turn on. | Fault in brake sensor circuit. |
| 3. After the FIRM RIDE lamp has turned on, release the break pedal. | FIRM RIDE lamp flashes a DTC. | Record DTC and refer to the DTC chart. |
| **Check Acceleration Signal** | | |

**Table 6-12** *Automatic ride control and EVO DVC manual test procedures (part 2 of 2)*

| Test Step | Result | Action |
|---|---|---|
| 1. Verify the shock selector switch is set to AUTO. | FIRM RIDE lamp turns on when the pedal is pressed to the floor. The lamp turns off 4 seconds after the pedal is released. | Proceed to the next step. |
| 2. After the FIRM RIDE lamp has turned off, depress the accelerator pedal to the floor. The FIRM RIDE lamp should turn on. | FIRM RIDE lamp does not turn on. | Fault in acceleration signal circuit. |
| 3. After the FIRM RIDE lamp has turned on, release the accelerator pedal. | FIRM RIDE lamp flashes a code. | Record DTC and refer to the DTC chart. |
| **Check Dimming Function** | | |
| 1. Move the shock selector switch to the FIRM position to turn on the instrument panel indicator. | FIRM RIDE lamp is bright when headlamps are off, lamps are dimmer when headlamps are on. | If no faults, vehicle has passed diagnostics. |
| 2. Cycle headlamps on and off while observing the FIRM RIDE lamp. | FIRM RIDE lamp does not dim with headlamps on. | Perform lamp diagnostics. |

## 6.4 Testing Optional Body Systems

There are numerous body system modules available as optional equipment on various Ford products. Applications vary by model design and equipment level

Some of the current supported systems include:

- CTM—Central timer module
- DDM—Driver door module
- DSM—Driver seat module
- EATC—Electronic automatic temperature control
- FEM—Front electronic module
- GEM—Generic electronic module
- HEC—Hybrid electronic cluster
- ICM—Instrument cluster module
- LCM—Light control module
- NAV—Navigation module
- LTW—Low tire warning
- OCS—Occupant classification system
- PAM—Parking aid module
- PATS—Passive anti-theft system
- PRB—Power running board module
- PSDM—Power sliding door modules 1 and 2
- TPM—tire pressure monitor
- VLC—Virtual instrument cluster

## 6.4.1 GEM, CTM, FEM, and REM Body Systems

The Generic Electronic Module (GEM) is available on many 1995 and later Ford vehicles. On some late-model vehicles, the GEM is referred to as the FEM (front electronic module) or REM (rear electronic module). For vehicles with the central timer module (CTM), the CTM option will display along with GEM; the CTM option never displays by itself.

Selecting GEM, GEM/CTM, FEM, or REM from the System Selection menu opens a main menu similar to Figure 6-132.

```
Main Menu (GEM)        Custom Setup
>Data Display
 Codes Menu
 Movies
```

**Figure 6-132** *Sample main menu for GEM, CTM, FEM, and REM*

These systems control numerous body system functions, including but not limited to:

- Power door locks
- Chimes
- Interior lighting
- 4x4 transfer case
- Wiper control

The circuits controlled by these systems vary, depending on the vehicle. All operate similarly and have the following functions available:

- KOEO Self-Test
- Gather and clear memory codes
- Review and print codes (only after codes have been gathered)
- View data parameters

During the KOEO self-test, the GEM transmits on-demand codes. Continuous codes are generated by selecting Memory Codes from the GEM Codes Menu.

Although Codes Menu options access tests specific to GEM-controlled electronics, scan tool operation is the same as for ABS Codes Menu options. Refer to “Codes Menu” on page 112 for detailed instructions.

### Data Display

Before viewing data on some EEC-IV and all EEC-V vehicles, you are prompted to select a data parameter group from the Custom Data menu (Figure 6-133).

```
Scroll & Press Y To Select/Deselect
>Display Data
 *Select/Deselect All
 *DTC CouNT
```

**Figure 6-133** *Sample GEM CUSTOM Data Menu*

The GEM Custom Data menu works exactly like the Engine Custom Data menu. See “EEC-V/ CAN Data Display” on page 109.

## 6.4.2 ICM, HEC, and VIC Body Systems

Selecting ICM/HEC or VIC Module from the System Selection menu opens a main menu similar to Figure 6-134.

```
Main Menu (ICM/HEC)    Custom Setup
>Data Display
 Codes Menu
 Movies
```

**Figure 6-134** *Sample main menu for ICM/HEC or VIC systems*

These systems have the following functions available:

- KOEO Self-Test
- Gather and clear memory codes
- Review and print codes (only after codes have been gathered)
- View data parameters

During the KOEO self-test, the ICM/HEC and VIC modules transmit on-demand codes. Continuous codes are generated by selecting Memory Codes from the Codes Menu.

Although Codes Menu options access tests specific to ICM/HEC- and VIC-controlled electronics, scan tool operation is the same as for ABS Codes Menu options. Refer to “Codes Menu” on page 112 for detailed instructions.

The Data Display selection is available on most 1996 and later vehicles. It operates like Data Display for Ford engine testing. See “Data Display” on page 139 for detailed information.

## 6.4.3 Tire Pressure Monitor (TPM) and Low Tire Warning (LTW) Systems

**CAUTION**

Always follow the recommended Ford Service Manual procedures when diagnosing or servicing the Tire Pressure Monitor and Low Tire Warning systems.

Tire pressure monitoring (TPM) and Low Tire Warning systems are available on certain models as optional or standard equipment. A vehicle that is not equipped may result in a no communication or no response message from the scan tool. Applicable vehicles are typically equipped with one of two basic styles, LTW as an indirect system (tire rotational system) and TPM as a direct system (measuring and transmitting tire pressure to an ECM).

## Low Tire Warning (LTW) System

The Low Tire Warning (LTW) is an indirect system that detects the difference in inflation pressures in one or more ties. The system uses the ABS wheel speed sensors to monitor the rolling radius of the wheel and tire assemblies. If a difference in rolling radius is detected, the ABS module illuminates the LTW lamp located in the instrument cluster. The LTW system is not capable of detecting rapid loss of inflation. The system may not detect loss of inflation in more than one tire. Always refer to the Ford Service Manuals for proper service procedures.

### *Testing the Low Tire Warning (LTW) System*

The scan tool supplies system description, basic operating characteristics, warning lamp operation, and system reset procedures. Follow on screen instructions provided for each test listed. The LTW system does not transmit trouble codes or serial data information.

**To select a LTW test:**

1. Select Body Systems (Figure 6-135).

```
Select System:        Airbag
 Engine              >Body Systems
 Transmission
 Antilock Brakes
```

**Figure 6-135** *Typical system menu*

2. Select Low Tire Warning (Figure 6-136).

```
Select System:
 Generic Electronic Module
 Instrument Cluster Module
>Low Tire Warning System
```

**Figure 6-136** *Typical system menu*

3. Select a test (Figure 6-137).

```
Main Menu (LTW)
>LTW System Information
 LTW Resetting Procedure
 Custom Setup
```

**Figure 6-137** *Typical LTW menu*

## Tire Pressure Monitor (TPM) System

The tire pressure monitoring system (TPMS) monitors the air pressure of all four regular road tires. The tire mounted pressure sensors transmit via radio frequency (RF) signals to the TPMS module, using the valve stem as an antenna. These transmissions are sent approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The TPMS module compares each tire pressure sensor transmission against a set of low-pressure limits. If the TPMS module determines that the tire pressure has fallen below these limit, the TPMS module communicates this on the CAN network to the vehicle's instrument cluster which then illuminates the TPMS indicator and displays the appropriate message center message (if equipped). Always refer to the Ford Service Manuals for proper service procedures.

### *Testing the Tire Pressure Monitor (TPM) System*

TPM test functions include data display, DTC reading, and DTC clearing.

**To get to TPM test functions:**

1. Select Body Systems (Figure 6-138).

```
Select System:        Airbag
 Engine              >Body Systems
 Transmission
 Antilock Brakes
```

**Figure 6-138** *Typical system menu*

2. Select Tire Pressure Monitor [Optional] (Figure 6-139).

```
Select System:
 Generic Electronic Module
 Instrument Cluster Module
>Tire Pressure Monitor [Optional]
```

**Figure 6-139** *Typical system menu*

**To select the TPM Data Display:**

- Select Data Display from the TPM menu (Figure 6-140).

```
Main Menu (TPM)       Custom Setup
>Data Display
 Codes Menu
 Movies                             F1234
```

**Figure 6-140** *Typical TPM menu*

**To get to read and clear TPM codes:**

1. Select Codes Menu from the TPM menu (Figure 6-141).

```
Main Menu (TPM)       Custom Setup
 Data Display
>Codes Menu
 Movies                             F1234
```

**Figure 6-141** *Typical TPM menu*

2. Select KOEO Self-Test, Memory Codes, or Clear Codes from the codes menu (Figure 6-142).

```
Select System:
 Generic Electronic Module
 Instrument Cluster Module
>Low Tire Warning System
```

**Figure 6-142** *Typical codes menu*

## 6.4.4 Anti-theft (PATS) Systems

After selecting PATS from the System Selection menu, the Main Menu (PATS) displays (Figure 6-143).

```
Main Menu (PATS)      Custom Setup
>Data Display
 Codes Menu
 Movies
```

**Figure 6-143** *Sample PATS main menu*

PATS systems have the following functions available:

- KOEO Self-Test
- Gather and clear memory codes
- Review and print codes (only after codes have been gathered)
- View data parameters

During the KOEO self-test, the PATS module transmits on-demand codes. Continuous codes are generated by selecting Memory Codes from the Codes Menu.

Although Codes Menu options access tests specific to PATS-controlled Electronics, scan tool operation is the same as for ABS Service Code Tests. Refer to “Codes Menu” on page 112 for detailed instructions. The Data Display selection operates similarly to Data Display for Ford engine testing. See “Data Display” on page 116 for detailed information.

### About PATS

PATS is a vehicle security feature introduced on 1996 and later vehicles. There are several variations, but all PATS modules generally work the same.

1. When energized, the PATS control module (Rx) requests the ignition code through the PATS transceiver (Tx).
2. The SecuriLock key transmits the ignition key code to the PATS transceiver, which sends it to the Rx).
3. The Rx compares the ignition key code to the key codes stored in non-volatile memory.
4. The Rx transmits a signal to the PCM to either enable or disable the fuel pump and injectors. The starter relay is ground as well on some vehicles.

PATS consists of the following:

- **PATS control module**—communicates with the PATS transceiver to verify key code through the Tx and Rx signal wires.
- **SecuriLock Ignition Key(s)**—contains a unique key code that is “married” to the vehicle.
- **PATS Transceiver**—mounted on the ignition lock cylinder housing and energizes the ignition key electronics through circular antenna.
- **Powertrain Control Module (PCM)**—enables fuel pump and injectors if a valid PATS key is detected.
- **Theft lamp**—operates as follows:
  - Ignition = Off: lamp flashes every two seconds to act as a visual theft deterrent on some vehicles.
  - Ignition = RUN or START: lamp flashes on for two or three seconds and then off.
  - System fault: lamp flashes briefly, and then flashes rapidly or remains on for one minute.

### Important Tips for Testing PATS Systems

- When replacing keys, make sure the vehicle owner throws out all old keys.
- Erasing and reprogramming keys does not fix any known intermittent PATS no-start issues. Do not reprogram keys if a fault cannot be identified.
- Make sure you have all keys programmed into the PATS module when reprogramming or diagnosing.
- Always verify that there are no aftermarket devices causing interference, such as alarms, remote starters, or other devices using transponders. Devices that power up the PCM without powering up the PATS module may cause no-start problems.
- Some aftermarket audio equipment can keep the RUN/START circuit active for over 5 seconds past ignition off. This can prevent PATS from properly reading ignition keys during programming. Remove or disable aftermarket equipment if this occurs.
- Some objects can cause interference with the PATS key, like foil stickers, brass key tags, other PATS keys, transponders used to purchase gasoline, and other metallic objects.
- Reprogramming the PCM does not have any effect on PATS operation.
- Disconnect battery cables when replacing the PATS module.
- If the engine does not crank on vehicles that have PATS providing a ground to the starter relay, verify the PATS output to the starter relay.
- If the PCM sets code P1260, look for other codes in the PATS module.
- Systems B, C, and E have an anti-scan function. If you attempt to start the vehicle with an unprogrammed key, the theft indicator lamp will flash rapidly and the vehicle will not start. Leave the key in the RUN position for 30 seconds to allow the anti-scan feature to time out. The vehicle will fail to start during this 30-second time period even if a correctly programmed key is used.

## 6.4.5 Optional Body Systems (DDM, DSM, EATC, LCM, NAV, OCS, PAM, PRB, PSDM)

There are numerous body system modules available as optional equipment on various Ford products. Applications vary by model design and equipment level.

When Body Systems is selected from the system selection menu, a menu of available body systems displays (Figure 6-144). Only systems available on the identified vehicle are included.

```
Select System:
 Driver Climate Seat Module
 Driver Seat Module (Memory Seats Only)
>Electronic Automatic Temp Control
```

**Figure 6-144** *Typical body systems menu*

Some of the current supported systems include:

- Driver door module (DDM)
- Driver seat module (DSM)
- Electronic automatic temperature control (EATC)
- Light control module (LCM)
- Navigation module (NAV)
- Occupant classification system (OCS)
- Parking aid module (PAM)
- Power running board module (PRB)
- Power sliding door modules 1 and 2 (PSDM)

These systems control numerous body system functions, including but not limited to featured body electrical systems such as:

- Seat and pedal controls
- Climate control systems
- Navigation systems
- Parking Aid systems
- Security systems
- Remote keyless entry
- Convenience groups: Power Running Boards or Power Sliding Door Module

The circuits controlled by these systems vary depending on the vehicle. All operate similarly and have the following functions available:

- KOEO Self-Test
- Gather and clear memory codes
- Review and print codes (only after codes have been gathered)
- View data parameters

During the KOEO self-test, the ECU transmits on-demand codes. Continuous codes are generated by selecting Memory Codes from the Codes Menu.

Although Codes Menu options access tests specific to a particular ECU subsystem, scan tool operation is the same as for ABS Codes Menu options. Refer to “Codes Menu” on page 112 for detailed instructions.

The Data Display selection is an available test option. It operates similarly to Data Display for Ford engine testing. See “Data Display” on page 116 for detailed information.

# 6.5 Testing 4X4/Transfer Case Systems

Selecting 4X4 Module, 4X4 (UBP NETWORK), or Transfer Case from the System Selection menu opens a main menu similar to Figure 6-145.

**NOTE:**
You will need to use the K-16 Personality Key™ device on UBP Network systems.

```
Main Menu (4X4)        Custom Setup
>Data Display
 Codes Menu
 Movies
```

**Figure 6-145** *Sample 4X4 systems main menu*

4X4/Transfer Case systems have the following functions available:

- KOEO Self-Test
- Gather and clear memory codes
- Review and print codes (only after codes have been gathered)
- View data parameters

During the KOEO self-test, the 4X4 module transmits on-demand codes. Continuous codes are generated by selecting Memory Codes from the Codes Menu.

Although Codes Menu options access tests specific to 4X4-controlled electronics, scan tool operation is the same as for ABS Codes Menu options. Refer to “Data Display” on page 116 for detailed instructions.

The Data Display selection is available on most 1996 and later vehicles. It operates like Data Display for Ford engine testing. See “Data Display” on page 116 for detailed information.

# 6.6 Testing Airbag Systems

**NOTE:**
Information in this section does not cover pre-1996 EEC-IV SRS systems. These earlier systems flash the DTC on the SRS warning lamp as soon as the code sets. The control module does not store codes or provide data.

Select Airbag from the System Selection menu to open the Airbag Main Menu (Figure 6-147). Airbags, or the Supplemental Restraint System (SRS), with a data stream are found on some 1995 and most 1996 and later OBD-II Ford models. Occupant Classification Systems (OCS) are available on 2007 and later models.

The control module stores DTCs. The stored DTCs and data stream information are available through the OBD-II diagnostic link connector (DLC). An airbag systems menu displays when airbag is selected as the system to test (Figure 6-146).

```
Select System
>Restraint Control Module
 Occupant Classification system
```

**Figure 6-146** *Sample Ford Airbag systems menu*

The airbag main menu displays once the system is selected (Figure 6-147).

```
Main Menu (RCM/ECS)    Custom Setup
>Data Display
 Codes Menu
 Movies
```

**Figure 6-147** *Sample Ford Airbag testing main menu*

The Service Codes selection from the Main Menu (RCM/ECS) offers the choices shown in Figure 6-148.

```
Codes Menu             Clear Codes
>Memory Codes
 KOEO Self-Test
 Lamp Fault Codes
```

**Figure 6-148** *Sample Airbag Service Code menu*

The Data Display selection is available on most 1996 and later vehicles. It operates like Data Display for Ford engine testing. See “Data Display” on page 116 for detailed information.

# 6.7 Super Star II Emulation Mode

In this mode, scan tool operations are similar to the Ford Super Star II Tester factory scan tool. Use the Super Star II Test Emulation Mode to read codes or initiate tests on the following systems:

- Integrated vehicle speed control (IVSC)
- Automatic Ride Control (ARC)
- Air Suspension and Automatic Ride Control (ASARC)
- 4-speed electronic automatic transmission (4EAT)
- Electronic variable orifice (EVO)

The Super Star II Emulation Mode may also be used to test an EEC-IV, MCU, or MECS engine control systems as well as ABS control systems. This test mode may be convenient for technicians familiar with the Ford tester. Refer to Ford service procedures for the specific vehicle year, model, and system, and for procedures to test these systems.

The Super Star II Mode is available as a main menu item where applicable (Figure 6-150).

```
Main Menu - PCM
 Codes Menu
 Functional Tests
>Super Star II Mode
```

**Figure 6-149** *Sample Ford Main Menu—PCM*

Select Super Star II Mode and the operating screen displays (Figure 6-150).

```
 ECA Manufacturer=[FORD  ]  [Code Speed]
>Test/Hold       =[Test  ]  [  11: FAST]
 Code Display    =[Live  ]  [  10: Slow]
Scroll To Select.  Press Y To Change.
```

**Figure 6-150** *Super Star II operating screen*

## 6.7.1 Super Star II Controls and Indicators

Scan tool controls operate as follows in the Super Star II mode:

- Moving the cursor up and down selects any of the three functions on the screen.
- The **Y** button switches between alternate functions as indicated by the cursor.
- The **N** button exits from the Super Star II mode back to the starting test selection screen.

## 6.7.2 Basic Super Star II Operation

The following sections outline basic Super Star II operations for testing Ford electronic systems. Refer to Ford test procedures in Ford service manuals or equivalent publications for specific instructions.

### ECA Manufacturer

The manufacturer of the electronic control assembly (ECA) for the test system must be identified when using Super Star II Emulation Mode. There are two choices: Ford and Mazda.

Mazda control systems are used for:

- 1994–97 Aspire with 1.3L engine
- 1991-94 Capri with 1.6L engine
- 1992–96 Escort and Tracer with 1.8L engine
- 1988–93 Festiva with 1.3L engine
- 1989–95 Probe with 2.0L, 2.2L, and 2.5L engines
- 1988–91 Tracer with 1.6L engine

All other models use a Ford system. The ECA Manufacturer selection affects test procedures and code displays on the test vehicle.

**NOTE:**
Some 4EAT transmissions use a separate MECS transmission control module (TCM).

## Test/Hold

When the cursor is in the Test/Hold position, the **Y** button works as the Test/Hold button on the Super Star II tester. The Test/Hold button is the main control on the Super Star II tester.

**To begin a test:**

- Select **Test/Hold** to display Test.

**NOTE:**
Be aware that if **Y**, or hold, is pressed during most self-test code output transmissions, codes are erased from memory. Follow Ford test procedures exactly.

## Code Display

There are two code display modes, live and review. In the live mode, codes display “live” as the vehicle transmits them, at the right of lines two and three under the heading Code. The first code received displays on line two; the second on line three. As more codes are received, they move upward on the display lines. The most recent code displays on line three.

**To review codes:**

1. Select **Code Display** to display Review.
2. Review all codes recorded in memory.

   While reviewing codes, the scan tool continues to receive any codes that are transmitted and may add new ones to the list. The most recent code is at the bottom of the list, followed by an “end” message. Press **Y** at any time to return to viewing live codes. The selection preset is live.

   If the scan tool memory becomes filled with codes, the message at the end of the list changes to read “full.” If this occurs, press **N** to exit from the Super Star II mode and clear the memory. Then press **Y** to reenter for further testing.

### *Code Speed*

The scan tool receives and displays both fast and slow codes and indicates whether each code was a fast or a slow transmission under the code speed display.

Some systems transmit both fast codes and slow codes; others transmit only slow codes. Code speed does not affect code meaning. Fast codes are transmitted one time each. Slow codes are transmitted two times each. The scan tool records and displays all codes.

### *Reading Codes*

Most Ford ABS, cruise control, and other electronic systems transmit codes after the self-test starts. Some systems transmit a “pass” code if no faults are present. Others transmit nothing if no faults are present.

Some systems may take up to one minute to transmit the first code, or may pause for 30 seconds or a minute between codes. Certain systems transmit only one code at a time, which must be corrected before other codes are transmitted.

Because of code variations, it is important to exactly follow the Ford test procedures for the specific vehicle and system being tested.

### *Clearing Codes*

Several different methods are used to clear codes from various Ford electronic systems. Some require that the vehicle battery be disconnected to clear codes from the control module. Refer to Ford test procedures for the exact vehicle and system being tested for instructions to clear codes.

The code memory of the scan tool clears automatically every time you exit from the Super Star II emulation mode.

## 6.8 Testing 4EAT Systems

The 4-speed Electronic Automatic Transmission (4EAT) is available on some 1989 and later Probe and 1990 and later Escort and Tracer models. On the 1990–92 4-cylinder non-turbo Probe and the 1993 1.9L Escort, the 4EAT is integrated with the MECS. All other 1990 and later Probe, Tracer, and Escort models use a separate test procedure for the 4EAT.

**NOTE:**
The scan tool must be operating in the Super Star II mode, as discussed earlier, to test the 4EAT control system. See “4-Speed Electronic Automatic Transmission (4EAT)” on page 63 for test connection instructions when testing models that transmit 4EAT data on the engine diagnostic connector.

The 4EAT system records service codes in memory and transmits codes in more than one test mode. Because several different tests are possible, refer to Ford procedures for the specific vehicle.

Available tests include:

- Wiggle test (engine off)
- Wiggle test (engine running)
- Key-on, engine-off (KOEO) self-test

Five 4EAT codes are available:

- 55—Pulse Generator
- 60—1-2 Shift Solenoid (SS1)
- 61—2-3 Shift Solenoid (SS2)
- 62—3-4 Shift Solenoid (SS3)

- 63—Lockup Solenoid (SS4)

Follow Ford procedures and the instructions below for 4EAT testing.

**To start a 4EAT test in Super Star II Mode:**

1. Switch the ignition off before starting a 4EAT test. Follow the Ford test steps exactly.
2. Select “ECA manufacturer=[Mazda].”
3. Turn the ignition on or off and press **Y** at the “test/hold” position as directed.
4. Read codes as they appear on the display.
5. Follow Ford test procedures to troubleshoot and clear codes and to perform specific functional tests.

## 6.8.1 Gathering Codes—1991–95 Escort and Tracer

Use an analog voltmeter to gather 4EAT codes on a 1991–92 Escort or Tracer with a 1.9L engine, or a 1991–95 Escort or Tracer with a 1.8L engine. The DTC output voltage from these models is low (about 0–2 V). Set the voltmeter to the 2 V scale and connect it as shown in Figure 6-151 and Figure 6-152.

The self-test input (STI) is internally grounded in the transmission control module, so codes output continuously until the ignition is switched off. The first digit of the DTC sweeps longer than the second digit. For example: a DTC 61 has 6 long sweeps followed by 1 short sweep of the voltmeter needle.

**To read 4EAT codes on 1.9L 1991–92 Escort and Tracer:**

- Connect an analog voltmeter to the STO terminal of the 4EAT connector (Figure 6-151).

**NOTE:**
Connect the negative voltmeter lead to the negative battery terminal.

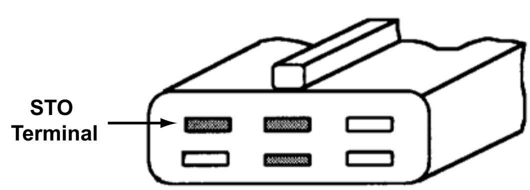


**Figure 6-151** *STO terminal on the 6-pin 4EAT test connector*

**To read 4EAT codes on a 1.8L 1991–95 Escort or Tracer:**

- Connect an analog voltmeter to the pins shown in Figure 6-152.

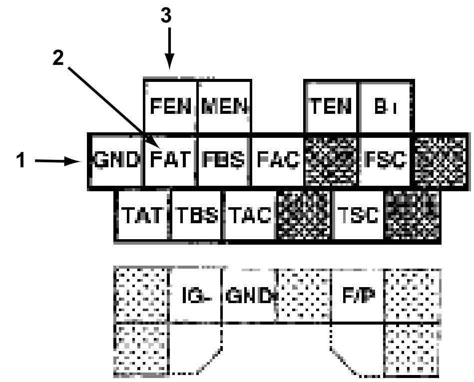


**Figure 6-152** *Code-reading pin locations for 1991–95 Escort and Tracer*

**1— Ground**

**2— Connect here for 1991–92 models**

**3— Connect here for 1993–95 models**

# 6.9 Testing Integrated Vehicle Speed Control (IVSC) Systems

The Integrated Vehicle Speed Control (IVSC) system is the Ford computerized cruise control system, available as an option on:

- 1986 to 1990 Taurus and Sable
- 1988 to 1990.5 Crown Victoria, Grand Marquis (5.0L Only)
- 1988 to 1990 Thunderbird and Cougar
- 1988 to 1990 Lincoln Mark VII
- 1988 to 1990 Lincoln Continental

## 6.9.1 Diagnostic Procedures

**NOTE:**
Always diagnose DTCs in the order they are received.

**To perform a IVSC KOEO Self-Test**

1. Turn Off Ignition switch.
2. Set transmission to Park.
3. Connect the scan tool using a Ford 1A to 1B adapter to the engine DLC located in the engine compartment. Do not connect the single pigtail (STI).
4. Select **Super Star II Emulation Mode**.

```
 ECA Manufacturer=[FORD  ]  [Code Speed]
>Test/Hold       =[Hold  ]  [  None    ]
 Code Display    =[Live  ]  [  10: Slow]
Navigate To Selection Press Y To Change.
```

**Figure 6-153** *Super Star II operating screen*

5. Cycle the ignition key ON.
6. Within ten seconds, press the speed control “ON” switch.
7. The scan tool will display a code ‘10’ indicating the self test has initiated.
8. After the code 10 is received, press speed control Off, COAST, ACCEL, RESUME buttons, and tap the brake pedal once (do not depress the throttle).
9. Code ‘11’ or ‘111’ indicates a system pass (proceed to the KOER test).
10. Any other DTC received refer to the DTC chart (Table 6-13, Table 6-14, Table 6-15, and Table 6-16).

**To perform a IVSC KOER Self-Test**

1. Warm up the engine before initializing the KOER self-test.
2. Connect the scan tool to the engine DLC using a Ford 1A or 1B adapter (Connect the STI pigtail for this test.)
3. Shut the engine Off.
4. Select **Super Star II Emulation Mode**.

```
 ECA Manufacturer=[FORD  ]  [Code Speed]
>Test/Hold       =[Hold  ]  [  None    ]
 Code Display    =[Live  ]  [  10: Slow]
Navigate To Selection Press Y To Change.
```

**Figure 6-154** *Super Star II operating screen*

5. Start the engine and within 30 seconds, press the speed control ‘ON’ switch.
6. Within 15 seconds, select Test/Hold = [Test].
7. The scan tool will display a code ‘10’ indicating the self-test has initiated.
8. Do not depress the throttle or brake during self test.
9. If the engine stalls at the end of the IVSC KOER test, shut the ignition off to prevent the engine KOEO test from starting.
10. Refer to the Table 6-13, Table 6-14, Table 6-15, and Table 6-16 for IVSC KOER self-test DTC descriptions.

**Table 6-13** *KOEO 2 digit integrated vehicle speed control DTC descriptions*

| KOEO 2 Digit DTC | Integrated Vehicle Speed Control KOEO DTC Description |
|---|---|
| 11 | System Pass |
| 23 | TP sensor input out of range |
| 47 | No input from speed control switches |
| 48 | Speed control switch input stuck |
| 49 | Speed control switch open ground |
| 53 | TP sensor input is greater than self-test maximum |

**Table 6-13** *KOEO 2 digit integrated vehicle speed control DTC descriptions*

| KOEO 2 Digit DTC | Integrated Vehicle Speed Control KOEO DTC Description |
|---|---|
| 63 | TP sensor input is less than self-test maximum |
| 74 | Brake on off signal always low |
| 75 | Brake on off signal always high |
| 67 | Neutral Pressure Switch circuit open, A/C input high |
| 81 | Servo Vent solenoid circuit |
| 82 | Servo Vacuum solenoid circuit |

**Table 6-14** *KOEO 3 digit integrated vehicle speed control DTC descriptions*

| KOEO 3 Digit DTC | Integrated Vehicle Speed Control KOEO DTC Description |
|---|---|
| 111 | System Pass |
| 121 | TP sensor input out of range |
| 457 | No input from speed control switches |
| 458 | Speed control switch input stuck |
| 459 | Speed control switch open ground |
| 123 | TP sensor input is greater than self-test maximum |
| 122 | TP sensor input is less than self-test maximum |
| 536 | Stop Light Switch |
| 528 | Clutch Pedal Position Circuit |
| 567 | Servo Solenoid Circuit |
| 568 | Servo Solenoid Circuit |

**Table 6-15** *KOEO 3 digit integrated vehicle speed control DTC descriptions*

| KOER 2 Digit DTC | Integrated Vehicle Speed Control KOER DTC Description |
|---|---|
| 11 | System Pass |
| 27 | Does not hold speed during dynamic test, Servo leaks down |
| 28 | Does not hold speed during dynamic test, Servo leaks up |
| 36 | Speed does not increase during dynamic test |
| 37 | Speed does not decrease during dynamic test |

**Table 6-16** *KOEO 3 digit integrated vehicle speed control DTC descriptions*

| KOEO 3 Digit DTC | Integrated Vehicle Speed Control KOER DTC Description |
|---|---|
| 111 | System Pass |
| 453 | Does not hold speed during dynamic test, Servo leaks down |
| 454 | Does not hold speed during dynamic test, Servo leaks up |
| 455 | Speed does not increase during dynamic test |
| 456 | Speed does not decrease during dynamic test |

Chapter 7

# GM Operations

This chapter explains how to begin using the scan tool’s basic setup and test functions. This information is specific to GM vehicles. For general scan tool functionality, see the user’s manual appropriate to your diagnostic tool.

**NOTE:**
The GM selection includes testing capabilities for GM, Hummer, and Workhorse vehicles.

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


- “GM Testing” on page 162
- “GM Data Parameters” on page 451
- “GM Communications Problems” on page 730


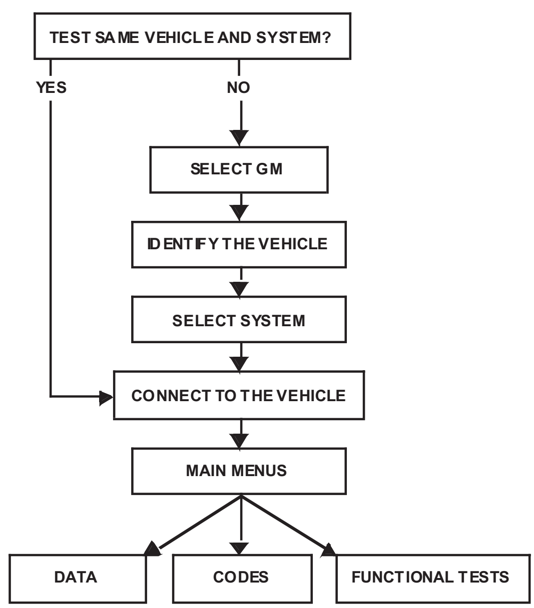


**Figure 7-1** *Basic GM test routine*

## 7.1 Identifying a Vehicle

Once the system to test is identified, you are prompted to identify the test vehicle by entering vehicle identification number (VIN) characters and answering questions.

**NOTE:**
Because of midyear manufacturing changes in engine computer systems, you should always enter a new identification when you test a different vehicle, even when two vehicles are the same year, model, and have the same engine and accessories installed.

The vehicle ID process begins from the Software Confirmation menu (Figure 7-2).

```
>GM Database (1990-2006)


Press Y To Continue
```

**Figure 7-2** *Sample Software Confirmation menu*

**To identify a vehicle:**

1. Press **Y** to confirm the software selection.
   A vehicle ID request screen similar to Figure 7-3 displays.

```
Select 10TH VIN Character
VIN: ---------4------
Vehicle: 2004
Engine:
```

**Figure 7-3** *Sample model year request*

2. Enter all VIN characters and press **Y** or **N** to answer any questions.
   The scan tool may ask a series of questions to determine the exact configuration of the test vehicle (Figure 7-3).

**Table 7-1** *Help with some vehicle identification questions*

| Question | Help |
|---|---|
| Is it 4L80 E automatic? | Vehicles with 4L80E transmissions do not have a transmission throttle valve cable connected to the throttle body. |
| Is it turbo? | Look for a turbocharger on the engine next to exhaust. |
| S/T Pickup with manual transmission? | Is it Chevy S10 or GMC Sonoma with manual transmission? |
| Light duty under 8600 GVW? | GVW rating is located on the drivers door, near latch. Normally 1500 series or C10 Trucks. |
| Postal vehicle? | Small van equipped with a 2.5L 4-cylinder. Also known as LLV. |
| With overdrive transmission? | Automatic transmission with 4 forward speeds. |
| Sequential fuel injection? | Fires injectors same as ignition firing order. May say SFI on VECI sticker or valve cover. |
| With OBD-II emissions? | Found on VECI label. |

When you are finished, a Vehicle ID Confirmation screen displays (Figure 7-4).

```
VIN: --6D---7-4------
Vehicle: 2004 Cadillac CTS
Engine: 3.6L V6 SFI (LY7)
Press Y To Continue.  N For New ID.
```

**Figure 7-4** *Sample GM Vehicle ID Confirmation screen*

3. Press **Y** if the vehicle ID is correct or press **N** to identify a different vehicle.

# 7.2 Selecting a System

The system is selected after identifying the vehicle (see Figure 7-1). The System Selection menu for these vehicles offers all systems the vehicle is equipped with (Figure 7-5).

```
Select System          Airbag
>Engine
 Transmission
 Antilock Brakes
```

**Figure 7-5** *Sample General Motors System Selection menu*

## 7.2.1 Selecting Systems

Select Systems (Figure 7-6) presents codes and data for engine, body, transmission, airbag, and vehicle theft deterrent, ABS control systems, and functional tests for engine, transmission, ABS, airbag, BCM, vehicle theft, IPC and transfer case.

```
Select System:
>Engine                ABS (Exit & RE-ID)
 Transmission
 Airbag                VTD
```

**Figure 7-6** *Sample GM Select System menu*

**NOTE:**
Some vehicles only have engine tests available. In this case, the Select System menu does not display and you go straight to the main menu for engine testing.

# 7.3 Connecting to the Vehicle

Once a vehicle has been identified, a scan tool connection message is shown, instructing you to use the supplied test adapters to connect the scan tool for testing.

```
Connect GM-1 Connector To 12-PIN ALDL
Connector Located Under Left Side OF
Dash.
Vehicle ID Stored.
```

**Figure 7-7** *Sample GM connection message*

The following adapters are available to test GM vehicles:

- **GM-1**—(Figure 7-8) The standard GM 12-pin adapter used for engine testing on all GM vehicles with 12-pin ALDL connectors.
- **GM-2**—(not shown) The GM 5-pin adapter used on 1981–82 GM vehicles with 5-pin ALDL connectors.
- **MULTI-1**—(Figure 7-9) This universal, multi-lead male connector adapter is required to test 1980½ Buick, Oldsmobile, and Pontiac systems, as well as some 4WAL antilock brake systems and any vehicle with the 3-pin Isuzu diagnostic connector. This adapter may be used in place of the GM-2 adapter, but the molded 5-pin adapter is easier to connect to the vehicle.
- **OBD-II**—(Figure 7-10) This 16-pin adapter is used for the 16-pin connector available on a few 1994–95 and most 1996 and later GM vehicles. The correct Personality Key™ device must be inserted into the OBD-II adapter for GM applications.

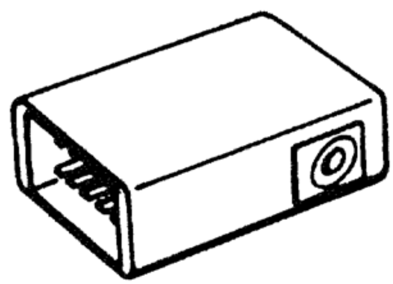

**Figure 7-8** *GM-1 adapter*

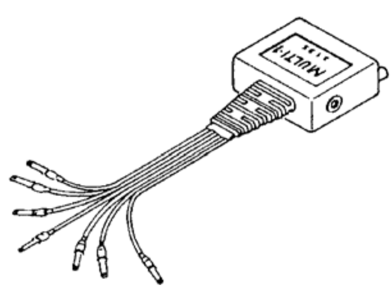


**Figure 7-9** *MULTI-1 adapter*

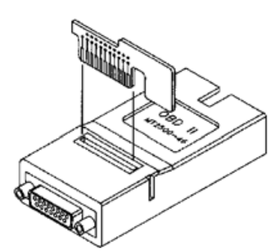


**Figure 7-10** *OBD-II adapter with Personality Key™*

**NOTE:**
The GM-2 adapter is similar to the GM-1.

On 1980 to 1995 GM vehicles, the test connector is referred to as the assembly line diagnostic link (ALDL) or the assembly line communication link (ALCL). Some 1994 to 1995 GM vehicles and most 1996 and later GM vehicles use a standard 16-pin OBD-II connector referred to as the data link connector (DLC). Connector locations are presented on screen when a connection to the vehicle is prompted.

The following figures show other GM vehicle connectors that require the MULTI-1 test adapter, along with instructions for connecting them.

**NOTE:**
You can also use the MULTI-2-D adapter for Spectrum and Storm.

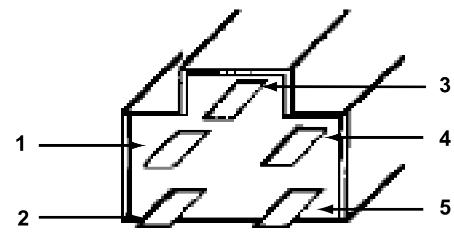


**Figure 7-11** *Connector for 1980½ Buick and Pontiac with 3.8L (VIN A) engine*

**1— White MULTI-1 wire**
**2— Black MULTI-1 wire**
**3— Brown MULTI-1 wire**
**4— Green MULTI-1 wire**
**5— Red MULTI-1 wire**

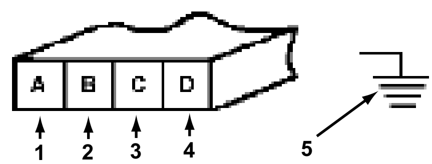


**Figure 7-12** *Connector for 1980½ Oldsmobile with 4.3L (VIN F) engine*

**1— Brown MULTI-1 wire**
**2— Green MULTI-1 wire**
**3— White MULTI-1 wire**
**4— Red MULTI-1 wire**
**5— Black MULTI-1 wire to chassis ground**

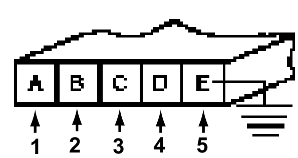


**Figure 7-13** *Connector for all 1981–82 models*

**1— Brown MULTI-1 wire**
Not used on Cadillac.
**2— Green MULTI-1 wire**
**3— Red MULTI-1 wire**
**4— White MULTI-1 wire**
**5— Black MULTI-1 wire**

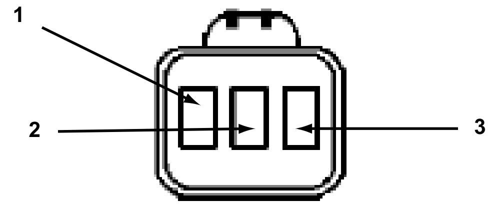


**Figure 7-14** *Connector for Spectrum and Storm*

**1— White MULTI-1 wire**

**2— Yellow or Green MULTI-1 wire**

**3— Black MULTI-1 wire**

**NOTE:**
The Storm ECM ALDL is white; the airbag ALDL is orange.

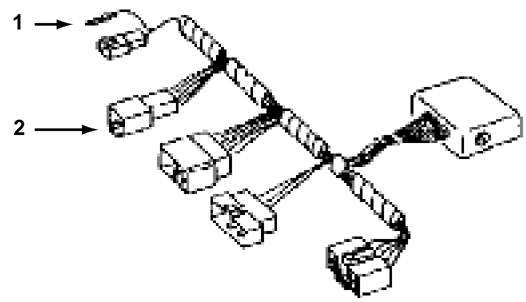


**Figure 7-15** *MULTI-2 Asian adapter*

**1— Ground**

**2— 2-D**

**To connect the scan tool to the test vehicle:**

1. Be sure the ignition switch is off.
2. Follow the on-screen instructions and connect the scan tool data cable to the test vehicle.
   a. Select the proper test adapter and attach it to the data cable.
   b. Connect the other end of the data cable to the scan tool data port.
   c. Connect the test adapter to the vehicle.

      Test adapters fit into the connectors only one way. Be sure the connector is installed securely.
3. Switch the ignition on.
4. Press **Y** to continue.

   The main menu for the selected system displays, and the scan tool is connected to the vehicle data stream.

## 7.4 GM Vehicles with Partial or No Self-Diagnostic Capability

The General Motors vehicles listed in either do not have electronic engine control systems, or they have systems without self-diagnostic capabilities. By itself, the presence of an ALDL connector does not mean the vehicle has self-diagnostic capabilities. The vehicles in Table 7-2 have limited self-diagnostic capabilities.

**Table 7-2** *GM vehicles without self-diagnostic capability*

| Year | Models |
|---|---|
| All | Diesel passenger cars |
| Pre 1981 | All models, except 1980 4.3L Olds (VIN code F) and 1980 Buick and Pontiac 3.8L (VIN code A) |
| 1981–82 | All trucks |
| 1983–85 | All Federal (49-state) trucks, except: 2.5L, 4-cylinder with TBI (VIN code E) and 6.2L diesel (VIN code C) |
| 1981–90 | All LPG-powered vehicles |
| 1981–90 | 6.2L diesel trucks (VIN code J) |
| 1981–91 | All 7.4L carbureted trucks (VIN code W) and 4.8L in-line 6-cylinder carbureted trucks (VIN code T) |
| 1985–88 | Chevrolet Nova (Troubleshooting tips available in Asian Import cartridge by identifying as same year Toyota with the 5th VIN as E and a 4-AC or 4ALC engine.) |

**Table 7-3** *GM vehicles with partial self-diagnostic capability*

| Year | Models |
|---|---|
| 1991–97 | Some 6.2L and 6.5L diesel trucks (VIN code J) have an ALDL that offers transmission module communication only. |
| 2003 and earlier | Some trucks with 6.5L diesel engine (8th VIN **Y**) with federal emissions offer transmission module communication only. |

# Chapter 8 GM Testing

This chapter provides information and procedures for testing 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 155
- "GM Data Parameters" on page 451
- "GM Communications Problems" on page 730


## 8.1 Testing Control Systems

Select Systems from the System Selection menu to open the main testing menu (Figure 8-1).

```
Main Menu GM Engine
>Codes & Data and Road Test
 Functional Tests     Troubleshooter
 Custom Setup
```

**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 DLC. "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 Scan Tool Communication

The Codes and 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 and 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, the screen updates to display a “no communication” message (Figure 8-3).

```
            No Communication.
Press N To Reenter Vehicle Identification
```

**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.

### 8.1.2 Codes and Data Selections

The Codes and 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 and Data test selections are:

- **Codes and Data**—displays trouble codes and data stream information from the selected ECM. The vehicle should not be driven during this test.
- **Codes**—displays trouble codes only, no data parameters.
- **Data**—displays data parameters only, no trouble codes.
- **Road Test (Data)**—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 and Data and Road Test**—displays trouble codes and data stream information from the selected ECM, whether or not the vehicle is being driven.
- **Codes and 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 and Data

Selecting Codes, Data or Codes and Data displays the data list or trouble codes for the selected module. Data for carbureted engines is slightly different than for fuel-injected engines, but both work the same (Figure 8-4 and Figure 8-5).

```
   RPM__1234  O2(mV)__689  MC DWL(°)__38
 **  Diagnostic Mode.  Do Not Drive.  **
No Codes Present
O2 Crosscounts___08   Open/Clsd Loop_Open
```

**Figure 8-4** *Sample GM Codes and Data display for a carbureted engine*

```
   RPM__1234  O2(mV)__689
Integrator__128
 **  Diagnostic Mode.  Do Not Drive.  **
No Codes Present
```

**Figure 8-5** *Sample GM Codes and 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 may display the data parameters in multiple 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 manual for the diagnostic tool you are using for instructions on reassigning LED functions.

## Diagnostic Trouble Codes

### *Current (Hard) Codes and History (Soft) Codes*

On some models, DTCs may be classified as either “current (hard)” or “history (soft).” Most 1988 and later GM vehicle controllers separate soft codes from hard codes.

- **Current (Hard) codes**—indicate a problem that exists at the time of testing. These are referred to as “current codes” in the trouble code menu.

- **History (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 current (hard) and history (soft) codes:**

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

### *1995 and Earlier Cadillac Engine System Codes*

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

- 1989 and earlier models transmit a history (soft) code 52
- 1990–95 models transmit history (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 (part 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 | |

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

| DTCs with Multiple Definitions–Cars | | | | |
|---|---|---|---|---|
| **DTC** | **Year** | **4th VIN** | **Engine** | **Definition** |
| 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 |
| 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 (part 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 (part 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 (Data)

Selecting Road Test (Data) 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 8-6).

```
   RPM__1234  O2(mV)__689
Integrator__128
 **  Road Test Mode. OK To Drive.  **
```

**Figure 8-6** *Sample Road Test (C&D) mode screen*

Whether 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 data information displays in Road Test (Data) mode as those described for the 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.
- 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.

## 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, Data and Road Test are separate selections on the Main Menu GM Engine (Figure 8-7).

```
Main Menu GM Engine    [Press N For Help]
>Codes & Data          Road Test (No C&D)
 Functional Tests      Review Movie
 Custom Setup
```

**Figure 8-7** *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 and 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 8-8).

```
Road Test Mode.  OK To Drive.
ECM Removed From Diagnostic Mode.
No Codes or Data Available.
Press N For Main Menu.
```

**Figure 8-8** *Sample Road Test (No C&D) screen*

## Codes and 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 and Data and Road Test displays on the Main Menu GM Engine (Figure 8-9).

```
Main Menu GM Engine   Other Systems
>Codes & Data and Road Test
 Functional Tests     Review Movie
 Custom Setup
```

**Figure 8-9** *Codes and 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 8-10).

```
   RPM__1234  O2(mV)__689
Integrator__128
 **  Codes And Data.  OK To Drive.  **
No Codes Present
```

**Figure 8-10** *Sample “Codes and Data and Road Test” display*

## Codes and Data Menu

Some vehicles have a Codes and Data Menu selection (Figure 8-11), 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 8-11** *Codes and Data Menu selection*

A data group combines similar data parameters into smaller data lists for faster, more efficient testing (Figure 8-12).

```
Codes & Data Menu:
>Codes & Data and Road Test
 Spark Data           Codes History
 Engine Data 1        Fuel Trim Data
```

**Figure 8-12** *Sample Codes and 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 and Data menu choices may include:

- Adaptive Report
- Codes
- 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 and Data Menu opens a submenu that may include the following options:

- Current
- Freeze Frame/Failure Records
- History
- MIL, SVS, or Message Requested
- Last Test Failed
- Test Failed Since Code Cleared
- Failed This Ignition
- DTC Status

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 8-13).

```
Choose A Failure Record Or Freeze Frame:
>P1406 (Freeze Frame)
 P1406
 P1577
```

**Figure 8-13** *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 8-14).

```
     Freeze Frame/Failure Record Data

P0201 Cyllinder 1 - Injector CKT Problem
Engine Load(%)_____0  Coolant(°C)_____100
```

**Figure 8-14** *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 8-15).

```
                Code List

P0122 TP Sensor or APP Sensor 1 CKT SHRT
*** End Of List ***
```

**Figure 8-15** *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 ran.

### *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 8-16).

```
               DTC Status
Scroll In Desired Trouble Code To Test
             ***  P0000  ***
```

**Figure 8-16** *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 8-17).

```
P0201 Cyllinder 1 - Injector CKT Problem
This Ignition Cycle__________Ran & Failed
LAST Test____Failed   Since Clear__Not Run
History_________Yes   MIL or SVS REQ___Yes
```

**Figure 8-17** *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 8-18).

```
                DTC Status
Scroll In Desired Trouble Code To Test
             ***  P1976  ***
This Vehicle Does Not Support This DTC!!
```

**Figure 8-18** *Sample screen when a DTC is not supported*

### 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 8-19).

```
Main Menu GM Airbag
>Codes                Other Systems

 Custom Setup
```

**Figure 8-19** *Sample early, pre-1994, airbag main menu*

Selecting Codes displays the airbag codes (Figure 8-20).

```
               Airbag Codes
  **  Diagnostic Mode.  Do Not Drive  **
71 Defective DERM
HC History Codes Follow
```

**Figure 8-20** *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 and Data Selections” on page 163 for 1994 and later models, and for 1993 and later Saturn airbag testing.

## 8.1.3 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 8-21). 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 8-21** *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 8-22).

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 8-22** *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 8-23).

```
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 8-23** *Sample AIR solenoid test caution*

2. Press **Y** to continue.
   The air solenoid test screen displays, which is the standard Codes and 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 8-24).

```
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 8-24** *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 8-25).

```
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 8-25** *First screen of the caution message*

2. Press **Y** to continue with the message (Figure 8-26).

```
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 8-26** *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 8-27, Figure 8-28, or Figure 8-29).

```
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 8-27** *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 8-28** *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 8-29** *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 8-30). This mode is used to check O2S operation and other engine operating conditions while the fuel system is held in a full-lean condition.

```
FL  RPM__1234  Vote___-54  MC DWL(°)__54
 **  Full Lean Test.  Do Not Drive.  **
....................  ....................
....................  ....................
```

**Figure 8-30** *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 and 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 8-31). Use this mode to check O2S operation and other engine operating conditions while the fuel system is held in a full-rich condition.

```
FR  RPM__1234  Vote___-54  MC DWL(°)__54
 **  Full Rich Test.  Do Not Drive.  **
....................  ....................
....................  ....................
```

**Figure 8-31** *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 and 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 8-32). 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 8-32** *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 8-33).

```
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 8-33** *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 8-32). 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 8-34). Follow instructions on the vehicle emission control information (VECI) decal to adjust timing.

```
10° RPM__1234  O2(mV)__689  INT______128
 **  Fixed Spark.  Do Not Drive.  **
....................  ....................
....................  ....................
```

**Figure 8-34** *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.

## 8.1.4 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.

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 or turning on an air conditioning clutch when the PCM detects low refrigerant pressure.

### Functional Test Selection

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

Select Functional Tests from a main menu displays the following menu (Figure 8-35).

```
>Injector Balance
 Calibration P/N
 VIN
 Output ControlS                  [More]
```

**Figure 8-35** *Sample Functional Tests menu*

**NOTE:**
Selecting Output Controls displays a list of component tests (Figure 8-36).

```
Select Test Mode.  Press Y To Continue.
>A/C Relay (On/Off)
 Cruise Inhibit (On/Off)
 Disable Idle Mode Spark (Reset)
```

**Figure 8-36** *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 8-37).

```
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 8-37** *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 8-38).

```
Fuel Pump Relay (On/Off)
 ON  Off  Change Data  Press N To Exit
RPM______________850  TPS(V)__________1.25
TPS(%)____________23  Adapt Shift CNT__Off
```

**Figure 8-38** *Sample Fuel Pump Relay Functional Test*

### *Variable Control Test*

Figure 8-39 is an example of a typical variable control test.

```
Canister Purge (%)                       0
>Test  Scroll Data  Change List  Exit
RPM_____________630   TPS(%)_____________0
EVAP Purge(%)____30   EVAP Vent SOL____OFF
```

**Figure 8-39** *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 8-40).

```
Canister Purge (%)                       0
*0     Scroll Data  Change List  Exit
RPM_____________630   TPS(%)_____________0
EVAP Purge(%)_____0   EVAP Vent SOL____OFF
```

**Figure 8-40** *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 8-41). Other variable control tests act similarly.

```
Canister Purge (%)                     10
*10    Scroll Data  Change List  Exit
RPM_____________630   TPS(%)_____________0
EVAP Purge(%)____10   EVAP Vent SOL____Off
```

**Figure 8-41** *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 and 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 8-42).

```
EGR Solenoid Should Cycle.  If Engine Is
Running, Idle Will Be Set To 1500 RPM.
Press Y To Enter Test.  Then Press
N To Exit.
```

**Figure 8-42** *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 8-43).

```
OFF  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 8-43** *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 8-44).

```
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 8-44** *Sample digital EGR control test*

2. Press Y to enter the test.
   A data list similar to that for Codes and Data displays (Figure 8-45).

```
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 8-45** *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 8-45). 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 a variable opening controlled by a stepper motor. The PCM controls 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 181 for testing information.

## EVAP Purge/Seal Test

The evaporative emissions system (EVAP) Purge/Seal tests may be used for:

- Checking for an EVAP system leak.
- Checking the integrity of the fuel tank pressure (FTP) sensor.

**NOTE:**
The fuel level in the tank must be between 15% and 85% full when performing EVAP tests. An incorrect fuel level may produce inaccurate results.

During a purge or seal test, live data displays on the screen along with a series of test commands. The commands are on the second line of the display and offer the following choices:

- Purge—controls the purge solenoid and closes the vent solenoid.
- Seal—sets the purge solenoid to a 0% duty cycle and closes the vent solenoid.
- Scroll—lets you scroll through the data list.
- Change List—opens the Data Menu so you can switch to a different data list.
- Exit—cancels the test and returns you to the Output Controls menu.

**IMPORTANT:**
The units for measuring fuel tank pressure with US Customary standards is typically inches of water (inH2O or “H2O), while millimeters of mercury (mmHg) is used for the metric system. This may cause confusion when converting one to the other, as the standard conversion factor used for manifold vacuum does not apply. Use the following formulas to convert fuel tank pressures:
**mmHg x 0.535 = inH2O**
**inH2O x 1.868 = mmHg**

**To check for an EVAP system leak:**

1. From the Functional Tests menu, select **Output Controls** > **EVAP Purge/Seal**.
2. Press **Y** to continue when the test information screen displays.
3. The screen should default to the EGR, EVAP, ACC. data list. If not, select **Change List** > **EGR, EVAP, ACC**.
4. Select **Scroll**, then move the EVAP parameters into the viewing area.
5. Select **Purge**, then set the purge rate at 10% or 20% to build vacuum in the tank.
6. Allow tank vacuum to build to about 5.35 to 8.03 inH2O (10 to 15 mmHg), then select **Seal**.
   The Scanner closes the purge valve, maintains a 0% purge rate, and closes the vent solenoid to seal the fuel tank and trap vacuum.
7. Monitor the vacuum decay rate over time to determine if there is a system leak.
8. Select **Exit** to end the test.
   Repair leaks as needed and retest.

**To check the FTP sensor integrity:**

1. Start the engine and allow it to run at idle.
2. From the Functional Tests menu, select **Output Controls** > **EVAP Purge/Seal**.
3. Press **Y** to continue when the test information screen displays.
4. Select **Change List** > **EGR, EVAP, ACC**.
5. Select **Scroll**, then move the EVAP parameters into the viewing area.

6. Select **Purge**.
7. Adjust the purge solenoid duty cycle to 30%.

   This setting causes vacuum in the tank to increase until the FTP sensor reaches a predetermined abort level. When this level is reached, the PCM cancels the test and opens the vent valve to release vacuum. The Scanner simultaneously displays a message indicating purge system vacuum is too high.

   Suspect a faulty FTP sensor if the PCM does not cancel the test or a “high vacuum” message does not display.

## EVAP Service Bay Test

The evaporative emissions system (EVAP) Service Bay Test may be used to run the I/M EVAP diagnostic monitor on some General Motors OBD-II vehicles. This test allows the technician to identify an EVAP failure or to verify repairs to the system. Not all OBD-II vehicles have the ability to perform the service bay test.

The EVAP Service Bay Test procedures vary slightly, depending upon whether or not the vehicle has an engine off natural vacuum (EONV) system. Pre-test conditions, which must be met for the test to run properly and provide accurate results, are listed below.

Enable conditions for models without EONV:

- Ignition switch must be in the On position
- Battery voltage must be in the 9 to 18 volt range
- Engine coolant temperature must be below 158°F (70°C)
- Fuel level must be between 15 and 85 percent of the fuel tank capacity
- Vehicle speed must be below 2 mph (3 kph)
- All DTCs must be cleared

Enable conditions for models with EONV:

- Battery voltage must be in the 11 to 18 volt range
- Engine coolant temperature must be below 158°F (70°C)
- The I/M EVAP monitor status must be “not complete”
- Fuel level must be between 15 and 85 percent of tank capacity, do not refuel during test
- All DTC must be cleared
- Ambient air temperature must be in the 32 to 104°F (0 to 40°C) range
- The vehicle must be driven for the time and distance specified on the scan tool
- Ignition switch must remain off during the engine off portion of the test, and the vehicle must remain at rest.

All systems begin with an engine running test that outputs a DTC in the event of a failure. This completes the procedure for models without EONV. For models with EONV, the technician is prompted to drive the vehicle a specific distance and allow the engine to run a specified amount of time to initiate the engine off portion of the test.

During the engine off portion of the test, the system monitors vacuum decay in the fuel tank after the ignition is switched off. This monitor may be active for up to 40 minutes. The I/M EVAP monitor should indicate “complete” following the engine off portion of the test.

If a test aborts for some reason, check to make sure the enable conditions are met. Clear DTC memory to reset the monitors in order to retest.

### 8.1.5 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 and Data

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

#### Selecting ABS

The ABS tests include trouble code reading and code clearing for most systems, plus the ability to read data and brake bleed for most systems.

Use the application tables on the following pages to identify the type of ABS used on a particular vehicle. Table 8-3 lists key questions for identifying systems.

Table 8-4 through Table 8-11 list applications for the different divisions:

- “Buick applications” on page 188
- “Cadillac applications” on page 189

- "Chevrolet (except trucks and vans) applications" on page 189
- "Chevrolet and GMC trucks and vans applications" on page 190
- "Geo and GM import applications" on page 190
- "Oldsmobile applications" on page 191
- "Pontiac applications" on page 191
- "Saturn applications" on page 192

Refer to the appropriate GM service manual for procedures and complete test and repair information for these systems.

**Table 8-3** *Key questions for identifying systems*

| Question | Help |
|---|---|
| IS It RWAL? | Vehicles with 4-wheel antilock brakes have a large underhood hydraulic control unit attached with steel lines to the brake master cylinder. To distinguish 4WAL from RWAL, see Figure 8-46. |
| With Traction Control? | The vehicle may have a switch on the console or dash to activate the system. Common badges are ASR and TCS. |
| Manual trans with a VCM? | The electronic control unit is located inside VCM (vehicle control module). The vehicle also has a hydraulic control unit underhood. |
| For 1999–2006 vehicles only: | |
| With ETS? | Vehicles (4th VIN W, N-Alero, and N-Grand Am) with Enhanced Traction System (ETS), have a traction off button on the dash or console. |
| With Magnasteer (MSVA)? | Vehicles with Magnetic Steering Variable Assist (MSVA or Magnasteer) have a 2-wire subharness from the steering rack assembly. |
| With electronic variable orifice (EVO)? | Vehicles with electronic variable orifice have wires going to the power steering pump. |
| With tire inflation monitor (TIM)? | Vehicles (4th VIN N) with Tire Inflation Monitors (TIM) have a reset switch located inside the fuse panel at the left side of the dash and a "low tire" lamp in the instrument cluster that comes on during a key on bulb check. |
| With Active Handling? | Vehicles with Active Handling have a suspension control switch in the center console. |
| With traction control? | Vehicles (4th VIN C) with traction control have a switch located at the end of the shift lever. Vehicles (4th VIN H-Pontiac) with traction control have a switch in the center front of the passenger compartment, under the console. Vehicles (4th VIN H-Oldsmobile) with traction control have a disable switch under the left side of the instrument panel, on the knee bolster. |

**WARNING**

ABS diagnosis with the scan tool does not require opening the hydraulic system or disassembling any mechanical parts. However, complete ABS service may require opening the hydraulic system. ABS hydraulic systems operate on pressures of 2000 psi or higher. Always completely depressurize the system before opening any hydraulic connection. Most systems are depressurized by applying and releasing the brake pedal at least 25 times. Refer to the GM service manual instructions for complete information on hydraulic system service and safety.

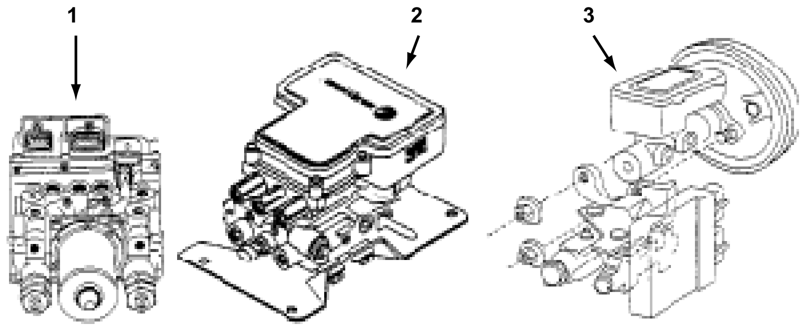


**Figure 8-46** *Difference between 4WAL and RWAL*

**1— 4WAL hydraulic control unit**

**2— 4WAL hydraulic control unit**

**3— RWAL control valve assembly**

**Table 8-4** *Buick applications*

| Model | Year | System |
|---|---|---|
| Century | 1994–98 | Delphi ABS VI (non-integral) |
| | 1999–2004 | DBC 7 (non-integral) |
| Electra | 1986–90 | Teves Mark II (integral) |
| LeSabre | 1991–95 | Teves Mark IV (non-integral) |
| | 1996–99 | Delco/Bosch 5 (non-integral) |
| | 2000–04 | Delco/Bosch 5.3 Hybrid (non-integral) |
| Park Avenue | 1986–90 | Teves Mark II (integral) |
| | 1991–95 | Teves Mark IV (non-integral) |
| | 1996–99 | Delco/Bosch 5 (non-integral) |
| | 2000–04 | Delco/Bosch 5.3 Hybrid (non-integral) |
| Reatta | 1988–90 | Teves Mark II (integral) |
| Regal | 1989–91 | Delco Moraine III (integral) |
| | 1992–98 | Delphi ABS VI (non-integral) |
| | 1999–2004 | DBC 7 (non-integral) |
| Riviera | 1988–90 | Teves Mark II (integral) |
| | 1992–93 | Bosch 2 (non-integral) |
| | 1995–99 | Teves Mark IV (non-integral) |
| Roadmaster | 1993–94 | Bosch 2 (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| Skylark | 1991–98 | Delphi ABS VI (non-integral) |
| Wagon | 1991–94 | Bosch 2 (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |

**Table 8-5** *Cadillac applications*

| Model | Year | System |
|---|---|---|
| Allante | 1987–92 | Bosch 3 (integral) |
| | 1993 | Bosch 2 (non-integral) |
| Catera | 1997 | |
| | 1998–2001 | Bosch 5.3 (non-integral) |
| Concours | 1994 | Bosch 2 (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| | 1997–99 | Delco/Bosch 5 (non-integral) |
| | 2000–01 | Delco/Bosch 5.3 Hybrid (non-integral) |
| CTS | 2003 | DBC 7 (non-integral) |
| | 2004 | DBC 7.2 (non-integral) |
| DeVille | 1986–90 | Teves Mark II (integral) |
| | 1991–93 | Teves Mark IV (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| | 1997–99 | Delco/Bosch 5 (non-integral) |
| | 2000–04 | Delco/Bosch 5.3 Hybrid (non-integral) |
| El Dorado | 1988–90 | Teves Mark II (integral) |
| | 1991–94 | Bosch 2 (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| | 1997–2001 | Delco/Bosch 5 (non-integral) |
| Fleetwood | 1986–90 | Teves Mark II (integral) |
| | 1990–94 | Bosch 2 (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| Seville | 1988–90 | Teves Mark II (integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| | 1997–99 | Delco/Bosch 5 (non-integral) |
| | 2000–04 | Delco/Bosch 5.3 Hybrid (non-integral) |
| SRX | 2004 | DBC 7.2 (non-integral) |
| XLR | 2004 | |

**Table 8-6** *Chevrolet (except trucks and vans) applications (part 1 of 2)*

| Model | Year | System |
|---|---|---|
| Beretta | 1991–96 | Delphi ABS VI (non-integral) |
| Camaro | 1993–97 | |
| | 1998–2002 | Bosch 5.3 (non-integral) |
| Caprice | 1991–94 | Bosch 2 (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| Cavalier | 1992–99 | Delphi ABS VI (non-integral) |
| | 2000–04 | DBC 7 (non-integral) |
| Corsica | 1991–96 | Delphi ABS VI (non-integral) |

**Table 8-6** *Chevrolet (except trucks and vans) applications (part 2 of 2)*

| Model | Year | System |
|---|---|---|
| Corvette | 1986–95 | Bosch 2 (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| | 1997–2000 | Delco/Bosch 5 (non-integral) |
| | 2001–04 | Delco/Bosch 5.3 Hybrid (non-integral) |
| Impala SS | 1994 | Bosch 2 (non-integral) |
| | 1995–96 | Bosch 5 (non-integral) |
| Impala | 2000–01 | Delphi ABS VI (non-integral) |
| Lumina | 1992–2001 | |
| Malibu | 1997–99 | |
| | 2000–04 | DBC 7 (non-integral) |
| Monte Carlo | 1997–99 | Delphi ABS VI (non-integral) |
| | 2000–04 | DBC 7 (non-integral) |
| Prizm | 1998–2002 | Lucas/Sumitomo Hybrid (non-integral) |

**Table 8-7** *Chevrolet and GMC trucks and vans applications*

| Model | Year | System |
|---|---|---|
| Aztek | 2001–04 | Bosch 5.3 (non-integral) |
| C/K Series, R/V Series | 1988–93 | Kelsey-Hayes RWAL |
| | 1992–2004 | Kelsey-Hayes 4WAL |
| Colorado/Canyon | 2004 | Advics 3-channel (non-integral) |
| G Series Van | 1990–92 | Kelsey-Hayes RWAL |
| | 1993–2000 | Kelsey-Hayes 4WAL |
| Hummer H2 | 2003–04 | Bosch 5.3 (non-integral) |
| Lumina APV, Venture | 1992–99 | Delphi ABS VI (non-integral) |
| M/L Series Van | 1990–92 | Kelsey-Hayes RWAL |
| | 1990–2004 | Kelsey-Hayes 4WAL |
| P Series | 1998–99 | |
| P Series (Workhorse) | 2000–2004 | |
| Rendezvous | 2002–04 | Bosch 5.3 (non-integral) |
| S/T Series | 1989–95 | Kelsey-Hayes RWAL |
| | 1991–2004 | Kelsey-Hayes 4WAL |
| Silhouette | 1992–99 | Delphi ABS VI (non-integral) |
| | 2000–04 | DBC 7 (non-integral) |
| Trans Sport, Montana | 1992–99 | Delphi ABS VI (non-integral) |
| | 2000–04 | DBC 7 (non-integral) |
| Venture | 2000–04 | |

**Table 8-8** *Geo and GM import applications (part 1 of 2)*

| Model | Year | System |
|---|---|---|
| Metro | 1995–2001 | Delphi ABS VI (non-integral) |
| Prizm | 1993–97 | |

**Table 8-8** *Geo and GM import applications (part 2 of 2)*

| Model | Year | System |
|---|---|---|
| Tracker | 1991–95 | Kelsey-Hayes RWAL |
| | 1996–98 | Delphi ABS VI (non-integral) |
| | 1999–2004 | DBC 7 (non-integral) |

**Table 8-9** *Oldsmobile applications*

| Model | Year | System |
|---|---|---|
| 88, Delta 88, LSS | 1987–90 | Teves Mark II (integral) |
| | 1991–95 | Teves Mark IV (non-integral) |
| | 1996–99 | Delco/Bosch 5 (non-integral) |
| 98, 98 Regency | 1986–90 | Teves Mark II (integral) |
| | 1991–95 | Teves Mark IV (non-integral) |
| | 1996 | Delco/Bosch 5 (non-integral) |
| Achevia | 1992–98 | Delphi ABS VI (non-integral) |
| Alero | 1999–2000 | |
| | 2001–04 | DBC 7 (non-integral) |
| Aurora | 1995–99 | Teves Mark IV (non-integral) |
| | 2000–03 | Delco/Bosch 5.3 Hybrid (non-integral) |
| Calais | 1991 | Delphi ABS VI (non-integral) |
| Cutlass (N) | 1997–99 | |
| Cutlass Ciera | 1994–96 | |
| Cutlass Supreme | 1989–91 | Delco Moraine III (integral) |
| | 1992–97 | Delphi ABS VI (non-integral) |
| Intrigue | 1999 | |
| | 1999–2001 | Bosch 5.3 (non-integral) |
| Toronado, Trofeo | 1988–90 | Teves Mark II (integral) |
| | 1991–93 | Bosch 2 (non-integral) |

**Table 8-10** *Pontiac applications (part 1 of 2)*

| Model | Year | System |
|---|---|---|
| 6000 STE, STE/AWD | 1986–91 | Teves Mark II (integral) |
| Bonneville | 1989–90 | |
| | 1991–95 | Teves Mark IV (non-integral) |
| | 1996–99 | Delco/Bosch 5 (non-integral) |
| | 2000–04 | Delco/Bosch 5.3 Hybrid (non-integral) |
| Bonneville SSE | 1988–90 | Teves Mark II (integral) |
| | 1991–95 | Teves Mark IV (non-integral) |
| Firebird | 1993–97 | Delphi ABS VI (non-integral) |
| | 1998–2002 | Bosch 5.3 (non-integral) |
| Grand Am | 1991–2000 | Delphi ABS VI (non-integral) |
| | 2001–04 | DBC 7 (non-integral) |

**Table 8-10** *Pontiac applications (part 2 of 2)*

| Model | Year | System |
|---|---|---|
| Grand Prix | 1989–91 | Delco Moraine III (integral) |
| | 1992–97 | Delphi ABS VI (non-integral) |
| | 1998–2001 | Bosch 5.3 (non-integral) |
| Sunbird | 1992–94 | Delphi ABS VI (non-integral) |
| Sunfire | 1995–99 | |
| | 2000–04 | DBC 7 (non-integral) |
| Vibe | 2003–04 | Lucas/Sumitomo Hybrid (non-integral) |

**Table 8-11** *Saturn applications*

| Model | Year | System |
|---|---|---|
| Ion | 2003–04 | Bosch 8.0 (non-integral) |
| Vue | 2002–04 | Bosch 5.3 (non-integral) |

## Vehicles without ABS Communication

Some GM vehicles have an ABS that cannot transmit codes or other data to the scan tool. Most of these vehicles do indicate system problems by flashing codes on the ABS warning lamp in the instrument cluster. A few models neither transmit codes nor flash them on a lamp.

The scan tool provides valuable diagnostic assistance for these vehicles by supplying code definitions through “Display ABS Codes” and by supplying troubleshooting tips. Enter the ID for one of these vehicles and a notification displays on the main menu (Figure 8-47).

```
No ABS Connector Available. Use Any GM
12 PIN Adapter For 12V & Ground.
```

**Figure 8-47** *Sample no ABS data communication ability message*

On a vehicle with no ABS codes or data and no available troubleshooter information, the following message appears (Figure 8-48).

```
No Information or Tests Available For
This Vehicle.
```

**Figure 8-48** *Sample no ABS information available message*

## Communication With the ABS Module (EBCM)

The ABS Codes and 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 and Data is selected, the scan tool first displays a “waiting for communication” message (Figure 8-49).

```
Waiting For Module To Communicate With
Scanner.  Connect ALDL Connector.
Turn Key On.
.........................................
```

**Figure 8-49** *Sample waiting for communication message*

After about 3 seconds, “waiting for brake module to respond” should appear on the fourth line of the display. A counter at the end of the fourth line to counts seconds as communication with the EBCM is established. 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 and Data display appears.

If communication is not established, or if communication is interrupted during testing, a communication lost message displays (Figure 8-50). 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 8-50** *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 and 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 and Data.
3. Switch the ignition off when ABS Codes and 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 “Current (Hard) Codes and History (Soft) Codes” on page 164 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 8-12** *Passenger car DTCs with multiple definitions*

| 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 |
| 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 |
| | 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 and 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 and 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 and Data display. Press **N** to return to the exit menu and repeat the clear ABS codes operation.

## 8.2.2 Bosch 2 Codes and Data—1990–97

An ABS Codes and 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 and Data mode (Figure 8-51), 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 and 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 8-51** *Sample Bosch 2 Codes and Data*

Select Codes and Data on a Bosch 2 system and the EBCM enters a diagnostic state. The EBCM remains in the diagnostic state after exiting Codes and 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 and 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 8-52).

```
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 8-52** *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.

The also EBCM records the number of times the engine 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 and Data exit menu (see “Clear Codes” on page 186).

## 8.2.3 Bosch and Delco Bosch 5.0/5.3 Codes and 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 and Data for these models displays a screen similar to Figure 8-53.

```
    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 8-53** *Sample Bosch or Delco Bosch 5.0 or 5.3 Codes and Data*

During ABS tests in Codes and 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 and 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 8-54.

```
  Code List
     ** Codes Only.  OK To Drive.  **
C0221 RF Wheel Speed Sensor CKT Open
***  End Of List  ***
```

**Figure 8-54** *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 195.

## 8.2.4 Delco-Moraine III Codes and Data—1988–91

The Delco-Moraine III system is fully functional in the Codes and 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. 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 and Data mode, followed by the test mode and the codes & data list (Figure 8-55).

```
    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 8-55** *Sample Delco Moraine III Codes and Data*

**NOTE:**
Vehicle components may seem to operate abnormally during testing in Codes and 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 8-56).

```
   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 8-56** *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 turned 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 and Data from the Main Menu GM ABS.

## 8.2.5 Delco-Moraine VI Codes and Data—1991–2001

The ABS Codes and 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 8-57.

```
                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 8-57** *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 and 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 and Data display for the VCM 4WAL brake system used on 1994 and later trucks and vans is shown in Figure 8-58.

```
    ABS Lamp______On   Brake SW____Open
 **  ABS Braking Is Off!  OK To Drive. **
No Codes Present
LF Wheel__________60   RF Wheel__________60
```

**Figure 8-58** *Sample Kelsey-Hayes VCM 4WAL Codes and Data*

## 8.2.7 4WAL Codes and Data—1990 and Later

The Codes and Data display for the Kelsey-Hayes Four-Wheel Antilock (4WAL) brake system used on 1990 and later trucks and vans is shown in Figure 8-59.

```
    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 8-59** *Sample Kelsey-Hayes 4WAL Codes and 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 and 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 8-60.

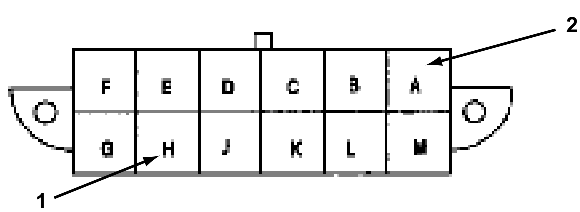


**Figure 8-60** *MULTI-1 adapter wire color codes for 4WAL testing*

**1— Green**

**2— Black**

For Kelsey-Hayes 4WAL systems with the 16-pin DLC, use the OBD-II connector (see “Connecting to the Vehicle” on page 157). 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 and 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. The RWAL system does 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 205 for more information.

### Clearing RWAL Codes

To clear codes from the RWAL system, except on vehicles that transmit ABS Codes and Data, switch the ignition off and disconnect the main connector at the RWAL EBCM. Refer to “Clearing Codes from ABS Codes and Data” on page 194 for information on clearing codes on vehicles with ABS Codes and Data.

## 8.2.9 Rear-Wheel Antilock (RWAL) Codes and 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 and Data display for the Kelsey-Hayes RWAL system, used on 1993 and later S and T trucks, is shown in Figure 8-61.

```
    ABS Lamp______On   Brake SW____Open
 ** ABS Braking Is Off!  OK To Drive.  **
No Codes Present
VEH Speed_________60   VLV Reset SW______60
Isolation SOL____Off   DUMP Solenoid____Off
Enable Relay_____Off   INJ 2 Fault______Yes
EST Enabled______Yes   4WD Active________No
```

**Figure 8-61** *Complete Codes and Data display for Kelsey-Hayes RWAL*

## 8.2.10 Teves II ABS Codes and Data—1986–91

The Teves II ABS displays codes by flashing the amber “antilock” 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 is off when no faults are present, and lights continuously whenever a fault is present. The EBCM/EBTCM recognizes both current and intermittent (hard and 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 and Data—1990–99

The ABS Codes and Data display for Teves IV systems provides trouble code information only; data parameters are not displayed (Figure 8-62).

```
            TEVES IV
 ** ABS Braking Is Off!  OK To Drive.  **
23 RF Wheel Speed Is 0 MPH
***  End Of List  ***
```

**Figure 8-62** *Sample Teves IV ABS Codes and Data*

In the ABS Codes and 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 and 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 and 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 and 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 and 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. This warning lamp is only lit by a base braking system condition.

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 only illuminates in the presence of a brake hydraulic system 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 and Data
- Codes
- Data only

In Codes and 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 8-63). Data parameters do not display.

```
  Code List
 ** Codes & Data.  OK To Drive. **
C0221 RF Wheel Speed Sensor CKT Open
***  End Of List  ***
```

**Figure 8-63** *Sample DBC 7 codes*

Similarly, in Data Only mode, the screen displays data parameters only (Figure 8-64). 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 8-64** *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 206 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.

**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 8-65).

```
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 8-65** *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 8-66). 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 8-66** *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 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.

# Chapter 9 Jeep Operations

This chapter explains how to begin using the scan tool's basic setup and test functions. This information is specific to Jeep vehicles. For general scan tool functionality, refer to the manual for the diagnostic tool being used.

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


- "Jeep Testing" on page 215
- "Chrysler and Jeep Data Parameters" on page 235
- "Jeep Communications Problems" on page 740


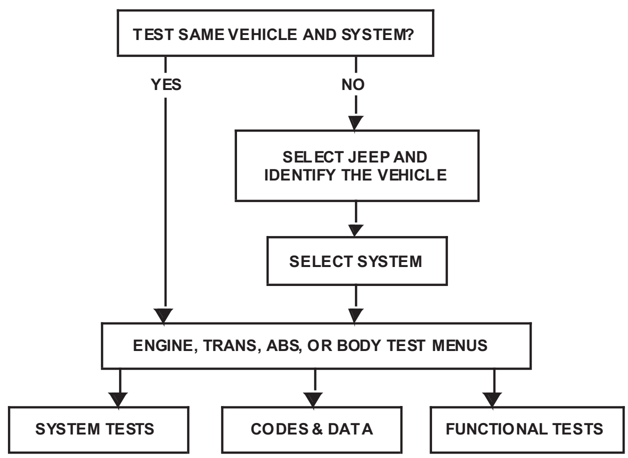


**Figure 9-1** *Basic Jeep test routine*

## 9.1 Identifying a Vehicle

Many vehicles have an automatic vehicle identification (ID) function. For others, the vehicle must be manually identified by entering specific vehicle identification number (VIN) characters into the scan tool.

### 9.1.1 Manual Identification

The vehicle ID must be entered manually to test the control system on 1990 and earlier vehicles and may be entered manually for systems that are identified automatically.

**NOTE:**
Because of midyear manufacturing changes in engine computer systems, you should always enter a new identification when you test a different vehicle, even when two vehicles are the same year, model, and have the same engine and accessories installed.

The vehicle ID process begins from the Software Confirmation menu (Figure 9-2).

```
>Chrysler Database (1983-2006)     V 11.0


Press Y To Continue
```

**Figure 9-2** *Sample Software Confirmation menu*

**To manually ID a vehicle:**

1. Press **Y** to confirm the software selection.
   A vehicle ID request screen similar to Figure 9-3 displays.

```
Select 10th VIN Character
VIN: ---------4------
Vehicle: 2004
```

**Figure 9-3** *Sample model year request*

2. Enter all VIN characters and press **Y** or **N** to answer any questions.
   When you are finished, a Vehicle ID Confirmation screen displays (Figure 9-4).

```
VIN: -J--4--1-4------
Vehicle: 2004 Jeep Wrangler-RHD
Engine: 2.4L L4 MPI
Press Y To Continue.  N For New ID.
```

**Figure 9-4** *Sample Vehicle ID Confirmation screen*

3. Press **Y** if the vehicle ID is correct or press **N** to identify a different vehicle.

## 9.1.2 Automatic Identification

Automatic ID is available on 1996 and later Jeep models (Figure 9-5).

```
Current Vehicle Identification IS:
Vehicle: 1997 Jeep XJ(4x4)            A/T
Engine: 2.5L L4 MPI                   A/C
Press Y For Same Vehicle.  N For New ID
```

**Figure 9-5** *Jeep automatic Vehicle ID Confirmation screen*

**To automatically identify a vehicle:**

1. Attach the test adapter to the data cable.
2. Connect the adapter to the vehicle.
3. Turn the ignition switch on.
4. Select **Domestic > Jeep**.
5. Select the year (10th VIN character) and follow any additional screen requests.
   The scan tool identifies the vehicle, then displays a vehicle identification screen.
6. Press **Y** to continue to the System Selection Menu.

### 9.1.3 Transmission System Identification

The scan tool automatically identifies the vehicle for all OBD-II models.

**To automatically ID 1991–95 models:**

1. Connect the scan tool to the engine diagnostic connector to get vehicle information.
2. Disconnect, and hook up to the transmission diagnostic connector.
   After identifying the vehicle, the scan tool displays the System Selection screen.

## 9.2 Selecting a System

Four control systems are generally available from the System Selection menu (Table 9-1).

**Table 9-1** *Jeep test availability*

| Control System | Description |
|---|---|
| Engine | Contains engine control tests from 1984 through the current model year. |
| TRANS (Transmission) | Transmission system tests include test programs for AW4, 42RE, 44RE, 45RFE, 46RE, and 545RFE transmissions. |
| BODY | Body system tests include actuator test mode tests as well as codes and data. |
| ABS | The ABS tests include test programs for all Jeep vehicles equipped with Bendix 9, and Teves Mark IV, IVg, and MK20 ABS control systems. |

**To select a system:**

1. Select an item from the menu (Figure 9-6).

```
Scroll to Select a System
>Engine
 Trans
 ABS
```

**Figure 9-6** *Sample Jeep System Selection menu*

Selecting any one of these systems from the menu may cause additional vehicle identification menus to display. For instance, select Engine and a vehicle emissions selection screen often appears (Figure 9-7).

```
Scroll To Select A Specific Module
>California Emissions
 Federal Emissions
```

**Figure 9-7** *Sample Jeep vehicle emissions selection*

2. Select the line that describes the emissions specification on the vehicle emissions control identification (VECI) sticker.

   The next screen is usually the options menu, which describes whether the vehicle has an automatic or standard transmission, and if it has air conditioning (Figure 9-8).

```
Scroll to Select Vehicle Options:
>A/T With A/C
 A/T Without A/C
 M/T With A/C
```

**Figure 9-8** *Sample Jeep vehicle options selection*

3. Select an option.

   If Trans (transmission) is selected from the System Selection menu, the scan tool may display the message shown in Figure 9-9. If this message displays, return to the System Selection main menu and select Engine.

```
Transmission Diagnostic Information IS
Located In The Engine Codes And Data
List.
Press N To Return To System Menu.
```

**Figure 9-9** *Transmission data in engine control system message*

Additional screens may display depending on the vehicle. All other screens are similar and require a selection to advance.

## 9.3 Connecting to the Vehicle

Once a vehicle has been identified and a system has been selected, a scan tool connection message is shown, instructing you to use the vehicle test adapters supplied to connect the scan tool for testing (Figure 9-10).

```
Connect OBD-II K13 Adapter To Connector
Located Under Left Of Steering Column
Under Dash.
Press Y To Continue.
```

**Figure 9-10** *Sample Jeep connection message*

Each test adapter plugs into a specific vehicle diagnostic connector and attaches to one end of the data cable. The other end of the cable attaches to the scan tool. Captive screws secure both data cable ends.

The following adapters are available to test Jeep vehicles:

- **JEEP-1**—(Figure 9-11) test adapter for 1990 and earlier
- **CHRY-1**—(Figure 9-13) engine test adapter for 1991–95; ABS adapter for 1991 only
- **CHRY-2**—(Figure 9-14) transmission and ABS test adapter for 1991–95 models
- **OBD-II**—(Figure 9-12) test adapter for 1996 and later
- **CAN-1B**—(Figure 9-15) test adapter for CAN vehicles.

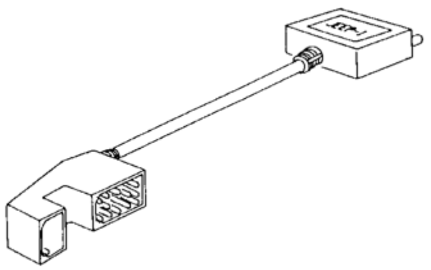

**Figure 9-11** *JEEP-1 Adapter*

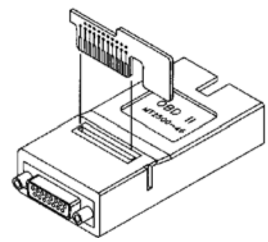

**Figure 9-12** *OBD-II adapter with Personality Key™ device*

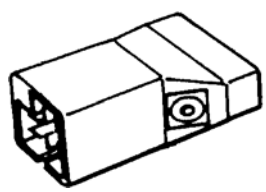

**Figure 9-13** *CHRY-1 adapter*

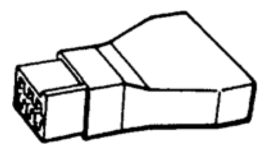

**Figure 9-14** *CHRY-2 adapter*

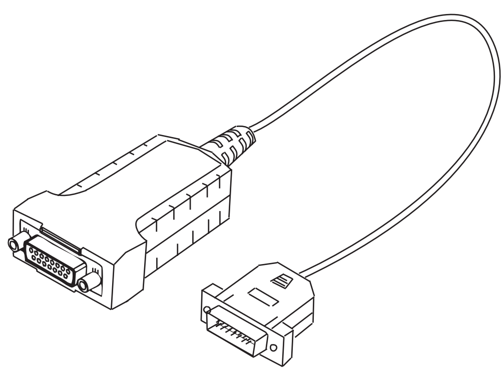

**Figure 9-15** *CAN-1B adapter*

The CHRY-1 engine test adapter has a socket for connecting the battery power cable or the cigarette lighter power cable. A power cable is not required with the JEEP-1, CHRY-2, or the OBD-II test adapters.

On 1987–90 Jeep models and 1996 and later models, the TCM or PCM communicates through the same diagnostic connector used for engine testing. On 1991–95 Jeep vehicles, the TCM communicates through a separate diagnostic connector. The scan tool connects to either a 6-pin or 8-pin diagnostic connector, which may be either black or blue in color. Use the CHRY-2 test adapter to connect to the black or blue connector.

Use Table 9-2 and the following figures to find the correct diagnostic connector location for the specific vehicle being tested.

**Table 9-2** *Jeep diagnostic connector locations*

| System | Year | Adapter | Connector Location |
|---|---|---|---|
| Engine | 1984–90 | JEEP-1 | Under hood (Figure 9-17) |
| | 1991–95 | CHRY-1 | Under hood (Figure 9-18) |
| | 1996–later | OBD-II | Under driver-side dash (Figure 9-16) |
| Transmission | 1987–90 | JEEP-1 | Under hood. For Cherokee and Comanche, see Figure 9-17. |
| | 1991–95 | CHRY-2 | Under dash |
| | 1996–later | OBD-II | Under driver-side dash (Figure 9-16) |
| ABS | 1989–90 | JEEP-1 | Under hood (Figure 9-17) |
| | 1991 | CHRY-1 | Under hood |
| | 1992–95 | CHRY-2 | Under dash |
| | 1996–later | OBD-II | Under driver-side dash (Figure 9-16) |
| Body computer | 1996–later | OBD-II | Under driver-side dash (Figure 9-16) |

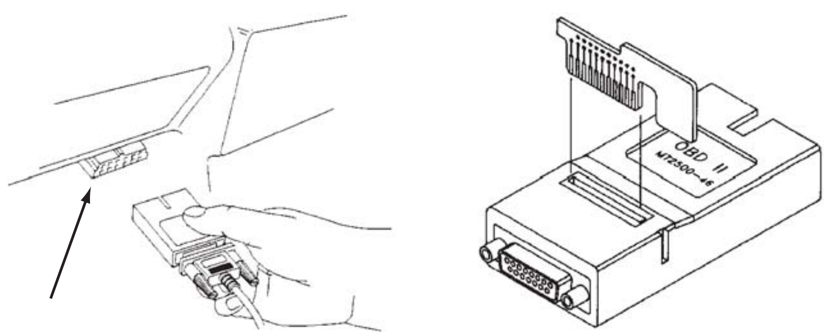


**Figure 9-16** *1996 and later OBD-II DLC*

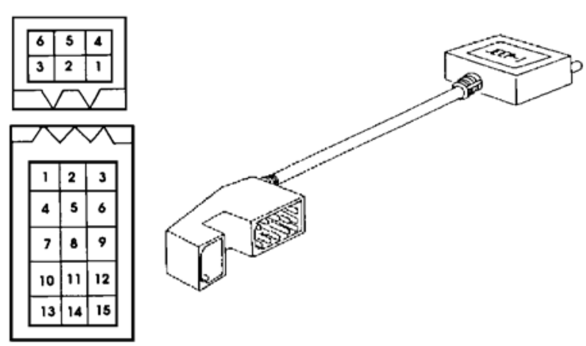


**Figure 9-17** *1990 and earlier DLC (left)—use JEEP-1 adapter (right)*

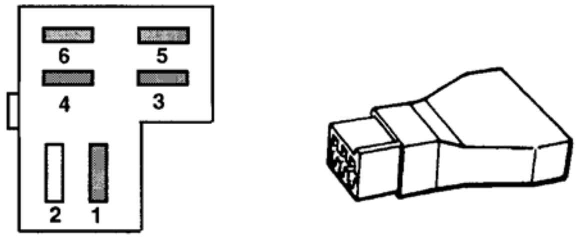


**Figure 9-18** *1991–95 CHRY-1 DLC (left)—use CHRY-2 adapter (right)*

**To connect the scan tool to the test vehicle:**

1. Be sure the ignition switch is off.
2. Follow the on-screen instructions and connect the scan tool data cable to the test vehicle.
   a. Select the proper test adapter and attach it to the data cable.
   b. Connect the other end of the data cable to the scan tool data port.
   c. Connect the test adapter to the vehicle.
      Test adapters fit into the connectors only one way. Be sure the connector is installed securely.
3. Switch the ignition on.
4. Press **Y** to continue.
   The main menu for the selected system displays.

## 9.4 Jeep Vehicles Without Self-Diagnostic Capability

The Jeep vehicles listed below either do not have electronic engine control systems, or they have systems without self-diagnostics capabilities. They will not communicate with a scan tool or scan tool programs are not available.

**Table 9-3** *Jeep vehicles without self-diagnostics capability*

| Year | Models |
|---|---|
| Pre–1984 | All models |
| 1984–86 | 2.8L carbureted, except with California emissions |
| Pre–1992 | Jeep Grand Wagoneer |

# Chapter 10 Jeep Testing

This chapter explains how to use the scan tool on 1985 and later Jeep engine control systems.

- Engine
- Transmission
- Body
- ABS

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


- "Jeep Operations" on page 208
- "Chrysler and Jeep Data Parameters" on page 235
- "Jeep Communications Problems" on page 740


## 10.1 Testing Engine Systems

Jeep has used four basic engine control systems since 1984:

- **Chrysler**—the Chrysler Jeep/Truck Engine Controller (JTEC) system is used on 1996 and later Jeep vehicles, and the Chrysler Single-board Engine Controller Generation II (SBEC-II) is used on 1991–95 Jeep vehicles. These systems provide access to diagnostic trouble codes (DTCs) and serial data.
- **Renix**—All 1986–90 fuel-injected engines use Renix engine control systems. These vehicles provide data but do not have the ability to store or transmit DTCs.
- **MCU**—All 1984–90 carbureted engines, except 1984–86 models with the GM 2.8L V6, use a Microprocessor Control Unit (MCU) system. These do not store or transmit DTCs and do not transmit data, but do provide actual sensor readings on the diagnostic connector.
- **GM Delco**—1984–86 Jeep models with a 2.8L V6 carbureted engine and California emissions use a GM Delco control system. This system provides access to DTCs and data.

### 10.1.1 Functional Tests

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

Jeep functional tests do not distinguish between engine-off and engine-running conditions. When a particular test cannot be performed with the engine either off or running, the scan tool does not accept the test command. On some models, a "lost communication" message displays. If so, make another selection or switch off the ignition.

Selecting Functional Tests from the Main Menu displays the Functional Tests menu (Figure 10-1).

```
Functional Tests:      Module Info
>ATM Tests             MIN Airflow RPM
 AIS Motor Test        Fuel Pressure Test
 Read IGN(+) At DLC    Reset SRI Lamp
```

**Figure 10-1** *Sample Jeep Functional Tests menu*

## ATM Tests

Selecting ATM Tests initiates the actuator test mode (ATM) tests that energize certain system actuators—such as switches, solenoids, relays, valves, and lamps—to check their operation. The tests are performed with the engine off; the PCM does not accept ATM test commands with the engine running.

Specific ATM tests vary for different systems but all operate in the same way.

On an ATM test screen, the selected actuator name is on the top line. For most ATM tests, the PCM pulses the actuator regularly for five minutes or until **Y** or **N** is pressed to stop the test. Actuator cycling times vary depending on the selected test. The important thing is whether the selected actuator responds to the PCM command.

The ATM Exit menu offers two choices that require a **Y** or **N** selection to advance (Figure 10-2):

- Exit ATM test mode and turn the actuator off.
- Exit the ATM test mode and leave the actuator on.

```
To Exit And Turn Off Actuator,
Press N.
To Exit And Leave Actuator On,
Press Y.
```

**Figure 10-2** *Sample Chrysler ATM test exit display*

During troubleshooting, leaving the actuator on is useful when you want to exit an ATM test so the scan tool may be used to monitor related engine data parameters or check a signal.

Making a selection returns you to the ATM test selection screen. Select a new ATM test to turn off an actuator that has been left on after exiting, or turn the ignition switch off.

**To conduct ATM tests:**

1. Select **ATM Tests**.
   The ATM tests menu now displays (Figure 10-3).

```
Scroll To Select A Test-Engine Off Only!
>Stop Current Actuator Test
 A/C Clutch Relay
 Auto Shutdown Relay
```

**Figure 10-3** *Sample ATM tests menu*

2. Select the desired ATM test.
   The selected actuator is energized.

**To turn off an actuator that has been left on after exiting:**

- Select a new ATM test, or switch off the ignition.

## AIS Motor Test

The AIS Motor Test commands the idle motor to obtain a desired RPM. The screen displays both desired RPM, which is user selectable, and actual idle speed (AIS). The engine must be running because the PCM does not actuate the AIS motor without an RPM signal.

**To select:**

1. Select **AIS Motor Test**.

   The AIS motor test now displays (Figure 10-4).

```
         **  AIS Motor Test  **
Scroll Desired Idle RPM.
DES Idle RPM____XXXX  DES Idle RPM____XXXX
Press N For Functional Tests Menu.
```

**Figure 10-4** *Sample AIS motor test*

2. Select the desired idle speed.

## Read IGN (+) at DLC

The Read IGN (+) At DLC test displays voltage on the PCM ignition supply circuit. This circuit runs from the battery, through the ignition switch, to the PCM. The reading shows supply, or battery, voltage at the diagnostic connector. Use this test to check for a faulty ignition switch, bad connections, open fusible links, and other voltage supply problems.

Selecting Read IGN (+) At DLC displays the following screen (Figure 10-5).

```
Turn Key On.  Ignition SUPPLY Voltage At
DLC                   === 12.3 Volts
..........................................
                      Press N To Exit
```

**Figure 10-5** *Sample read IGN (+) at DLC screen*

## Module Info

Selecting Module Info checks automatic vehicle ID at any time when testing a 1991 or later vehicle, or to verify an identification entered manually.

**To check the test vehicle:**

1. Select **Module Info**.

   A gathering information screen briefly displays, followed by one of two module information screens. If the module information check matches that of the vehicle ID already entered in the scan tool, the display is similar to Figure 10-6.

```
SBEC-II P/N: 52345008-B  Emissions: CAL
Vehicle: 1991 Jeep (4x2)              A/C
Engine: 4.0L L-6 MPI                  A/T
Press N To Exit.
```

**Figure 10-6** *Module info vehicle ID*

If the module information check does not match the vehicle ID already entered in the scan tool, the display is similar to Figure 10-7. A selection is required to continue.

```
SBEC-II P/N: 52345008-B  Emissions: CAL
Vehicle: 1991 Jeep (4x2)              A/C
Engine: 4.0L L-6 MPI                  A/T
ID Mismatch.  Press Y For New, N For OLD.
```

**Figure 10-7** *Sample vehicle ID mismatch*

2. When this screen displays:
   - Press **Y** to overwrite the previous identification in memory and store the new, correct identification.
   - Press **N** to ignore the new identification and continue to operate with the previously entered identification.

## Min Airflow RPM

Select MIN Airflow RPM and the AIS motor retracts to obtain the minimum idle RPM. The air-fuel mixture also is enriched during the test. The scan tool displays engine RPM during the test. Refer to Jeep service manuals for specifications and test procedures.

Selecting MIN Airflow RPM displays the following screen (Figure 10-8).

```
 **  Minimum Airflow Idle Speed Test  **
AIS Motor Closed And Fuel Enrichment
Provided.             Engine RPM_____XXXX
Press N For Functional Tests Menu.
```

**Figure 10-8** *Sample minimum airflow RPM test*

## Fuel Pressure Test

The Fuel Pressure Test selection energizes the auto shutdown (ASD) relay to operate the electric fuel pump. This pressurizes the system to allow fuel pressure testing.

The fuel pressure is limited to the relief pressure of the fuel pressure regulator. When pressurized, the regulator should hold a specified pressure for a specified length of time.

Connect a pressure gauge to the fuel rail or throttle body to read the regulated pressure or to test for a leaking pressure regulator. Refer to Jeep service manuals for specifications and procedures.

**To conduct a fuel pressure test:**

1. Select **Fuel Pressure Test**.

   A test activation screen now displays (Figure 10-9).

```
Turn Key On To Activate Fuel Pump,
Press And Hold Y.  Read Pressure With
Gauge.  Press N To Exit.
.........................................
```

**Figure 10-9** *Sample fuel pressure test activation*

2. Switch the ignition key on but do not start the engine.
3. Press and hold the **Y** button to energize the relay and operate the pump.

   The bottom line of the screen reads “fuel pump on pressurizing system” when the **Y** button is held. Release the button to de-energize the relay.

## Reset SRI Lamp

Selecting Reset SRI Lamp resets the service reminder indicator (SRI) lamp on 1991–93 vehicles. The lamp comes on at about 82,500 miles to alert the driver that the vehicle is due for emission services.

The Reset SRI Lamp selection is available for all 1991–95 vehicles, even though some models do not have an SRI lamp. The SRI memory exists in the PCM, even without a lamp, and the scan tool resets this memory.

The SRI lamp cannot be turned off manually; it must be reset through the PCM. The reset SRI lamp functional test resets the lamp timer.

**To reset the SRI lamp:**

1. Switch the ignition on with the engine off.
2. Select **Reset SRI Lamp**.

   A confirmation screen displays (Figure 10-10).

```
Reset SRI Lamp:  Key On, Engine Off.
..........................................
..........................................
Press Y Or N.
```

**Figure 10-10** *Sample reset SRI lamp confirmation*

3. Press **Y** again.

   A “Resetting SRI Lamp” message briefly displays, followed by a “reset complete” message. If the ignition is off and the PCM does not respond to the lamp reset request, a “no response” message displays (Figure 10-11).

```
Reset SRI Lamp
No Response
Make Sure Key Is On And Engine Is Off
Press N To Exit.
```

**Figure 10-11** *Sample SRI reset no response message*

**If a “no response” message displays:**

1. Press **N**.

   The Functional Tests menu displays.
2. Switch the ignition on with the engine off.
3. Select **Reset SRI Lamp** and repeat the operation.

   If the PCM repeatedly transmits the no response message, refer to Jeep test procedures to diagnose the problem.

## 10.1.2 System Tests

The System Tests selection is available for most 1991 and later engines, except diesels. This selection does not display if not available for the identified vehicle. System tests available vary by model.

Most system tests display data parameters and allow manual control of system actuators. Each of the available system tests are explained in the following sections. Selecting Systems Tests displays the System Tests menu (Figure 10-12).

```
                      Misfire Counters
>Purge Vapors Test    Set Sync Signal
 EGR Systems Test
 Generator Field Test Read VIN
```

**Figure 10-12** *Sample system tests menu*

### Purge Vapors Test

The Purge Vapors Test is available on all 1996 and later models and on 1995 models with a 5.2L engine. This test displays various evaporative emissions data parameters and allows manual control of the purge valve operation.

**To conduct a purge vapors test:**

1. Select **Purge Vapors Test**.

   The purge vapors test screen displays (Figure 10-13).

```
Purge Status___Norm    Engine RPM_____1538
* Y To Switch Between Norm, FLOW & BLOCK
No Codes Available In This Mode
UPSTRM O2S(V)__1.99    DWNSTRM O2S(V)_1.00
```

**Figure 10-13** *Sample purge vapors test*

2. Press **Y** to switch the state of the purge valve between normal, flow, and block.
   The selected purge valve state is shown as “Purge Status” on the display.

## EGR Systems Test

The EGR Systems Test is available on some 1995 models. This test displays various parameters related to EGR control and operation and allows manual control of the EGR valve.

**To conduct an EGR systems test:**

1. Select **EGR Systems Test**.
   The EGR systems test screen displays (Figure 10-14).

```
EGR Status_____Norm    Engine RPM_____1487
* Y To Switch Between Norm, FLOW & BLOCK
No Codes Available In This Mode
MAN VAC(kPa)______19   IAC (Steps)_______51
```

**Figure 10-14** *Sample EGR systems test*

2. Press **Y** to switch the state of the EGR valve between normal, flow, and block.
   The selected EGR valve state is shown as “EGR Status” on the display.

## Generator Field Test

The Generator Field Test, available on most 1996 and later models, displays various parameters related to the charging system and allows manual control of the generator field.

**To conduct a generator field test:**

1. Select **Generator Field Test**.
   The generator field test screen displays (Figure 10-15).

```
Generator Field_Full   Engine RPM_____1487
* Y To Switch Between Norm, Full & Off
No Codes Available In This Mode
Battery Volts___13.1   DES Charge(V)___15.0
```

**Figure 10-15** *Sample generator field test*

2. Press **Y** to switch the generator field state between normal, full, and off.

The selected field state is shown as “Generator Field” on the display.

## Misfire Counters

The Misfire Counters selection, available on 1996 and later models, displays the number of misfire occurrences for each individual cylinder and the PCM adaptive learn state for the present drive cycle. Selecting Misfire Counters displays the following screen (Figure 10-16). Scroll to view the entire list.

```
CYL 1 Misfires_____1  CYL 2 Misfires_____0
  ***** OBD II Misfire Counters *****
No Codes Available In This Mode
CYL 3 Misfires_____0  CYL 4 Misfires_____0
```

**Figure 10-16** *Sample misfire counters*

## Set Sync Signal

The Set Sync Signal test resets fuel injection synchronization on 1993 and later models. This procedure is necessary after certain repairs, such as cylinder head removal or timing belt replacement. A typical set sync signal display is shown in Figure 10-17.

```
Set SYNC Test  *Engine Must Be Running*
Rotate Dist To Set Distributor(°) To 0
No Codes Available In This Mode
Distributor(°)_____0  Engine RPM______1875
```

**Figure 10-17** *Sample set synchronization signal*

The value displayed refers to fuel synchronization only. Ignition timing is PCM-controlled. Moving the distributor does not set ignition timing.

## Read VIN

The Read VIN functional test displays the VIN stored in the PCM. If a replacement PCM has not yet been programmed with a VIN, the scan tool provides a guide for PCM VIN programming.

---

**IMPORTANT:**
Read this entire procedure before beginning. The PCM can only be programmed with a new VIN once! If a false VIN is programmed into the PCM, the PCM must be replaced with a new one.

---

**To read the VIN stored in the PCM:**

1. Select **Read VIN**.
2. If a VIN is already stored in the PCM, a “controller cannot be programmed” message appears, press **N** to exit.

   If a VIN is not stored in PCM memory, the VIN entry screen displays (Figure 10-18).

```
PCM Requires VIN Programming
Please Enter New VIN:  XXXXXXXXXXXXXXXX
                       ^
Press Y To Continue.
```

**Figure 10-18** *Sample VIN entry*

3. Select the correct characters as requested until all 17 characters are selected.

   After the 17th character is selected, a confirmation screen displays (Figure 10-19).

```
PCM Requires VIN Programming
Please Enter New VIN:  1C3EJ56H2TN201213
Are You Sure You Want To Program The PCM
With The Above VIN?
```

**Figure 10-19** *Sample read VIN confirmation*

4. Before pressing **Y**, carefully compare the VIN that appears on the screen to the characters on the VIN plate.

   Pressing **Y** permanently programs the VIN displayed into the PCM. For the vehicle to run properly, the programmed VIN must match the VIN plate.
5. Press **Y** to continue, or **N** to return to the VIN entry screen.

   When **Y** is pressed, the PCM checks to verify that the entered VIN is a valid DaimlerChrysler Motors VIN.
   - If the PCM does not recognize the VIN as valid, a “the VIN that was entered is not valid!” message displays.
   - If the VIN is valid, a “VIN program successful!” message displays.

## Speed Control

The Speed Control Test, which is available on 1991–95 models, displays the present speed control operating mode and the reason for the last system disengagement, or cutout. Four additional speed control data parameters display on the screen (Figure 10-20). Other speed control related data parameters are also available in the Codes and Data mode for engine testing.

```
** Speed Control Status **  [N To Exit]
Speed Control___OFF   Brake____________OFF
Last Cutout__On/Off   Disabled______On/Off
VEH Speed(MPH)____0   S/C Target(MPH)____0
```

**Figure 10-20** *Sample speed control status*

**To verify that the speed control system is operating properly:**
1. Road test the vehicle with the Speed Control Status screen displayed.
2. Engage and disengage the speed control system to verify proper system operation.

### Theft Alarm Status

The Theft Alarm Status Test, available on 1991–95 models, displays the present engine control module communication link with the theft alarm module. Use this test to determine if a no-start condition is the result of an unauthorized attempt to start the engine.

Select Theft Alarm Status Test and the following screen displays (Figure 10-21).

```
         ** Theft Alarm Status **
System Enabled        No Signal Received
Fuel Allowed
                      Press N To Exit.
```

**Figure 10-21** *Sample theft alarm status*

The vehicle theft alarm (VTA) monitors vehicle entry and the ignition. During unauthorized entry, the VTA notifies the PCM. The PCM responds by disabling the electronic fuel injection after the engine starts.

### EVAP Monitoring Test

The EVAP MONITORING Test is available on most 2001 and later models. This test will force the PCM to run the evaporative system self test. The test can be used to confirm repairs made to the evaporative system without taking the vehicle on an EVAP drive cycle road test. If the system fails, the test DTCs will be set in Codes or 1 TRIP Codes.

## 10.1.3 Codes and Data Selections

The Codes and Data selection from the Main Menu is available on all 1991 and later fuel-injected Jeep vehicles with Chrysler control systems. It is not available for carbureted engines with Chrysler control systems, but is available on 1984–86 California emissions models that have a 2.8L V6 carbureted engine and GM Delco control system.

In the Codes and Data mode, the scan tool reads all data available on the PCM data stream, including any DTCs. When Codes and Data is selected, the scan tool displays the Codes and Data Menu that offers up to three choices:

- Codes & Data
- Secondary Indicators
- 1 Trip Codes

**NOTE:**
These selections work the same for Jeep as they do for Chrysler. See “Codes and Data Selections” on page 26 for general procedures.

The scan tool does not affect PCM or engine operation on 1991 and later fuel-injected models, so they can be driven in the Codes and Data mode.

Models with a GM Delco control system, 1984–86 2.8L carbureted V6 engine, and California emissions cannot be driven in the Codes and Data mode. The Codes and Data mode on these vehicles may be called the “special,” “10K,” or “diagnostic mode” in some service manuals. In Codes and Data mode, the scan tool places a 10-kilohm resistive load across the diagnostic terminals. This causes the PCM to alter engine operation.

### 10.1.4 Data (No Codes)

Data without codes is the only data viewing mode available on the Main Menu for all 1986–90 fuel-injected models with a Renix control system, and on 1984–90 models with a carbureted engine and MCU control system. The information displayed is different for the two systems.

- On fuel-injected engines with a Renix control system, the scan tool displays data transmitted on the PCM data stream.
- On carbureted engines with an MCU system, the scan tool displays the actual sensor values. On the MCU system, the sensors are hard wired to the diagnostic connector and the PCM does not transmit a data stream.

The scan tool does not affect PCM or engine operation on these systems, so the vehicle may be driven in the data mode to test for intermittent problems.

For 1991 and later fuel-injected engines and for 1984–86 models with a 2.8L V6 engine, a Data (No Codes) selection is available in addition to the Codes and Data selection.

### 10.1.5 Memory Resets

The Memory Resets selection is on the Codes and Data exit menu on most 1991 and later models and opens the Memory Resets menu (Figure 10-22). This function clears adaptive, or learned, values from PCM memory and returns them to their factory preset values.

```
>Clear Codes          All Adaptives
 Adaptive Fuel        IAC(AIS) Position
 MIN Throttle         Battery Disconnect
```

**Figure 10-22** *Sample Memory Resets Menu*

**NOTE:**
Memory Resets work the same for Jeep as they do for Chrysler. See “Memory Resets” on page 28 for instructions.

## 10.2 Testing Transmission Systems

This section describes how to test Jeep electronic transmissions that have a separate transmission control module (TCM). Included are:

- 1987 and later with a AW4 transmission
- 1993–95 with a 42RE transmission

- 1999 and later with a 45RFE or 545RFE transmission

All other Jeep electronic transmissions display codes and data through the powertrain control module (PCM). See “Testing Engine Systems” on page 215 for these models.

## 10.2.1 Codes and Data

The transmission Codes and Data mode operates similarly to the Codes and Data mode for engine testing. See “Codes and Data Selections” on page 224 for procedures.

A Codes and Data selection displays available switch and sensor readings and output commands, as well as any DTCs that may be present (Figure 10-23).

```
  Output RPM_____578   TPS Steps_________16
  * *  Codes & Data.  OK To Drive  * *
No Codes Present
Lock-up__________OFF   Brake________Pressed
```

**Figure 10-23** *Sample transmission Codes and Data*

The top line remains fixed and displays two principal items, followed by the test mode and the Codes and Data list. All sensor and switch readings in Codes and Data are “live” values, the TCM or PCM does not substitute default values in the data list for failed sensors or switches.

### Diagnostic Trouble Codes

The DTC list appears below the mode name line. If there are no codes are present, the display reads “no codes present.” If DTCs are present, the scan tool displays them in the order in which they occurred. The first code that set is at the top of the list and the most recent code that occurred is at the end of the list (Figure 10-24).

```
  Output RPM_____578   TPS Steps_________16
  * *  Codes & Data.  OK To Drive  * *
700 Solenoid 1 Fault(Stored)
705 Throttle Position Sensor Fault
```

**Figure 10-24** *Transmission Codes and Data with codes present*

DTCs may be classified as either “hard” or “soft” codes. Some control modules indicate if a code is hard or soft on the screen, but many do not.

- **Hard codes**—indicate a problem that exists at the time of testing.
- **Soft codes**—indicate a problem that occurred in the past but is not present now. These may also be referred to as “history” codes or “continuous memory” codes.

**To distinguish between hard and soft codes:**

1. Clear the PCM memory and reenter Codes and 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.

# 10.3 Testing Body Systems

The Body selection is available on 1996 and later Jeep models. This selection allows communication with the body control module (BCM) and allows various body system tests.

The BCM communicates and exchanges data with other modules over a multiplex network called a communication bus. When connected, the scan tool communicates on the bus for body testing. The BCM controls various driver information functions including door-ajar and lamp-failure indicators, fluid-level indicators, and seat belt lamps and chimes.

## 10.3.1 ATM Tests

**NOTE:**
ATM tests with the BCM work the same as they do for the PCM. See “ATM Tests” on page 227 for information.

Selecting ATM Tests displays the ATM Tests Menu (Figure 10-25).

```
Scroll To Select A Test
>Chime
 Courtsey Lamp
 Fog Lamps
```

**Figure 10-25** *Sample body ATM tests*

## 10.3.2 Codes and Data

**NOTE:**
The Codes and Data selection operates the same for Jeep as is does for Chrysler. See “Codes and Data” on page 26 for information.

The scan tool does not affect BCM operation, so the vehicle may be driven in the Codes and Data mode for testing. All sensor and switch readings in Codes and Data are “live” values, the BCM does not substitute default values for failed sensors or switches.

```
  Panel(V)______12.0  Ignition(V)_____12.0
  * *  Codes & Data.  OK To Drive   * *
No Codes Present
Battery(V)______12.0  Inter Wiper(V)__12.0
```

**Figure 10-26** *Sample body Codes and Data*

### BCM Trouble Codes

All body DTCs are hard codes (the fault exists at the time of testing). If the fault is intermittent and goes away, the DTC is removed from the list. The BCM has no long-term memory to store intermittent codes.

```
  Panel(V)______12.0  Ignition(V)_____12.0
  * *  Codes & Data.  OK To Drive  * *
12 Battery Was Disconnected
16 Internal Body Controller - ROM Fail
```

**Figure 10-27** *Body Codes and Data with codes present*

# 10.4 Testing ABS Systems

This section explains the scan tool functions available to test several brake systems on Jeep vehicles. Refer to Jeep service procedures for complete test and repair information.

## 10.4.1 ABS Control Systems

Some ABS modules operate as part of a network while others operate as stand-alone units. Teves ABS modules communicate over a multiplex network called a communication bus and exchanges data with other modules. The Bendix ABS module is a stand-alone system and does not use a communication bus.

**WARNING**

ABS diagnosis with the scan tool does not require opening the hydraulic system or disassembling mechanical parts. Complete ABS service, however, may require opening the hydraulic system. ABS hydraulic systems operate at pressures of about 2000 psi or higher. The system must be completely depressurized before opening any hydraulic connection. In most cases, apply and release the brake pedal at least 40 times to depressurize the system. Follow Jeep service instructions for information on system service and safety.

The scan tool performs ABS diagnostic tests on many Jeep vehicles with ABS. These ABS models have wheel speed sensors, as well as red and yellow indicator lamps on the instrument panel. If ABS is present on the test vehicle, the indicator lamps light momentarily when the ignition is switched on.

## 10.4.2 Teves Functional Tests

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

A Functional Tests selection is available on the ABS main menu for vehicles with Teves systems (Figure 10-28).

```
Main Menu (Jeep ABS)   Other Systems
>Functional Tests      Codes & Data
 Custom Setup
```

**Figure 10-28** *Sample Teves ABS main menu*

Select to display the Functional Tests menu (Figure 10-29).

```
Functional Tests:
>ATM Tests             Bleed Brakes
 ABS Simulated Stop    Hydraulic Test
```

**Figure 10-29** *Sample Teves ABS Functional Tests menu*

## ATM Tests

ATM tests with the ABS module work the same as they do for the PCM. See “ATM Tests” on page 216 for information.

When ATM Tests is selected for ABS systems, a menu with the following choices displays.

- Left front inlet valve
- Right front inlet valve
- Left front outlet valve
- Right front outlet valve
- Pump motor
- Rear inlet valve
- Rear outlet valve

## ABS Simulated Stop

The ABS Simulated Stop selection is available with Teves Mark IV and IVg systems. This mode simulates an ABS stop without driving the vehicle.

**To simulate an ABS stop:**

1. Select **ABS Simulated Stop**.
   The simulated stop test displays (Figure 10-30).

```
        ** Simulated ABS Stop **
Brakes Must Be On.
Press & Hold Brake To Continue.
Press N To Abort Test.
```

**Figure 10-30** *Sample ABS simulated stop test*

2. Press and hold the brake pedal.

   The screen updates to show the simulation is active (Figure 10-31) and a pulsation should be felt in the brake pedal.

```
         ** Simulated ABS Stop **
Simulating.

Press N To Abort Test.
```

**Figure 10-31** *Sample active ABS simulated stop test*

## Bleed Brakes

The Bleed Brakes selection is used to bleed the hydraulic control unit (HCU). Always follow Jeep recommended brake bleeding procedures for these systems. Whenever the hydraulic control unit is removed, air enters the system. Proper brake bleeding on Teves Mark IV, Mark IVg, and Mark 20 ABS consists of three steps:

1. Manually bleeding the base brakes.
2. Bleeding the HCU.
3. Manually bleeding the base brakes again.

**CAUTION**

Failure to follow proper brake bleeding procedures may result in improper brake system operation or brake system failure. Refer to Jeep Service Manuals for proper brake bleeding procedures.

After manually bleeding the base brakes, bleed the HCU using Jeep service instructions and the following procedure.

**To bleed the HCU:**

- Select **Bleed Brakes**.

  An “Actuating Motor” message momentarily displays (Figure 10-32).

```
            ** Bleed Brakes **
Actuating Motor

Press N To Abort Test.
```

**Figure 10-32** *Sample bleed brakes actuating motor screen*

After the ABS pump motor energizes, the screen updates to an “actuating motor/outlet valves” message (Figure 10-33).

```
            ** Bleed Brakes **
Actuating Motor/Outlet Valves

Press N To Abort Test.
```

**Figure 10-33** *Sample bleed brakes actuating motor and outlet valves screen*

After the ABS module cycles the outlet valves, the "actuating motor" message again displays. A test complete message displays at the end of the sequence (Figure 10-34).

```
            ** Bleed Brakes **
Test Is Complete

Press N To Exit.
```

**Figure 10-34** *Sample bleed brakes functional test complete screen*

### Hydraulic Test

The Hydraulic Test selection is available from the ABS Functional Tests menu for vehicles with Teves systems. This test cycles the pump motor and valves in the HCU.

Components are activated in the following sequence:

1. Left front valves
2. Right front valves
3. Rear valves
4. Pump motor

**To conduct a hydraulic test:**

1. Select **Hydraulic Test**.
   The test initiation screen displays (Figure 10-35).

```
       ** Hydraulic Valve Test **
Brakes Must Be On.
Press & Hold Brake To Continue.
Press N To Abort Test.
```

**Figure 10-35** *Sample hydraulic test initiation*

2. Press the brake pedal and the active ABS component displays (Figure 10-36).

```
       ** Hydraulic Valve Test **
Left Front Valves.
Continue Holding Brake.
Press N To Abort Test.
```

**Figure 10-36** *Sample active hydraulic test*

A "Test complete" message displays at the end of the sequence.

## 10.4.3 Codes and Data

The Codes and Data selection for ABS systems is available for 1989–91 models with Bendix 9 ABS and on 1992–01 models with Teves systems. The scan tool displays diagnostic trouble codes (DTCs) and data from the ABS module.

**NOTE:**
The Codes and Data selection operates the same for Jeep as is does for Chrysler. See “1 Trip Codes” on page 28 for information.

## Bendix 9

The Bendix 9 ABS on 1989–90 models communicates data through the same diagnostic connector used for engine testing. However, on 1991 models with Bendix 9 ABS, the ECM transmits data through a special diagnostic connector, distinct from the engine connector.

Two instrument panel indicator lamps are used on the Bendix 9 system, a red brake warning lamp, and a yellow check antilock lamp. When the ignition is switched on, both lamps illuminate for a bulb check. Once the ABS module performs a self-diagnostic check and determines ABS is operational, the lamps switch off.

If an ABS problem is detected by the ECM, the lamps light in different combinations to identify the failure. The lamps display ABS failure information for three conditions:

- Key-on and engine-off (KOEO)
- Start, engine cranking
- Key-on and engine-running (KOER)

See Table 10-1 to identify ABS failures on the warning lamps.

**Table 10-1** *Bendix 9 ABS instrument panel indicator lamp display*

<table>
<tr><th>Condition</th><th>KOEO</th><th>Start</th><th>KOER</th></tr>
<tr><td>Normal</td><td>Yellow on 2 seconds</td><td>Yellow & red</td><td>Off</td></tr>
<tr><td>Low fluid or Parking Brake</td><td>Red</td><td>Yellow & red</td><td>Yellow & red above 2.5 MPH</td></tr>
<tr><td>Low Accumulator</td><td>Yellow & red after 20 seconds</td><td>Yellow & red</td><td>Yellow & red</td></tr>
<tr><td>Front-to-rear pressure differential</td><td>Red</td><td>Yellow & red</td><td>Yellow & red above 3 MPH</td></tr>
<tr><td>Low boost pressure</td><td>Yellow & red</td><td>Yellow & red</td><td>Yellow & red</td></tr>
<tr><td>Sensor faults</td><td>Yellow on 2 seconds</td><td>Yellow & red</td><td>Yellow above 15 MPH</td></tr>
<tr><td>Excess decay</td><td>Yellow on 2 seconds</td><td rowspan="2">Yellow & red</td><td rowspan="2">Yellow</td></tr>
<tr><td>Solenoid faults</td><td>Yellow</td></tr>
<tr><td>Pump fault</td><td>Yellow on 2 seconds</td><td>Yellow & red</td><td>Red</td></tr>
<tr><td>Low voltage</td><td>Yellow</td><td>Yellow & red</td><td>Yellow</td></tr>
<tr><td>Brake switch</td><td>Yellow on 2 seconds</td><td>Yellow & red</td><td>Red during stop</td></tr>
<tr><td>Relay</td><td rowspan="2">Yellow</td><td rowspan="2">Yellow & red</td><td rowspan="2">Yellow</td></tr>
<tr><td>Diagnostic mode</td></tr>
</table>

In the ABS Codes and Data mode, the antilock functions of the Bendix 9 system remain fully functional, and new trouble codes may set during testing. The vehicle may also be driven safely for testing.

A complete Bendix 9 ABS Codes and Data list is shown in Figure 10-37. Data list vary somewhat between vehicles, but all are similar.

```
    Pump_____On  Brake___No  PROM__8866
   **  Codes & Data.  OK To Drive  **
No Codes Present
LF Wheel(MPH)_____45   RF Wheel(MPH)_____45
LR Wheel(MPH)_____45   RR Wheel(MPH)_____45
LF SOL_______BLD&DCY   RF SOL_______BLD&DCY
Rear SOL_________OFF   G-Switch________Open
DIFF Press______Open   Boost Pres______CLSD
Low ACCUM______FALSE   Modulator REL__FALSE
SOL Undervolt___TRUE   P-BRK/LO FLU___FALSE
```

**Figure 10-37** *Sample Bendix 9 ABS Codes and Data list*

**CAUTION**

Before driving a vehicle with an ABS complaint, especially if the red brake warning lamp is on, test the brakes at low speed to make sure the vehicle stops normally. An illuminated red brake warning lamp may indicate reduced braking ability.

## Teves

Three Teves systems are currently used by Jeep:

- Mark IV
- Mark IVg
- MK20

In addition to Codes and Data, Teves systems offer two alternate viewing modes on the menu:

- Data (No Codes)
- Codes Only

The Data (No Codes) selection presents the data list only, DTCs do not display. Similarly, Codes Only displays just codes without data.

The complete Teves ABS data list is shown in Figure 10-38.

```
    Brake SW____CLSD   Motor Speed_____OFF
   **  Data Only.  OK To Drive  **
No Codes Available From This Mode
G-SW #1_________Open   G-SW #2_________Open
LF Wheel(MPH)_____45   RF Wheel(MPH)_____45
LR Wheel(MPH)_____45   RR Wheel(MPH)_____45
LF SOL_______BLD&DCY   RF SOL_______BLD&DCY
PED TRVL SNS_______1
```

**Figure 10-38** *Sample Teves ABS data list*

Chapter 11

# Parameters Overview

The following chapters provide definitions and operating ranges for the data parameters that display on the scan tool.

The scan tool can display all of the operating parameters available from the electronic control module of the vehicle, which provides two basic kinds of parameters:

- Digital (discrete) parameters are those that can be in only one of two states, such as on or off, open or closed, high or low, rich or lean, and yes or no. Switches, relays, and solenoids are examples of devices that provide discrete parameters on the data list.
- Analog parameters are displayed as a measured value in the appropriate units such as voltage, pressure, temperature, time, and speed parameters. These displays as numbers that vary through a range of values in units, such as pounds per square inch (psi), kilopascal (kPa), degrees Celsius (°C) or Fahrenheit (°F), kilometers per hour (KPH), or miles per hour (MPH).

The scan tool displays some data parameters in numbers that range from 0 to 100, 0 to 255, or 0 to 1800 because that is the maximum number range that the control module transmits for a given parameter. However, many parameter readings never reach the highest possible number. For example, you never see a vehicle speed parameter reading of 255 MPH.

The range of a parameter often varies by year, model, and engine, but typical sampled values observed under actual test conditions are in the parameter description when available.

Parameters may also be identified as input signals or output commands.

- Input or feedback parameters are signals from various sensors and switches to the ECM. They may display as analog or discrete values, depending on the type of input device.
- Output parameters are commands that the control module transmits to various actuators, such as solenoids and fuel injectors. They are displayed as discrete parameters, analog values, or as a pulse-width modulated (PWM) signal.

In the following chapters, parameters are presented as they appear on the scan tool screen. Often, the same parameter goes by a different name when used on more than one model, engine, or control system. In these instances, all of the applicable parameter names displayed on the scan tool are listed before the description.

**NOTE:**
The Snap-on® scan tool may display names for some data parameters that differ from names displayed by a factory tool and other scan tools.

Data parameter descriptions in this manual were created from a combination of sources. For most parameters, basic information was provided by the respective manufacturers, then expanded through research and field testing. For some parameters, no information is currently available.

Always use a power graphing meter, such as the Snap-on® Vantage PRO™ or a lab scope, to further validate the displayed values. If data is corrupted on multiple data parameters, do not assume that the control module may be faulty. This corrupt data may be caused by improper communication between the scan tool and the control module. See the troubleshooting sections of the user manual for the diagnostic tool you are using for more communication problem details.

Chapter 12

# Chrysler and Jeep Data Parameters

This chapter contains information for interpreting data parameters on Chrysler and Jeep vehicles.

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


- “Chrysler Operations” on page 4
- “Chrysler Testing” on page 12
- “Chrysler Communications Problems” on page 707


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


- “Jeep Operations” on page 208
- “Jeep Testing” on page 215
- “Jeep Communications Problems” on page 740


## Alphabetical Parameter List

### Numerics

## A

## B



## C

## D



## E

## F

## G



## H



## I

## J



## K



## L

## M

## N



## O



## P

## R

## S

## T

## U

# Engine Parameters

This section defines data parameters available from the engine control module or the powertrain control module (PCM) on Chrysler and Jeep vehicles.

**1/1 Goal (0-1)(V)**
**2/1 Goal (0-1)(V)**
**Range: ______ 0.00 to 1.00 V**

Indicates the filtered O2S voltage that the PCM is trying to maintain.

Next Generation Controllers (NGC) provides a bias voltage of 2.5 V to sensor. Voltage levels with the engine running will fluctuate around 2.5 V. Actual sensor voltage output range is about 1 V. Displayed is the desired sensor output with the voltage bias filtered out.

**1/1 LP STATUS**
**Range: ______ OPEN/CLSD**

Displays the bank 1 O2S control status.

**1/1 O2 HTR DC(%)**
**1/2 O2 HTR DC(%)**
**2/1 O2 HTR DC(%)**
**2/2 O2 HTR DC(%)**
**1/1 Pulse Width O2 Heater(%)**
**1/2 Pulse Width O2 Heater(%)**
**2/1 Pulse Width O2 Heater(%)**
**Range: ______ 0 to 100%**

Next Generation Controllers (NGC) provide voltage to O2S heater circuit as needed. Ground is hardwired to the chassis. The PCM duty cycles voltage between 0 and 100%.

**1/1 O2S DES(V)**
**2/1 O2S DES(V)**
**1/1 O2 Sensor Goal(V)**
**2/1 O2 Sensor Goal(V)**
**Range: ______ 2.5 to 5.0 V**

The ideal O2S voltage that the PCM is trying to maintain.

The value changes based on downstream O2S switch rate to allow the catalyst to operate at its most efficient level. It should read between 2.8 and 3.3 V, which includes the ground bias voltage of 2.5 V.

**1/1 O2 Sensor(V)**
**1/2 O2 Sensor(V)**
**2/1 O2 Sensor(V)**
**2/2 O2 Sensor(V)**
**Range: ______ 2.00 to 3.00 V**

Next Generation Controllers (NGC) provides a bias voltage of 2.5 V to sensor. Voltage levels with the engine running will fluctuate around 2.5 V at the sensor. This parameter displays the actual sensor reading. Actual sensor voltage output is about 1V, sensor voltage reading will be shifted up by the bias.

**1/1 O2 Volts (0-1)(V)**
**1/2 O2 Volts (0-1)(V)**
**2/1 O2 Volts (0-1)(V)**
**2/2 O2 Volts (0-1)(V)**
**Range: ______ 0.00 to 1.00 V**

Displays the sensor output with the bias voltage filtered out. Next Generation Controllers (NGC) provides a bias voltage of 2.5 V to sensor. Voltage levels with the engine running will fluctuate around 2.5 V at the sensor. Actual sensor voltage output range is about 1 V.

**4” PORT VAC**
**10” MAN VAC**
**Range: ______ OVER/UNDER**

The four inches of mercury (4”) and ten inches of mercury (10”) vacuum switches are used on most 1984–90 carbureted vehicles. The 10” Hg switch monitors intake manifold vacuum and the 4” Hg switch monitors ported vacuum.

These parameters read as follows:

- OVER when vacuum is at or greater than the switch setting
- UNDER when vacuum is lower than the switch setting

Ported vacuum should be low at idle, manifold vacuum should be high at idle.

**A/C CLUTCH**
**Range: ______ ON/OFF**

Shows if the PCM energized the relay to engage the air conditioning compressor clutch. This parameter indicates the PCM command has been given, it is not a feedback signal to indicate that the A/C clutch has actually engaged.

**A/C PRESS(V)**
**Range: ______ 0 to 5.0 V**
**A/C PRESSURE(psi)**
**Range: ______ 0 to 500 psi**
**A/C PRESSURE(kPa)**
**Range: ______ 0 to 3,450 kPa**

The A/C pressure transducer senses the refrigerant pressure in the discharge line of the air conditioning system. The voltage parameter is the sensor input signal to the PCM. The PCM uses this signal to cycle the A/C clutch on and off, and to control dual cooling fan operation. The pressure parameter is a value internally calculated by the PCM.

**A/C REQUEST**
**Range: ______ ON/OFF**

Used on some 1991 and later vehicles, indicates the status of the PCM command to the air conditioning compressor. This is the actual PCM command—it is not the switch position. The position of the instrument panel switch is the A/C SWITCH parameter.

**A/C SWITCH**
**Range: ______ ON/OFF**
**A/C SELECT**
**A/C SELECT SW**
**A/C Select Switch**
**Range: ______ YES/NO**

Should read as follows:

- ON or YES when the A/C switch is on and all other in-series switches are closed.
- OFF or NO when any A/C series switch is open.

**AC Hi-Side Voltage(V)**
**Range: ________________ 0 to 5.0 V**
**AC Hi-Side Pressure(psi)**
**Range: ________________0 to 500 psi**
**AC Hi-Side Pressure(kPa)**
**Range: ________________ 0 to 3,450 kPa**

The A/C pressure transducer senses the refrigerant pressure in the Hi pressure line of the air conditioning system. The voltage parameter is the sensor input signal to the PCM. The PCM uses this signal to cycle the A/C clutch on and off. The pressure parameter is a value internally calculated by the PCM.

**ACCEL PEDAL(%)**
**Range: ________________ 0 to 100%**

The position of the accelerator pedal in percentage based on the APP sensor reading.

**ACTUAL ASD RELAY**
**Range: ________________ ON/OFF**

When the auto shutdown (ASD) relay energizes, a special circuit sends a signal to the PCM. This parameter indicates the status of this signal.

ACTUAL ASK RELAY reads ON when the relay is energized.

**ADDED FUEL(µS)**
**L ADDED FUEL(µS)**
**R ADDED FUEL(µS)**
**IDLE ADAP(µS)**
**L IDLE ADAP(µS)**
**R IDLE ADAP(µS)**
**Range: ________________ 1024 to + 1016 µS**

The adaptive adjustment made by the PCM to fuel injector pulse width at idle.

- A negative number means that the PCM is decreasing the pulse width.
- A positive number means the PCM is increasing the pulse width.

On some 1992 and later engines, such as the 1993 3.3L and 3.5L, the oxygen sensors for the left and right cylinder banks are separately controlled by the PCM and have separate adaptive injector strategies.

These parameters display in microseconds (µS). A microsecond equals 0.000001 second, or 1/1000-millisecond.

**AIS (STEPS)**
**IAC(STEPS)**
**Range: ________________1 to 255**

The position of the automatic idle speed (AIS) or idle air control (IAC) motor as stepper-motor position counts.

- A low number indicates the motor is retracted to maintain a low idle speed.
- A high number indicates that the motor is extended further to maintain the required idle speed.

**AIR SOL**
**Range: ________________ ON/OFF**

Displays the status of the downstream pulse air solenoid on most 1984–90 carbureted engines and reads as follows:

- ON when the solenoid routes air to the second bed of the catalytic converter

- OFF when air is being routed to the upstream solenoid or vented to atmosphere

The upstream and downstream solenoids distribute air to the exhaust pipe and catalytic converter (pulse air system).

Both solenoids are controlled by the PCM.

- The upstream solenoid distributes air into the exhaust pipe, just below the O2S.
- The downstream solenoid distributes air to the catalytic converter.

**AIR SWITCH SOL**
**Range: ____________ OPEN/CLSD**
**SEC AIR SOL**
**Range: ____________ ON/OFF**

Shows if the PCM energized the air switching solenoid to direct air injection into the manifold during engine warm-up and read as follows:

- OPEN or ON during warm-up
- CLSD or OFF when the engine is at operating temperature

Parameters indicate if PCM command has been given. It is not a feedback signal to indicate that the solenoid is operating or responding to the command.

**AMBIENT/BATT(°C)**
**Range: ____________ -45 to 243°C**
**AMBIENT/BATT(°F)**
**Range: ____________ -49 to 469°F**

Used on some diesel engines and indicates either the under-hood ambient temperature or the temperature of the battery.

**AMB TEMP(°F)**
**Ambient Temp(°F)**
**Range: ____________ -40° to 389°**
**Ambient Temp(°C)**
**AMB TEMP(°C)**
**Range: ____________ -40° to 199°**

The temperature of the ambient air in the engine compartment on some vehicles. The PCM converts voltage to air temperature readings.

**AMB TEMP(V)**
**Ambient Temp(V)**
**Range: ____________ 0 to 5.1 V**

A direct voltage reading from the ambient air temperature sensor.

Sensor voltage and temperature are inversely related:

- Low temperature produces a high voltage signal
- High temperature produces a low voltage signal

**APP 1(V)**
**APP 2 (V)**
**Range: ____________ 0 to 5 V**

APP 1 and APP 2 represent two sensors in one housing that provide the PCM with two separate voltage signals in proportion to accelerator pedal position.

APP 1(V) will increase at twice the rate of APP 2(V) as the throttle is opened.

**APPS(%)**
**Range: ____________ 0 to 100%**

The position of the accelerator pedal based on the signal from the accelerator pedal position sensor and reads 100% when the accelerator pedal is fully pressed.

**ASD RELAY**
**AUTO SHUTDOWN**
**Range: ____________ ON/OFF**

Indicates whether the PCM has ordered the auto shutdown relay to turn on. The auto shutdown relay provides power to the fuel pump, the ignition coil, and the fuel injectors.

- ASD RELAY should read ON whenever the actual state of the ASD relay is commanded on.
- AUTO SHUTDOWN should read ON whenever the engine is running.

**ASD RLY SENSE**
**Range: ____________ ON/OFF**
**ASD Relay Sense**
**Range: ____________ Low/High**

The state of the ASD Sense Switch.

**B1 VOLTAGE**
**Range: ____________ ACTIVE/INACTV**

B1 circuit voltage is active, or high, with the ignition switch in the run position. It is inactive, or low, with the ignition switch in start when the engine is cranking.

**BALLAST BYPASS**
**Range: ____________ ON/OFF**

The ballast bypass relay for the ignition starting circuit on some 1991 and later vehicles and should read as follows:

- ON during cranking
- OFF for normal engine operation

**BARO PRESS(”Hg)**
**Barometric Pressure(“Hg)**
**Range: ____________ 0 to 60 “Hg**
**BARO PRESS(kPa)**
**Barometric Pressure(kPa)**
**Range: ____________ 10 to 200 kPa**

Chrysler systems do not have a barometric pressure (BARO) sensor, however, the PCM provides these internally-calculated BARO values. The PCM first samples the MAP sensor signal with the key on and the engine off, just before cranking. At this point, manifold pressure should be equal to, or be very close to, atmospheric pressure.

Since 1985, Chrysler turbo systems have a “baro read” solenoid that switches the MAP sensor inlet between atmospheric pressure and the intake manifold. The PCM updates BARO readings when the engine is running by switching the baro-read sensor to atmosphere on deceleration for some vehicles. Early 1985 systems updated the BARO readings by switching the MAP sensor to atmospheric pressure at idle.

The PCM uses the BARO pressure value along with the MAP value to calculate manifold vacuum and absolute pressure. Actual readings are typically from about 29.6 InHg (100 kPa) at sea level to 17.8 InHg (60 kPa) at 14,000 feet.

**BARO READ SOL**
**Range: ______ ON/OFF**

Shows if the PCM has energized the BARO read solenoid. The solenoid momentarily switches the MAP sensor inlet from manifold pressure to atmospheric pressure to update the barometric pressure reading for the PCM.

BARO READ SOL reads as follows:

- ON only when the PCM is sampling barometric pressure
- OFF at all other times

**BASE SPARK(°)**
**Range: ______ -64° to 63.5°**

The base spark advance.

**BATT TEMP(°F)**
**Battery Temp(°F)**
**Range: ______ -40° to 389°**
**BATT TEMP(°C)**
**Battery Temp(°C)**
**Range: ______ -40° to 199°**

An approximation of the temperature of the vehicle battery. The PCM uses this parameter to regulate the computer-controlled charging system. A cold battery is charged at a higher rate than a warm battery.

**BATT TEMP(V)**
**Battery Temp(V)**
**Range: ______ 0 to 5.1 V**

A direct voltage reading from the battery temperature sensor. The battery temperature sensor is a variable resistor in parallel with a 5 V reference signal to the PCM. Sensor voltage and temperature are inversely related. Low temperature produces high voltage; high temperature, low voltage.

**BATTERY(V)**
**Range: ______ 0.0 to 16.0 V**

The battery voltage sent from the fuel pump control module (FPCM) to the injector pumps in diesel engines.

**BATTERY VOLTS**
**Range: ______ 0 to 15.7 V**

Chrysler charging systems are controlled by the PCM, and the voltage regulator is part of the control system. Therefore, the PCM receives a direct input signal to indicate battery, or system, voltage at all times.

Although the measurement range is 0 to 15.7 V, the reading should be close to normal charging system regulated voltage with the engine running, which is typically 13.0 to 15.0 V at idle. Check the reading against actual voltage measured at the battery or alternator. Check vehicle specifications for exact values.

**BOOST(psi)**
**Range: ______ 0 to 512 psi**

The intake manifold boost pressure from the MAP sensor on some diesel engines.

**BOOST GOAL(psi)**
**Range: ____________________ 1 to 30 psi**
**BOOST GOAL(kPa)**
**Range: ____________________ 10 to 200 kPa**

The level above barometric pressure at which the PCM is attempting to maintain manifold pressure on some turbocharged engines. It indicates the amount of desired turbocharger boost above atmospheric pressure.

Typical readings vary by model and should be much less than the maximum range.

**BOOST(V)**
**Range: ____________________ 0 to 5.0 V**

Intake manifold boost pressure voltage from the MAP sensor. The greater the voltage, the higher the boost pressure on some diesel engines.

**BRAKE**
**Range: ____________________ ON/OFF**

State of the brake switch, which is an input signal to the PCM. The brake switch contacts used to signal the PCM for speed control and torque converter clutch operation are normally closed. When the brake pedal is pressed, the PCM receives a high-voltage, open-circuit signal and disengages the speed control.

This parameter should read ON when the brake pedal is pressed and OFF at all other times.

**BRAKE SW 1**
**BRAKE SW 2**
**Range: ____________________ ON/OFF**

State of two separate switches that are located in one housing near the brake pedal. These redundant switches actuate in parallel when the brake pedal is pressed.

**CAL(V)**
**Range: ____________________ 0 to 5.10 V**

Appears only on early-model turbocharged vehicles sold in Mexico. These control systems do not have oxygen sensors. Instead, the PCM calculates fuel metering based on input signals from other engine sensors and a calibration potentiometer. The display shows the input value from the calibration potentiometer. Low voltage indicates a lean condition that requires increased fuel metering. High voltage indicates a rich condition that requires less fuel.

**CALC LOAD VALUE**
**Range: ____________________ 0 to 100%**

Relative engine load. The value is PCM-calculated based on engine speed, number of cylinders, and manifold air flow.

High numbers indicate heavy loads; low numbers indicate light loads.

**CAM SYNC START**
**Range: ____________________ YES/NO**

Reads YES when the camshaft is locked and NO at all other times.

**CAM SYNC STATE**
**Range: ____________________ YES/NO**

Indicates whether the PCM sees cam and crank signals during startup and normal operation.

**CAM TIMING POS(°)**
**Range: ____________________ 0° to 127°**

Variations from the learned camshaft timing position in degrees.

**CAM/CRANK DIFF°**
**Range: ______ 0 to 17°**

Amount of change in phase between cam and crank signals from initial set. This is an indicator of timing belt stretch. A code will set at approximately 17 degrees or less than 1 tooth of the belt.

**CAT MODEL**
**CAT Modeled Temp**
**Range: ______ not available**

Indicates PCM-estimated temperature of the catalyst.

**CHARGE TEMP(°)**
**Intake Air Temp(°)**
**IAT(°)**
**INLET AIR TEMP(°)**
**Range: ______ -40° to 199°**

Indicates the temperature of the air-fuel charge inside the intake manifold on models with port-fuel injected engines. The PCM converts voltage signals from a thermistor sensor in the manifold to charge temperature or inlet air temperature (IAT) readings.

Charge temperature and IAT sensors are the same type of thermistor as the engine coolant temperature (ECT) sensor. If the ECT sensor fails, the engine control module substitutes the charge temperature or IAT readings for coolant temperature. This occurs in the “limp-in” mode.

**CHARGE TEMP(V)**
**IAT(V)**
**INLET AIR TEMP(V)**
**Intake Air Temp(V)**
**Range: ______ 0 to 5.1 V**

A direct voltage reading from the air-fuel charge temperature sensor. Sensor voltage and temperature are inversely proportional. Low temperature produces a high voltage reading and high temperature produces a low voltage reading.

**CHK GAUGES LMP**
**Range: ______ ON/OFF**

The check gauges lamp status on the instrument panel. This parameter should read ON if the lamp is on and OFF if the lamp is off.

**CKP COUNT**
**CMP COUNT**
**Range: ______ 0 to 255**

Count of the crankshaft position (CKP) sensor and camshaft position (CMP) sensor pulses.

**CKP ENG RPM**
**Range: ______ 0 to 8192**

Engine RPM as reported by the crankshaft sensor to the ECM on some diesel trucks.

**CLSD LOOP TMR**
**Closed Loop Timer**
**Range: ______ 0 to 13:41 min**

At engine startup, displays the total time necessary until the engine enters closed-loop operation. The timer then counts down to zero. The PCM calculates this time at each engine start based on inputs from coolant and air intake temperature sensors.

**CMP ENG RPM**
**Range: ____________________ 0 to 8192**

Engine RPM as reported by the camshaft sensor to the ECM on some diesel trucks.

**CNG PRESSURE(V)**
**Range: ____________________ 0 to 5.0 V**
**CNG PRESSURE(psi)**
**Range: ____________________ 0 to 150 psi**
**CNG PRESSURE(kPa)**
**Range: ____________________ 0 to 1035 kPa**

Compressed natural gas vehicles use a pressure regulator to regulate the fuel pressure from approximately 3000 psi to the 90–140 psi needed for engine operation. A low pressure sensor is located on the fuel injector rail inlet block. The pressure parameter is a value internally calculated by the PCM based on the input signal from the sensor.

The low pressure sensor uses three circuits:

- 5 V reference
- Ground
- Signal

The sensor input signal to the PCM. The PCM uses this signal for fuel injector timing calculations.

Normal range for the signal is 0.5 V at 0 psi to 4.5 V at 150 psi. Zero (0) V indicates a short and 5.0 V indicates an open circuit.

**CNG TEMP(V)**
**Range: ____________________ 0 to 5.0 V**
**CNG TEMP(°F)**
**Range: ____________________ -40° to 248°**
**CNG TEMP(°C)**
**Range: ____________________ -40° to 120°**

Used only on compressed natural gas vehicles. The voltage parameter is the fuel temperature sensor input signal to the PCM. The fuel temperature sensor is located on the fuel injector rail. The PCM uses this signal along with other data parameters to calculate fuel injector timing.

Sensor voltage and temperature are inversely related.

- Low temperature produces a high voltage signal.
- High temperature produces low voltage.

The degree (°) parameter is a PCM-calculated value based on the voltage input signal from the fuel temperature sensor.

**COIL BRN 1(μS)**
**Coil 1 Burn Time(μS)**
**Coil 2 Burn Time(μS)**
**Range: ____________________ 0 to 4080**

Displays ignition coil burn time.

**COIL DWL(mS)**
**Range: ____________________ not available**

The ignition coil is supplied 12 V from the ASD relay. The PCM controls the primary circuit that fires the coil. Dwell time is based on crankshaft speed and camshaft position.

**COOLANT(°F)**
**Engine Coolant Temp(°F)**
**Range: ______ -40° to 389°**
**COOLANT(°C)**
**Engine Coolant Temp(°C)**
**Range: ______ -40° to 199°**

The engine coolant temperature parameter is supplied to the PCM by the engine coolant temperature (ECT) sensor. The ECT sensor is a thermistor installed in the engine coolant passages. The PCM converts ECT sensor voltage signals to temperature readings.

Reads as follows:

- 185° to 220°F (85° to 105°C) on a vehicle with a fully warmed engine running at idle.
- -40°F or -40°C may indicate an open in the sensor or the circuit.
- Above 366°F (185°C) may indicate a short in the sensor or the sensor circuit.

**COOLANT TEMP(V)**
**COOLANT(V)**
**Range: ______ 0 to 5.1 V**

The engine coolant temperature (ECT) sensor voltage signal is available on most vehicles.

Temperature and ECT sensor voltage are inversely related:

- Low temperature produces a high voltage signal.
- High temperature produces a low voltage signal.

**CRANK INJ(mS)**
**Range: ______ 0 to 524280**

Indicates the fuel injector pulse width at start-up.

**CRANK SENSOR**
**Range: ______ YES/NO**
**Cruise Cancel Switch State**
**Cruise Set/Coast Switch State**
**Cruise On/Off Switch State**
**Cruise Resume/Accel Switch State**
**Cruise Set Switch State**
**Range: ______ Not Pressed, Pressed**

Indicate the following:

- Cruise Cancel Switch State = whether the cruise cancel switch is pressed.
- Cruise Set/Coast Switch State = whether the cruise coast switch is pressed.
- Cruise On/Off Switch State = whether the cruise on/off switch is pressed.
- Cruise Resume/Accel Switch State = whether the cruise resume/accel switch is pressed.
- Cruise Set Switch State = whether the cruise set switch is pressed.

**CAM SENSOR**
**Range: ______ not available**

These direct ignition systems (DIS) parameters show the status of the crankshaft position (CKP) and camshaft position (CMP) sensors. The CMP signal is used for injection timing and cylinder identification and the CKP sensor signal is used to control fuel injection quantity and to determine engine speed and spark advance.

Both parameters must read YES with the engine cranking or running.

**CRNK SYNC START**
**Range:** ______ **YES/NO**

This parameter reads YES when the crank is locked and NO at all other times.

**CTS**
**Range:** ______ **COLD/WARM**

The coolant temperature switch (CTS) used on most 1984–90 carbureted engines reads as follows:

- COLD when the engine temperature is below 135°F (57°C) and the switch is open
- WARM if temperature is 135°F (57°C) or above and the switch is closed

**CURRENT SYNC**
**Range:** ______ **OK/LOST**

Whether the camshaft position (CMP) and crankshaft position (CKP) sensor signals are synchronous.

CURRENT SYNC reads as follows:

- OK when the signals are synchronous
- LOST when the signals are not synchronous

**DBL STRT OVRIDE**
**Range:** ______ **ON/OFF**

Reads as follows:

- ON whenever the engine is running
- OFF at all other times

**DES CHARGE(V)**
**Range:** ______ **0 to 15.7 V**

Desired charging voltage that the PCM is trying to maintain on 1990 and later vehicles with PCM-controlled charging systems. Compare this parameter reading to the BATTERY VOLTS parameter and actual voltage to help troubleshoot electrical problems.

**DES CHARGE SOL**
**Range:** ______ **ON/OFF**

The purge valve solenoid. This device allows high pressure between the turbo and the throttle body to be vented to reduce surge and noise on deceleration.

**DES IDLE RPM**
**Range:** ______ **see description**

Desired idle speed the PCM is attempting to maintain. Desired idle is computed by the PCM. Normally, actual and desired idle RPM readings should be equal or close to each other.

**DES PURGE(mA)**
**Range:** ______ **0 to 670 mA**

Desired current that the PCM is trying to maintain to the proportional purge solenoid. The PCM calculates this desired amount based on what is needed to achieve the correct amount of vapor flow from the evaporative canister.

**DES TPS(V)**
**Range:** ______ **0 to 5**

Final set-point for the electronic throttle control.

**DISABLED**
**ENABLED**
**ENGAGED**
**Range: ______ see description**

Current status of the speed control system. The parameter name changes as the speed control system status changes. When speed control is disabled, this parameter indicates the current reason the system was disabled.

These parameters read the same as the LAST CUTOUT parameter (see “LAST CUTOUT” on page 271). When the speed control system is turned on, this parameter becomes enabled.

**E-CELL EXPIRED**
**Range: ______ YES/NO**

Internal state of the PCM. The E-cell is used to modify the fuel metering and spark timing calculations for a new, or “green,” engine. The E-cell is an electrolytic cell that contains a silver cathode and a gold anode. As current passes through it, the silver gradually depletes to the anode. After a specified time, the anode is completely depleted; and the E-cell becomes an open circuit. The PCM then adjusts its fuel and spark calculations for a broken-in engine.

E-CELL EXPIRED should read as follows:

- YES after a few thousand miles, though exact mileage varies by vehicle and engine
- NO on a new vehicle

**ECM BATTERY(V)**
**Range: ______ 0 to 16.00 V**

Battery voltage received by the ECM on some diesel engines.

**ECM ENG RPM**
**Range: ______ 0 to engine max**

Engine RPM as reported by the ECM on some diesel trucks.

**EGR DUTY CYC(%)**
**EGR DC(%)**
**EGR Duty Cycle(%)**
**Range: ______ 0 to 100%**

Pulse width modulated output signal from the PCM to the EGR valve solenoid, and EGR DC(%) indicates the duty cycle command for the LSEGR PWM port.

read as follows:

- 0% indicates a closed valve
- 100% indicates a fully open valve

**EGR FLOW(g/s)**
**EGR Flow(g/s)**
**Range: ______ 0 to 30**

Mass flow rate from the EGR system to the intake manifold.

**EGR SENSOR(V)**
**EGR SENSE(V)**
**EGR Sensed(V)**
**Range: ______ 0 to 5.0 V**

Input signal from the EGR valve position (EVP) sensor to the PCM and reads as follows:

- 0 V indicates the valve is closed
- 5.0 V indicates the valve is open

**EGR SOLENOID**
**EGR**
**Range: ____ ON/OFF**

PCM command to an EGR valve vacuum control solenoid. This is not a feedback signal from the solenoid.

Reads as follows:

- ON when the solenoid is energized to turn off EGR
- OFF when the solenoid is off to allow EGR

**EMR LAMP**
**SRI(EMR) LAMP**
**Range: ____ ON/OFF**

PCM output signal to the instrument panel Emission Maintenance Reminder or Service Reminder Indicator (EMR or SRI) lamp.

Read ON when the panel lamp is lit to indicate the need for scheduled emission service.

**Engine Coolant Temp(V)**
**Range: ____ 0 to 5.0 V**

The voltage signal of the engine temperature (ECT) sensor is available on most vehicles.

Temperature and ECT sensor voltage are inversely related:

- Low temperature produces a high voltage signal.
- High temperature produces a low voltage signal

**Engine Coolant Temp(°F)**
**Range: ____-40° to 389°**
**Engine Coolant Temp(°C)**
**Range: ____-40° to 199°**

The engine coolant temperature parameter is supplied to the PCM by the engine coolant temperature (ECT) sensor. The ECT sensor is a thermistor installed in the engine coolant passages. The PCM converts ECT sensor voltage signals to temperature readings. Normal readings are 185° to 220°F (85° to 105°C) with a fully warmed engine running at idle.

**Engine RPM**
**Range: ____0 to 8192 rpm**

Engine RPM as reported from the injection pumps to the fuel pump control module (FPCM) for diesel engines.

**ETC DIRECT(%)**
**Range: ____ -100 to 99.9969**

Desired electronic throttle control pulse width modulation.

**EXHAUST**
**EXHAUST #1**
**EXHAUST #2**
**F EXHAUST**
**F BNK UP EXH**
**L EXHAUST**
**R EXHAUST**
**F BNK UP EXH**
**R BNK UP EXH**
**L BNK DN EXH**
**L BNK UP EXH**
**R BNK DN EXH**
**UPSTRM EXH**
**DWNSTRM EXH**
**Range: ________________________________________________RICH/LEAN/CENTER**

General rich or lean exhaust gas condition as measured by the oxygen sensor (O2S).

The exhaust oxygen content is related to the oxygen content of the intake air-fuel mixture, and thus indicates intake air-fuel ratio. The O2S must be hot (above 500°F/260°C), and the PCM must be in closed loop before the PCM responds to the sensor input. Some V-type engines have separate O2Ss for the left and right cylinder banks, or for front and rear banks on transverse engines. In addition, OBD-II vehicles have an additional downstream sensor mounted below each catalyst.

**FAN DUTY CYC(%)**
**Range: ________________________________________________________ 0 to 100%**

Pulse width modulated fan circuit signal used to vary the fan speed and reads as follows:

- 0% indicates that the fan is off
- 100% indicates that the fan is running at high speed

**F BANK INJ(mS)**
**L BANK INJ(mS)**
**R BANK INJ(mS)**
**Range: _______________________________________________________0 to 99.9 mS**

Average fuel injection pulse width, or PCM commanded on-time, for a bank of cylinders in milliseconds.

- The “F” parameter is the front bank of cylinders on a transverse engine.
- The “L” parameter is the left bank on a longitudinal engine.
- The “R” parameter is the rear bank on a transverse engine and the right bank on a longitudinal engine.

**FLEX FUEL(V)**
**Range: ________________________________________________________ 0 to 5.0 V**
**METHANOL(%)**
**Range: ________________________________________________________ 0 to 100%**

PCM input signal from a thermistor-type sensor that measures methanol in the fuel for flexible fuel vehicles. The percentage parameter is calculated by the PCM based on the voltage signal from the sensor.

**FUEL(%)**
**#1 FUEL(%)**
**#2 FUEL(%)**
**Range: ______ see description**

Adaptive adjustment made by the PCM to the fuel injector pulse width at idle as a percentage.

Readings range from -25 to +25% on all models except trucks with EFI. For EFI trucks, readings range from -50 to +50%.

A negative percentage means the PCM is decreasing pulse width, and a positive percentage means the PCM is increasing injector pulse width.

On some engines, the oxygen sensors for the left and right cylinder banks have separate adaptive injector strategies.

**FUEL ALLOWED**
**Range: ______ YES/NO**

The vehicle theft alarm (VTA) system monitors vehicle entry and the ignition. During unauthorized entry, the VTA sends a message to the engine control module to disable the engine. The PCM responds by disabling electronic fuel injection after the engine starts. The parameter shows the present communication link with the alarm module.

**FUEL LEVEL(V)**
**Range: ______ 0 to 8.7 V**
**FUEL LEVEL(%)**
**Range: ______ 0 to 100%**
**FUEL LEVEL**
**Range: ______ 0 to 1.00**
**FUEL LVL(GAL)**
**Range: ______ 0 to 31.9**

These fuel level input signals are provided to the PCM by the body computer.

FUEL LEVEL(V) and FUEL LEVEL(%) represent the fuel level in the tank as voltage and as percentage, respectively. The actual voltage range varies, depending on fuel tank capacity.

FUEL LEVEL displays a decimal measurement of the fuel level:

- 0.00 = empty tank
- 0.50 = ½ tank
- 1.00 = full tank

The PCM calculates this value, and then rounds it up.

FUEL LVL(GAL) is the PCM-calculated amount of fuel in gallons remaining in the tank.

**FUEL PUMP RLY**
**Range: ______ ON/OFF**

PCM command status for the fuel pump relay and reads ON if the PCM energized the fuel pump relay solenoid to close the fuel pump relay contacts.

**FUEL SHUTOFF**
**Range: ______ ON/OFF**

ECM command status to the fuel pump relay, which controls power to the fuel pump control module (FPCM) on some diesel engines.

This parameter only reads ON when the fuel pump relay contacts are open to prevent current to the FPCM.

**FUEL SYS**
**L FUEL SYS**
**R FUEL SYS**
**Range: ______ see description**

Shows whether the vehicle is operating in closed or open loop, and if any diagnostic trouble codes (DTCs) are in memory.

Theses parameters read as follows:

- CLSD LOOP during closed-loop operation without DTCs
- CL FLT during closed-loop operation with DTCs
- OPEN LOOP during open-loop operation without DTCs
- OL FLT during open-loop operation with DTCs
- OL/DRIVE (no information available at time of publication)

**FUEL SYNC**
**Range: ______ OPEN/CLSD**

Used only on turbocharged engines. It is a synchronizing pulse from the ignition system that the PCM uses as one of the input signals to control fuel injector timing.

The value should switch steadily between OPEN and CLSD on a running engine.

**FUEL TEMP(°C)**
**Range: ______ -18 to 2,254°C**
**FUEL TEMP(°F)**
**Range: ______ 0 to 4,089°F**

Fuel temperature inside the fuel injector pump.

**G SW #1**
**G SW #2**
**Range: ______ OPEN/CLOSED**

On Teves systems the deceleration switch assembly provides the ABS control module with three different deceleration rates, two for forward braking, and one for rearward braking. The switch assembly is under the rear seat. The assembly contains three normally-open mercury switches that monitor vehicle deceleration.

**G-SWITCH**
**Range: ______ OPEN/CLSD**

This Bendix 9 parameter indicates the status of the deceleration switch. The deceleration switch is a mercury switch mounted in the ECM at a specific angle. When deceleration occurs, the switch closes and this parameter reads CLSD. It reads OPEN at all other times.

**GENERATOR DC(%)**
**Generator Duty Cycle(DC%)**
**Range: ______ see description**

NGC controllers duty cycle voltage to the generator field coil based on sensed battery voltage. Ground is hardwired to the chassis.

A normal reading is approximately 15% at idle.

**GENERATOR FIELD**
**Range: ______ ON/OFF**

The PCM regulates charging voltage within a range of 12.9 to 15.0 V.

The reading is ON when the PCM is commanding the generator field to energize.

**GENERATOR LAMP**
**ALTERNATOR LAMP**
**Range:** ______ **ON/OFF**

PCM output signal to the instrument panel charging system warning lamp.

These parameters read as follows:

- ON when the panel lamp is on
- OFF during normal operation

**GLOW PLUG RELAY**
**Range:** ______ **ON/OFF**

Displays glow plug relay status. Reads ON when the relay is energized and the contacts are closed for diesel engines.

**H2O IN FUEL(V)**
**Range:** ______ **0 to 5.0 V**
**H2O IN FUEL**
**Range:** ______ **ON/OFF**

Signal input to the diesel engine control module of a thermistor-type sensor that measures water in the fuel. The engine control module monitors this signal when the ignition key is put in the on position, and at the end of the intake heater post-heat cycle. If the signal indicates that the water present is above acceptable limits, the control module turns the water-in-fuel indicator lamp on.

**H2O IN FUEL LMP**
**Range:** ______ **ON/OFF**

PCM command status to the water-in-fuel indicator lamp located on the instrument panel in diesel engines.

The reading is ON when the indicator lamp is lit and there is water in the fuel.

**HI SPD GND RLY**
**Range:** ______ **ON/OFF**

PCM ground circuit for the high speed radiator fan relay.

The reading is ON when the PCM has closed this ground circuit to allow fan operation.

**HIGH ALT**
**Range:** ______ **YES/NO**

Altitude jumper wire status on most 1984–90 carbureted engines. Typically, the altitude jumper wire is taped to the computerized emission control (CEC) wire harness, either in the engine compartment or under the dash.

HIGH ALT reads as follows:

- YES for vehicles operated above 4,000 feet (6,400 meters) when the altitude jumper wire is grounded
- NO for vehicles operated below 4,000 feet when this wire should be open

**HIPRES FUEL CUT**
**Range:** ______ **ON/OFF**

Used on compressed natural gas vehicles to indicate the status of the high pressure fuel shut-off solenoid relay. This relay controls the operation of the high-pressure fuel shut-off solenoid in the fuel pressure regulator.

The reading is ON when the PCM-controlled ground is open to disable fuel injection.

**IAC AIRFLW(g/s)**
**Range: ______ see description**

Idle air control (IAC) air flow measured in grams per second.

- A 4-cylinder engine should read approximately 30–40 g/s at idle.
- A 6-cylinder engine should read approximately 350 g/s at idle with no load.

**IAC CURRENT(mA)**
**Range: ______ see description**

Idle air control motor amperage. The PCM pulse width modulates power and ground to open or close air passage for idle control. More amperage increases air flow and RPM.

- A 4-cylinder engine should read approximately 400 mA at warm idle.
- A 6-cylinder engine should read approximately 350–600 mA at idle.

**IAC PWM(%)**
**IAC Pulse Width(%)**
**Range: ______ 20 to 50%**

Idle air control motor pulse width modulation percentage.

**IDLE ADAP(µS)**
**Range: ______ -1024 to +1016 µS**

Adaptive adjustment made by the PCM to fuel injector pulse width in microseconds.

- A negative value means the PCM is decreasing the pulse width from its programmed value.
- A positive value means the PCM is increasing the pulse width from its programmed value.

A microsecond is 1/1000-millisecond or 0.000 001 second.

**IDLE SELECT**
**Range: ______ ON/OFF**

ECM output command to the fuel pump control module status on some diesels.

**IDLE SOLENOID**
**Range: ______ ON/OFF**

Idle relay status on most 1984–90 carbureted engines. The idle relay energizes the idle solenoid, which allows vacuum to operate the vacuum actuator.

The actuator opens the throttle to increase engine RPM. This occurs during deceleration, when the A/C is turned on for models with a 4.2L 6-cylinder engine, or when the steering wheel is turned to full stop on 1984–85 models with a 2.5L 4-cylinder engine.

**IDLE SWITCH #1**
**IDLE SWITCH #2**
**Range: ______ ON/OFF**

Status of the two idle switches. The switches are built into the accelerator pedal position sensor (APPS) on some models.

At idle speed, switch #1 should read ON and switch #2 should read OFF.

**IG DWL CYL1(mS)**
**IG DWL CYL2(mS)**
**Range: ____ 0.5 to 2.0 mS**
**Ignition Dwell Cylinder 1(µS)**
**Ignition Dwell Cylinder 2(µS)**
**Range: ____ 0 to 4000 µS**

Ignition dwell for cylinder banks 1 and 2. The PCM can alter the duty cycle to each bank of the engine based on emission requirements. For 3.5L models, NGC controllers use six coil-on-plug units but adjusts the dwell bank to bank.

**IGN(V)**
**Range: ____ 0 to 12.0 V**

Key-on voltage at the ignition switch.

**IGN CYCLES**
**Range: ____ 0 to 50**

Number of engine starts since the last fault code set, or codes were cleared.

**IGN CYCLES 1**
**IGN CYCLES 2**
**IGN CYCLES 3**
**Range: ____ 0 to 127**

Number of times the engine has been started since the last three faults were set or codes were cleared.

- IGN CYCLES 1 pertains to the most recent fault.
- IGN CYCLES 2 pertains to the second-most recent.
- IGN CYCLES 3 pertains to the third-most recent.

**IGN START SW**
**Range: ____ ON/OFF**

Ignition start switch state.

**IGNITION SENSE**
**Ignition Run Switch Sense**
**Range: ____ HI/LOW**

Ignition switch to the PCM and reads as follows:

- HI when the switch is in the crank position
- LOW when the switch is in the run position

**IGNITION SW**
**IGN RUN SW**
**Range: ____ ON/OFF**

Read as follows:

- ON when the ignition switch is in the on position
- OFF at all other times

**INJ(mS)**
**INJ1(mS)**
**INJ2(mS)**
**Range: ____ 0 to 99.9 mS**

Displays fuel injection pulse width in milliseconds. Pulse width is the PCM commanded on-time for the fuel injectors.

A high pulse width indicates more on-time and a richer mixture. A low pulse width indicates less on-time and a leaner mixture. There are no definite specifications for injector pulse width, but the reading should change as engine speed and load changes:

- About 1 to 4 mS at idle
- Up to 12 mS or more at wide open throttle

Expect readings to be a little higher for some engines.

The throttle-body injection systems on 1988 and later V6 and V8 truck engines have two fuel injectors, and the PCM sends separate commands to each injector. These display as INJ1(mS) and INJ2(mS).

**INJ CYL 1(mS)**
**INJ CYL 2(mS)**
**Range: ________ not available**

Injector pulse width in milliseconds for cylinder banks 1 and 2. The PCM grounds the control side for the injector for the desired amount of time based on engine operating parameters. Pulse width is adjusted for each bank of cylinders based on feedback from that bank's oxygen sensors.

**INJ TEMP(°F)**
**Range: ________ -40° to 389°**
**INJ TEMP(°C)**
**Range: ________ -40° to 199°**
**INJ TEMP(V)**
**Range: ________ 0 to 5.1 V**

Direct voltage from the fuel temperature sensor in the throttle body on V6 and V8 truck engines with TBI. Sensor voltage and temperature are inversely proportional. Low temperature equals high voltage, and high temperature low voltage.

**INTAKE HEATR #1**
**INTAKE HEATR #2**
**Range: ________ ON/OFF**

This Diesel engine parameter displays intake air heater status.

**INTAKE HTR(°C)**
**Range: ________ -45 to 243 °C**
**INTAKE HTR(°F)**
**Range: ________ -49 to 469 °F**

displays intake heater temperature on diesel engines. This is an ECM-calculated value based on the ambient temperature at startup, coolant temperature, and engine run time.

**KNOCK**
**Range: ________ 0 to 255 counts**

Intensity of the vibrations that the knock sensor (KS) is detecting. The KS is a piezoelectric sensor is on the left side of the engine block, adjacent to cylinder number five on 1987–90 4.0L MPI engines. When the PCM detects knock it retards ignition timing.

**KNOCK SENSOR(V)**
**#1 KNOCK(V)**
**#2 KNOCK (V)**
**Knock Sensor 1 Volts(V)**
**Knock Sensor 2 Volts(V)**
**Range: ________ 0 to 5.0 V**

Actual voltage sent to the PCM by the knock sensor or sensors. When voltage readings are high, the knock retard parameters should show some timing retard.

Some 1992 and later engines have separate knock sensors for the left and right banks; these display as #1 KNOCK and #2 KNOCK or Knock Sensor 1 and Knock Sensor 2.

**LAST CUTOUT**
**Range:** ______ **see description**

Most recent reason for speed control disengagement and reads as follows:

- ON/OFF = the ON/OFF speed control switch was turned off
- SPEED = the speed sensor detected a vehicle speed that was below 35 MPH (56 KPH)
- RPM = engine RPM was excessive
- BRAKE = the brake was pressed
- P/N = the park/neutral switch was engaged
- RPM/SPD = the RPM speed ratio was not constant
- CLUTCH = the clutch was disengaged (manual transmission)
- SOL FLT = a fault occurred in either the servo vent or the vacuum solenoid circuit

**LF SOL**
**RF SOL**
**REAR SOL**
**Range:** ______ **OFF/ISO/BDL/DCY/BLD&DCY**

These Bendix 9 parameters indicate the status of the pressure modulator solenoid valves.

The pressure modulator provides three-channel pressure control to the front and rear brakes. Two channels, LF and RF, control the front brakes, and one channel controls the rear brakes. Three solenoid valves control each channel—isolation, decay, and build—for a total of nine solenoid valves. The three solenoids in each channel have separate functions and are individually controlled by the ECM.

These parameters read as follows:

- ISO means that an isolation valve is actuated. The isolation solenoid valves in each channel isolate the master-cylinder line pressure from a wheel cylinder or caliper during antilock operation.
- DEC means that a decay valve is actuated. The decay solenoid valves provide a controlled decrease, or drop, in pressure to the wheel brakes during antilock operation.
- BLD means that a build valve is actuated. The build solenoid valves provide a controlled pressure increase to the wheel brakes during antilock operation.
- BLD&DCY means that the build and decay solenoids are both energized.
- OFF means that none of the valves for a particular channel are energized.

**LIMP-IN**
**Range:** ______ **see description**

Indicates if and why the PCM has placed the engine in limp-in mode and reads as follows:

- NONE = Not in limp-in mode
- IAT FLT = IAT circuit fault
- TPS FLT = TP sensor circuit fault
- MAP ELC FLT = MAP sensor circuit fault
- MAP VAC FLT = MAP vacuum sense fault
- ECT FLT = ECT sensor circuit fault

**LK DET PMP**
**LK DET PMP SOL**
**LK DET PMP SW**
**Range: ______________________________ ON/OFF**

Leak detection pump circuit components status. The leak detection pump is used to detect a leak in the evaporative system. A solenoid opens and closes the pump switch as commanded by the PCM to cycle the pump on and off.

**LOCKUP SOL**
**TCC SOL**
**Range: ______________________________ ON/OFF**

Shows whether the PCM enabled the torque converter clutch (TCC) to engage. Enabling criteria are gear selection, speed, engine temperature, and throttle position.

When these parameters read ON, the PCM has completed one side of the circuit that energizes the solenoid. The circuit must also be completed by various transmission, speed, and brake switches to open the transmission hydraulic line and engage the TCC.

This parameter indicates that the PCM command has been given. It is not a feedback signal to indicate that the clutch has actually engaged.

**LOOP STATUS**
**Range: ______________________OPEN/CLOSED/DECEL**

Indicates whether the PCM is using open or closed loop operation to control the air-fuel ratio. During open loop operation, the PCM uses MAP, coolant temperature, engine speed, throttle position, and intake air temperature values to control air-fuel ratio. During closed-loop operation, the PCM uses feedback signals from the O2Ss to control the air-fuel ratio.

LOOP STATUS reads as follows:

- OPEN during warm-up
- CLSD when the engine reaches normal operating temperature
- DECEL when the PCM senses a closed-throttle condition and an engine speed above 1200 RPM, which signals the PCM to begin a fuel-cutoff strategy.

**LT ADAP(%)**
**L ST ADAP(%)**
**L LT ADAP(%)**
**R LT ADAP(%)**
**F LT ADAP(%)**
**ST ADAP(%)**
**R ST ADAP(%)**
**F ST ADAP(%)**
**1/1 LT ADAP(%)**
**1/1 ST ADAP(%)**
**Range: __________________________0.6699 to 1.3301**

The ST (short-term) and LT (long-term) parameters show the PCM adaptive adjustment to fuel injector pulse width as a percentage. A negative value means the PCM is decreasing the pulse width, a positive value means the PCM is increasing the pulse width from its programmed value.

Any operating condition that requires an immediate fuel correction for a temporary situation is controlled short-term adaptive parameters. Short-term adaptive is only active when the engine is running in closed-loop. Adjustments to correct for variations in engine build and wear are controlled by the long-term adaptive parameters.

The Long-term adaptive values are stored in nonvolatile PCM memory. As long-term adaptive values change, they establish a new baseline reference for the short-term adaptive values.

Note the following regarding these parameters:

- F, L, and R stand for Front, Left, and Rear or Right fuel banks, respectively.
- 1/1 LT ADAP(%) indicates the PCM correction to bank 1 to account for fueling errors.
- 1/1 ST ADAP(%) indicates the bank 1 O2S control factor.

**LT FUEL TRIM**

**Range:** ____ **0 to 255**

This long-term (LT) fuel trim number represents the operation and long-term correction of the fuel metering of a fuel-injected engine. LT FUEL TRIM indicates whether the PCM is commanding a rich or a lean air-fuel mixture. Jeep manuals refer to this parameter as adaptive gain.

Like “ST FUEL TRIM” on page 282, the LT fuel trim values range from 0 to 255 with a midpoint of 128. LT fuel trim values higher than 128 indicates the PCM is commanding a long-term rich mixture correction. LT fuel trim values lower than 128 indicate the PCM is commanding a lean mixture (Figure 12-1).

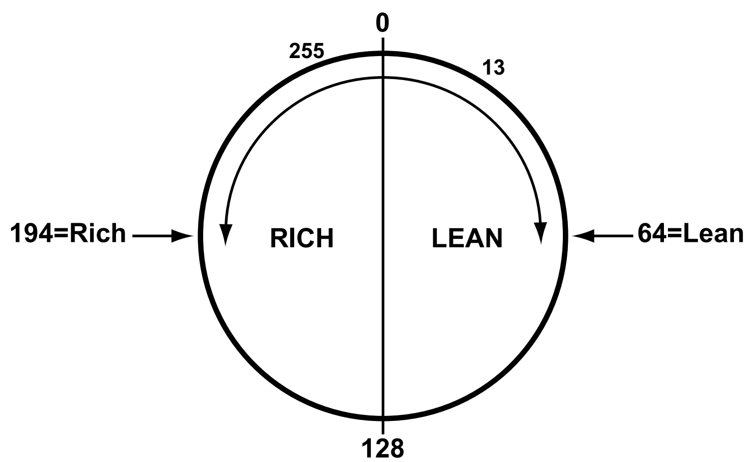


**Figure 12-1**

Rich/lean correction from base midpoint (0)

The LT fuel trim value follows the ST fuel trim value. That is, it makes long-term corrections to fuel metering in response to short-term fuel changes. For example, ST and LT trims may both start at 128. The ST number may move up toward or above 130. At that point, the LT value may move up to 129. The ST then will return to 128 to indicate that it is controlling fuel metering at the midpoint of an overall richer operating condition. A similar action occurs when the PCM commands a leaner mixture and the values move downward. Refer to the ST fuel trim description for more information.

Compare LT fuel trim value to injector on-time. An LT value above 128 indicates increased on-time. A value below 128 indicates decreased on-time. The LT fuel trim correction operates only in closed loop. In open loop, the display goes to a fixed value, usually 128.

**MALFUNCTION LMP**
**CHECK ENG LAMP**

**Range:** ____ **ON/OFF**

PCM output signal to the instrument panel warning lamp and reads as follows:

- ON when the panel lamp is on
- OFF when the system is operating normally and the lamp is off

**MAN VAC(“Hg)**
**Range: ______ 0 to 60 “Hg**
**MAN VAC(kPa)**
**Range: ______ 10 to 200 kPa**

The PCM calculates this manifold vacuum value based on the MAP sensor voltage signal. The calculation compares a barometric pressure reading taken from the MAP sensor before startup to the MAP voltage while the engine is running. The PCM converts the difference between these two voltage signals to a value equivalent to manifold vacuum.

The reading should be about 0 inHg or 0 kPa with the engine off and the manifold close to atmospheric pressure. When the engine is running with high manifold vacuum, the vacuum reading increases. Although the display values range up to 60 inHg or 200 kPa, typical vacuum readings at idle are about 18 to 21 inHg or 60 to 70 kPa.

Compare MAP and vacuum readings as follows:

- MAP voltage and pressure are high when vacuum is low.
- MAP voltage and pressure are low when vacuum is high.

**Table 12-1** *Pressure/voltage conversion*

| Unit Of Measure | Voltage | | | | | | |
|---|---|---|---|---|---|---|---|
| | High | | | | | | Low |
| VACUUM (kPa) | 70 | 60 | 50 | 40 | 30 | 20 | 10 |
| VACUUM (inHg) | 21 | 18 | 15 | 12 | 9 | 6 | 3 |

**MAP/BARO RATIO**
**Range: ______ 0 to 7**

Boost level. Any value greater than 1 indicates boost from the turbo.

The PCM logs the barometric pressure when the key is turned on (engine off) with the MAP sensor and compares it with Manifold Absolute Pressure to determine air density and O2 content for proper fuel ratio.

**MAP SNR(“Hg)**
**MAP Vacuum(“Hg)**
**Range: ______ 0 to 60 “Hg**
**MAP SNR(kPa)**
**MAP Vacuum(kPa)**
**Range: ______ 10 to 200 kPa**

The PCM calculates manifold absolute pressure (MAP) from the MAP sensor voltage signal.

A typical MAP SNR reading at sea level is 29.9 inHg or 102 kPa with the engine off and the manifold close to atmospheric pressure. When the engine is running, the MAP reading drops.

On a normally aspirated engine running at full throttle and full load, manifold pressure is close to atmospheric pressure. The MAP reading should be lower than 29.9 inHg or 100 to 102 kPa. On turbocharged engines, the reading rises above 30 inHg or 100 kPa as boost is applied.

See Table 12-1, “Pressure/voltage conversion” on page 274 for reading interpretations.

Compare the MAP voltage and MAP pressure readings. Pressure should be high when voltage is high, low when voltage is low. If the readings appear abnormal for the apparent engine load, the sensor signal to the PCM may be inaccurate or the PCM calculations may be incorrect.

**MAP SNSR(V)**
**Map Volts(V)**
**Range: ____ 0 to 5.1 V**

The manifold absolute pressure sensor is an analog voltage parameter that varies with manifold pressure. The MAP is intake manifold pressure relative to zero. The MAP and manifold vacuum are related inversely:

- MAP voltage is low when absolute pressure is low (vacuum is high), such as during idle or deceleration.
- MAP voltage is high when absolute pressure is high (vacuum is low), such as during heavy-load operation, or with the key on and the engine off.

With the key on and engine off, the MAP sensor provides a barometric pressure reading. The PCM uses this barometric pressure reading, along with the engine running MAP sensor voltage, to calculate manifold vacuum and true absolute pressure. The PCM also uses MAP voltage and engine speed to calculate engine load.

**MC SOLENOID**
**Range: ____ ON/OFF**

Mixture control (MC) solenoid status on 1984–85 models with a 2.5L carbureted engine. The PCM controls the air-fuel mixture by cycling the MC solenoid on and off in response to the O2S and throttle position sensor.

- When the air-fuel mixture is rich, the MC solenoid cycles on longer to add more air.
- When the air-fuel mixture is lean, the MC solenoid cycles off longer.
- During open loop operation, the MC solenoid cycle-time supplies a fixed volume of air.
- During closed loop operation, the MC solenoid cycle-time varies with the air-fuel mixture.

**MIN TPS (V)**
**Minimum TPS(V)**
**Range: ____ 0 to 5.1 V**

The PCM interprets the lowest voltage signal received from the throttle position sensor (TPS) as the closed-throttle position. When the throttle closes, TPS voltage must return to ±20 millivolts (±0.02 V on the display) of the previous signal to actuate the AIS motor and control timing. If not, the engine may idle poorly or stall.

If the throttle is opened during starting, the PCM receives a higher than expected minimum TPS voltage. The PCM then uses internal values in its programs to recognize the lower signal as the throttle returns to idle after starting at the displayed value.

**MTV SOLENOID**
**Range: ____ ON/OFF**
**MTV Output State**
**Range: ____ Deenergized/Energized**
**MTV Valve State**
**Range: ____ OPEN/CLOSED**

The manifold tuning valve (MTV) optimizes intake manifold tuning by opening and closing a passage connecting the left and the right intake manifold plenums. The PCM-controlled MTV solenoid activates the valve.

MTV SOLENOID reads as follows:

- ON when the solenoid energizes to close the valve, which is at wide open throttle and engine speed below 3008 RPM
- OFF when the solenoid de-energizes to open the MTV valve, which is when engine RPM reaches 3008 RPM

MTV Valve State reads as follows:

- Closed when the solenoid energizes the valve, which is at wide open throttle and engine speed below 3008 RPM.
- Open when the solenoid de-energizes the MTV valve, which is when engine RPM reaches 3008 RPM

The PCM energizes the solenoid again when engine speed exceeds 4288 RPM.

**NVLD SOLENOID**
**Range: ____ ON/OFF**

Condition of the Natural Vacuum Leak Detection (NVLD) solenoid. This solenoid is normally closed and activates a valve inside the NVLD unit to vent the charcoal canister during normal operation and seals the vent during leak detection.

**NVLD SWITCH**
**Range: ____ OPEN/CLOSED**

The NVLD switch is inside the NVLD assembly and attached to a diaphragm. As the tank cools on a hot shutdown, a natural vacuum is created if the system has no leaks. A vacuum of 1 “H2O pressure will close the switch.

**O2(V)**
**O2(mV)**
**#1 O2(V)**
**#2 O2(V)**
**DWNSTRM O2S(V)**
**F DNSTM O2S(V)**
**F UPSTM O2S(V)**
**L O2S(V)**
**L UPSTMO2S(V)**
**L DNSTM O2S(V)**
**PRECAT O2S(V)**
**POSTCAT O2S(V)**
**R O2S(V)**
**R UPSTM O2S(V)**
**R DNSTM O2S(V)**
**UPSTRM O2S(V)**
**1/2 O2S(V)**
**Range: ____ 0 to 5.20 V**

The exhaust O2S signal indicates whether the engine is running rich or lean. An O2S is capable of generating a signal ranging from 0 to a little over 1 V (0 to 1000 mV). The display is in decimal fractions of a volt, such as 0.75 V, which is 750 mV.

A normal O2S signal ranges from about 0.10 to 1.00 V:

- A high signal indicates rich exhaust.
- A low signal indicates lean exhaust.

Although the display ranges to just over 5.0 V, the sensor cannot generate more than about 1 V. You should not see O2S voltage go much above 1.0 or 1.1 V in fully rich conditions.

**NOTE:**
The O2S must be hot (above 500°F/260°C) to generate a reliable signal, and the PCM must be in closed loop before it responds to the sensor signal.

Some V-type engines have separate oxygen sensors for the left and right (longitudinal engine) or front and rear (transverse engine) cylinder banks. In addition, OBD-II vehicles have oxygen sensors mounted below, or downstream of, each catalytic converter.

Most 1992 and later engines may output 4.5 to 5.2 V with the key on and engine off due to the O2S heater circuit. This is normal.

**O2 ADAP CELL ID**
**Range: ______ ±33%**

NGC controllers have 26 long-term cells based on MAP and RPM. Each cell can adapt the pulse width plus or minus 33%. The cell ID is the one that is currently being used. Positive numbers indicate more fuel is needed and negative numbers indicate that less fuel is needed. Values will be updated once the PCM is in long-term closed loop.

**O2 CROSSCOUNTS**
**Range: ______ 0 to 255**

Displays the number of times that the O2S voltage crossed from the lean region, which is below 450 mV, to the rich region, which is above 450 mV. When the engine is warmed up and running in closed loop, the O2S voltage changes constantly. A counter in the PCM records the number of times the signal crosses between rich and lean. The value is the number of crossovers within the last second.

The crosscounts indicate how well the O2S is responding to changes in fuel metering and exhaust oxygen content. It does not indicate how well the O2S is performing. It shows that the sensor varies its voltage in response to exhaust oxygen content.

On some engines, the O2S may cool off at idle, and the system may go to open loop. In this case, the sensor will not provide a varying voltage to the PCM, and the crosscount reading is zero. Run the engine at fast idle for a few seconds to warm the sensor, return to closed loop, and restore the crosscount reading.

**O2HTR DTY CYC(%)**
**Range: ______ 0 to 100%**

Oxygen heater duty cycle in percentage. Bank 1, Sensor 1 O2 heater ground is duty cycled in the PCM between 0 and 100%. This allows the PCM to turn off current flow through the heater element when engine heat is high enough to maintain O2 operation.

**OIL PRESS(psi)**
**Range: ______ 0 to 128**
**OIL PRESS(kPa)**
**Range: ______ 0 to 885**

Oil pressure. They rely on an oil pressure transducer that sends an analog voltage signal to the PCM. The PCM calculates the oil pressure from this signal.

**OIL PRESS(V)**
**Range: ______ 0 to 5 V**

Oil pressure in the form of voltage from the oil pressure sending unit. The greater the voltage, the lower the oil pressure.

**OPEN/CLSD LOOP**
**L-FUEL SY**
**R-FUEL SY**
**L OPEN/CLSD LP**
**R OPEN/CLSD LP**
**Range: ______ OPEN/CLSD**

Loop operating status of the PCM. In open loop, the PCM uses throttle position, coolant temperature, and engine speed to control the air-fuel ratio. During closed-loop, the PCM uses feedback signals from the oxygen sensors to control the air-fuel ratio.

These parameters read as follows:

- OPEN during warm-up
- CLSD when the engine reaches normal operating temperature

Parameters that begin with L or R refer to the left or right cylinder bank.

**P-Ratio MAP/BARO**
**Range: ______ 0 to 7**

The PCM logs the barometric pressure when the key is turned on (engine off) with the MAP sensor and compares it with Manifold Absolute Pressure to determine air density and O2 content for proper fuel ratio.

**PCM ODO(mi)**
**Range: ______ see description**

This parameter indicates the mileage in PCM memory, which is updates every six miles.

**PCV VALVE**
**Range: ______ OPEN/CLSD**

Displays PCV valve status on most 1984–90 carbureted engines. The normally-open PCV valve is controlled by the PCV shutoff solenoid. The value should read CLSD when running at idle (the solenoid is energized to close the valve and stop PCV flow) and OPEN at all other times (the solenoid is de-energized to open the valve and allow PCV flow).

On 2.5L engines, an anti-diesel relay momentarily energizes the PCV solenoid when the engine is shut off to prevent dieseling.

**PRGE ADAPTIVE(%)**
**Range: ______ 0 to 33%**

Fuel correction as a result of the amount of HC stored in the canister.

**PRGE DUTY CYC(%)**
**PURGE DC(%)**
**Purge Duty Cycle(%)**
**Range: ______ 0 to 100%**

Displays the pulse-width-modulated PCM command signal to the evaporative purge valve and reads as follows:

- 0% indicates that the valve is not energized
- 100% indicates that the valve is fully energized

**PRNDL**
**Range: ______ 1-2/3/PRND/????**

Displays the neutral safety switch status, which is activated by the position of the gear selector lever. Reads as follows:

- PRND when the selector lever is in park, reverse, neutral, or drive

- 1-2 when the selector lever is in the 1-2 position
- 3 when the selector lever is in the 3 position
- ???? when the shift lever is between positions

**PURGE(mA)**
**PRGE FEDBCK(mA)**
**Range: ____ 0 to 670 mA**
**PURGE CURR(mA)**
**Range: ____(range 0 to 2**

PURGE(mA) and PRGE FEDBCK(mA) indicate the amount of PCM-controlled current to the proportional purge solenoid. The PCM varies the current to achieve the correct amount of vapor flow from the evaporative canister.

PURGE CURR(mA) indicates the proportional purge solenoid current sense.

**PRGE FLOW(g/s)**
**Purge AirFlow(g/s)**
**Range: ____ 0 to 63.9**

Actual flow through the purge solenoid in grams per second.

**PRGE VAPOR(%)**
**Range: ____0 to 1**

Percentage of fuel in the purge airflow.

**PROM**
**Range: ____0 to 99999**

Identification numbers of the programmable read-only memory (PROM) in the PCM. The PROM is a replaceable electronic device that contains the operating programs and calibration values for a specific vehicle, engine, and accessory combination.

Often, a PROM is revised, or there is a new PROM issued to cure a driveability problem or to improve operation. Also, the PROMs are interchangeable, so it is possible for the wrong PROM to be installed.

**PURGE SOL**
**Range: ____OPEN/CLSD**

The PCM sends output commands to the fuel vapor solenoid in order to control vapor canister purging.

PURGE SOL reads as follows:

- OPEN when the solenoid is de-energized to allow vapor purging
- CLSD when the solenoid is energized to block the canister vacuum line and prevent the canister from purging

**PURGE SOL FLW(%)**
**Range: ____ 0 to 99%**

Amount of time the PCM is commanding the purge solenoid to energize as a percentage. The PCM calculates this value using the purge feedback circuit amperage. The purge solenoid regulates the rate of vapor flow from the EVAP canister to the throttle body.

A reading of 99% indicates the valve is fully open to allow maximum purge.

**PWR STEER SW**
**Range: ____ OPEN/CLSD**
**Power Steering Switch**
**Range: ____ Low Pressure/High Pressure**

During tight turns at low speed, high pressures generated in the power steering system cause the steering pump to load the engine enough to stall it. To prevent this, many late-model vehicles have a power steering fluid pressure sensing switch. The switch opens when pressure rises above 400 psi (2758 kPa). An open switch signals the PCM to raise idle speed to prevent the engine from stalling.

**RAD FAN DC(%)**
**Range: ____ 0 to 100%**

Displays the duty cycle of the signal delivered to the fan relay.

**RAD FAN RELAY**
**RAD FAN LOW RLY**
**RAD FAN HI RLY**
**RAD FAN HI2 RLY**
**Range: ____ ON/OFF**

PCM has commanded the engine cooling fan to turn on. Some vehicles have high-speed and low-speed fans, and two parameters are used indicate the state of the fan relays. The PCM controls relays based on coolant temperature and compressor head pressure.

These parameters should read ON whenever the air conditioning is operating or the coolant temperature is high enough to require fan operation to cool the engine.

**RETARD CYL #1(°)**
**RETARD CYL #2(°)**
**RETARD CYL #3(°)**
**RETARD CYL #4(°)**
**Range: ____ 0° to 127°**

Displays the amount of ignition retard the PCM is commanding to each cylinder. Readings are relative to base timing.

**RPM**
**Engine RPM**
**Range: ____ 0 to engine max**

RPM is engine speed and is always at the top left of the display.

On 1988 and earlier models, RPM is internally computed by the PCM based on ignition reference pulses. On 1989 and later vehicles, the PCM computes RPM using the crankshaft position (CKP) sensor signals.

**S/C CANCEL**
**S/C COAST**
**S/C ON/OFF**
**S/C RESUME**
**S/C SET SW**
**Range: ____ PRESSED/RELEASED**

Indicates cruise control status as follows:

- S/C CANCEL = whether the cruise cancel switch is pressed.
- S/C COAST = whether the cruise coast switch is pressed.
- S/C ON/OFF = whether the cruise on/off switch is pressed.
- S/C RESUME = whether the cruise resume/accel switch is pressed.

- S/C SET SW = whether the cruise set switch is pressed.

**S/C LAMP**
**S/C ENGAGED LMP**
**S/C POWER RELAY**
**Range:** ______ **ON/OFF**

Speed control lamp and speed control power relay. The relay provides battery voltage to the servo solenoids. These parameters read ON when speed control is enabled.

**S/C SET SPD**
**Range:** ______ **0 to 127.5**

Displays the cruise control set speed.

**S/C SW INPUT(V)**
**S/C SW 1(V)**
**S/C SW 2(V)**
**S/C SWITCH(V)**
**S/C Switch(V)**
**Range:** ______ **0 to 5.1 V**

Displays the speed control switch voltage.

**S/C TARGET (MPH)**
**S/C TARGET (KPH)**
**Range:** ______ **0 to vehicle max**

Displays the speed at which the driver set the control on some 1990 and later vehicles.

**S/C VAC SOL**
**Range:** ______ **OPEN/CLSD or BLOCK/APPLY**
**S/C VENT SOL**
**Range:** ______ **OPEN/CLSD or BLEED/HOLD**

The PCM sends output commands to the speed control (S/C) vacuum and vent solenoids to control the servo.

The value reads OPEN if a solenoid is energized.

The vacuum and vent solenoid readings usually have the following relationships with throttle position control.

**Table 12-2** *S/C VAC SOL and S/C VENT SOL readings and throttle position*

| S/C Vacuum Solenoid | S/C Vent Solenoid | Throttle Position |
|---|---|---|
| OPEN | CLSD | Accelerate |
| OPEN or CLSD | OPEN | Decelerate |
| CLSD | CLSD | Steady |

**SENSED TIP**
**Range:** ______**0 to 10 psi**

Displays the intake pressure reading from the TIP sensor.

**SHIFT IND LAMP**
**Range:** ______ **ON/OFF**

Displays the PCM output command to the instrument panel lamp on some trucks with a manual transmission. The PCM determines whether to light the lamp based on engine speed, vehicle speed, and engine load.

When this parameter displays ON, the panel lamp should be on. If not, there is a problem in the circuit or with the PCM command.

**SPARK ADV(°BTC)**
**Spark Advance(°)**
**Range: __________ -90° to +90°**

This is a PCM output parameter that indicates the total amount of spark advance or retard being commanded, not including base timing.

**SPEED CNTRL**
**Range: __________ ON/OFF/SET/RESUME**

Displays the PCM input signal that indicates the position of the speed control switch.

Be aware, this parameter displays on some vehicles that do not have speed control, however, it continuously displays OFF.

**SRV SOLENOID**
**Range: __________ ON/OFF**
**SRV Output State**
**Range: __________ Deenergized/Energized**
**SRV Valve State**
**Range: __________ Open/Closed**

Displays the current state of the short runner valve.

**ST FUEL TRIM**
**Range: __________0 to 255**

Displays the short-term (ST) fuel trim value represents the operation and the short-term correction to the fuel metering of a fuel-injected engine. ST FUEL TRIM indicates whether the PCM is commanding a rich or a lean mixture. Jeep manuals refer to this parameter as ALFACL.

The ST fuel trim value ranges from 0 to 255 with a midpoint of 128. A value higher than 128 indicates a PCM command for a short-term rich mixture, a value lower than 128 indicates a short-term lean mixture (see Figure 12-1 on page 273).

Compare ST FUEL TRIM numbers to injector on-time. A value above 128 indicates increased on-time. A value below 128 indicates a decrease to on-time. The ST fuel trim correction operates only in closed loop. In open loop, the ST fuel trim goes to a fixed value, usually 128.

**ST RETARD(°)**
**Range: __________ 0 to 63.5°**

Displays the short-term knock spark retard.

**STATUS**
**Range: __________ see description**

The slash in the displayed value of this parameter divides the reading into two sections. The value to the left of the slash indicates transmission solenoid faults, and the value to the right of the slash indicates throttle position (TP) sensor faults.

- 0 = no faults have occurred
- A number greater than 0 to the left of the slash = transmission solenoid faults
- A number greater than 0 to the right of the slash = TP sensor faults

**STEP EXTEND**
**STEP RETRACT**
**Range: ______________________________ YES/NO**

Displays the stepper-motor status used to control the air-fuel mixture on 1984–90 models with a 4.2L carbureted engine. The stepper-motor moves metering pins in the carburetor throat to control airflow.

Readings indicate if the PCM is commanding the stepper motor to extend or retract:

- If the fuel mixture is rich, the extend parameter reads NO and the retract parameter reads YES.
- If the mixture is lean, the extend parameter reads YES and the retract parameter reads NO.

**SURGE VALVE**
**Range: ______________________________ CLSD/OPEN**

Indicates whether the PCM has energized the surge valve to bypass the turbocharger and reduce boost on turbocharged vehicles. The parameter shows the PCM command has been given. It does not indicate the valve is operating.

**TARGET IAC**
**Range: ______________________________ 1 to 255**

Displays the PCM desired position of the idle air control (IAC) motor in step counts.

**Target Idle Speed(RPM)**
**Range: ______________________________ see description**

Displays the desired speed the PCM is attempting to maintain. Desired idle is computed by the PCM. Normally, actual and desired idle RPM readings should be equal or close to each other.

**T-BODY TEMP(°F)**
**Range: ______________________________ -40° to 389°**
**T-BODY TEMP(°C)**
**Range: ______________________________ -40° to 199°**

Displays fuel temperature in the throttle body on low-pressure throttle body injection systems. A thermistor sensor is installed in the throttle body fuel passage, and the PCM converts the sensor voltage signals to the fuel temperature readings.

With a low-pressure throttle body injection (TBI) system, fuel may boil in the throttle body during a hot-soak period. At engine startup, the PCM compares the engine coolant temperature to throttle body fuel temperature. If the fuel temperature is above a programmed value, the PCM increases injector pulse width during starting to purge fuel vapors from the injectors. The throttle body temperature affects injector pulse width only during starting, not at any other time.

**T-BODY TEMP(V)**
**Range: ______________________________ 0 to 5.1 V**

The throttle body temperature voltage is a direct reading from the fuel temperature sensor in the throttle body low-pressure throttle body injection systems. Sensor voltage and temperature are inversely related. Low temperature produces a high voltage signal; high temperature produces low voltage.

**TCC FULL LOCK**
**Range: ______________________________ ON/OFF**

Displays the low/reverse solenoid status. With the transmission above first gear, the transmission controller turns on the low/reverse solenoid to provide the hydraulic flow and pressure to the valve body allowing full engagement of the torque converter.

**TCC P-EMCC**

**Range: ______ ON/OFF**

Displays the low/reverse solenoid status. With the transmission above first gear, the transmission controller duty cycles the low/reverse solenoid providing a reduced amount of pressure to the valve body and partially engaging the torque converter lockup clutch.

**TCC UNLOCKED**

**Range: ______ ON/OFF**

Indicates whether the transmission controller turned off the low/reverse solenoid to prevent torque converter lockup.

**THROTTLE(%)**
**THROTTLE POS(%)**
**TPS(%)**
**Throttle Position Sensor(%)**

**Range: ______ 0 to 100%**

Some vehicles transmit a throttle position sensor (TPS) information as a percentage of full-throttle opening, instead of a voltage signal.

These parameters read as follows:

- From 0 to 10% at idle
- Above 90% at wide open throttle

Readings should change smoothly as the throttle moves through its full range.

**THROTTLE POS(V)**
**TPS(V)Throttle Position Sensor(V)**

**Range: ______ 0 to 5.1 V**

The throttle position (TP) sensor produces a signal that is proportional to the throttle position. The PCM uses this voltage signal to determine how wide the throttle is open: low voltage at closed throttle, and high voltage at wide open throttle.

The TPS voltage available to the PCM ranges from 0 to approximately 5.1 V. For most Chrysler engines, expect the following readings:

- About 1.0 V at idle
- About 3.5 V at wide open throttle

Voltage should change smoothly as the throttle moves through its full range.

**THROTTLE SW**

**Range: ______ OPEN/CLSD**

Displays the throttle switch status. Reads as follows on 1989 fuel-injected truck engines:

- OPEN when the throttle is off idle
- CLSD when the throttle is closed

**TIP(V)**

**Range: ______ 0 to 5 V**

Displays the throttle inlet pressure (TIP) voltage. The TIP sensor is used in place of MAP. The TIP/BARO solenoid switches back and forth between intake manifold and atmospheric pressure. This allows for the BARO reading to update during turbo boost.

**TOTAL ADV(°BTC)**
**Range: ____________________________________________ -90° to +90)**

On some 1990 and later models, this parameter displays the total spark advance or retard commanded by the PCM, including base timing.

**TOTAL KNK RTD (°)**
**OVERALL KNK RTD(°)**
**KNK RTD CYL 1(°)**
**KNK RTD CYL 2(°)**
**KNK RTD CYL 3(°)**
**KNK RTD CYL 4(°)**
**Range: ____________________________________________ 0° to 90°**

Displays the amount of spark advance removed by the PCM when the detonation sensor senses knock. Timing is retarded from the optimum advance for existing speed and load. Knock retard does not indicate that timing is retarded after top dead center. It shows the amount of advance that has been taken away.

Typically, the logic module retards timing from maximum advance in 5-degree increments until detonation stops or until 15 degrees have been removed. Advance is then restored at about 2 degrees per second. Knock retard is cancelled below 1000 RPM.

On non-turbocharged engines, the total or overall knock retard for all cylinders displays, for turbocharged engines, knock retard for individual cylinders displays.

**TPS 1(V)**
**TPS 2(V)**
**Range: ____________________________________________ 0 to 5**

Indicates the voltage signals from two TPS units built into the electronic throttle control (ETC) throttle body. Each sensor outputs a voltage signal in proportion to the throttle plate position.

As the throttle is opened, voltage from TPS 1 increases while TPS 2 decreases.

**TPS 1 MIN(V)**
**TPS 2 MIN(V)**
**Range: ____________________________________________ 0 to 5**

Displays the learned lower limits for TPS 1 and TPS 2 respectively.

**TPS CALC(V)**
**Range: ____________________________________________ 0 to 5.0 V**

This calculated value for throttle position is what the PCM expects to see from the TPS based on RPM and MAP. The value should be close to actual and will be used in the event of a TPS failure.

**TPS STEPS**
**Range: ____________________________________________ see description**

Displays the throttle position sensor step count. This parameter should read as follows:

- 0 when the throttle is fully closed
- Increases to 7 as throttle is pressed to WOT

**TRANSFER PUMP**
**Range: ____________________________________________ ON/OFF**

Displays the transfer pump status on some diesel engines. The transfer pump delivers fuel from the fuel tank to the fuel-injection pump.

**TRD LINK**
**Range: ______ ON/OFF**

When the transmission shifts gears, the transmission control module (TCM) signals the PCM so it momentarily shuts off a number of fuel injectors. This signal, called the torque reduction link, smooths shifting and decreases transmission wear.

Reading is ON if the PCM is cutting fuel delivery as instructed by the TCM signal.

**TURBO BARO**
**Range: ______ not available**

Displays the BARO reading from the TIP sensor.

**VEH SPEED**
**Range: ______ 0 to vehicle max**

Displays the measurement provided by the vehicle speed sensor (VSS) pulses to the PCM.

On late-model vehicles, the VSS signal also is used to control torque converter clutch (TCC) engagement.

**VEH THEFT**
**Range: ______ ON/OFF**

Indicates whether Vehicle Theft Security System (VTSS) is engaged. The signal is sent to the PCM from the BCM.

**VEH THEFT STATE**
**Range: ______ fuel allowed/fuel not allowed**

Indicates whether the BCM is allowing the PCM to turn the fuel pump on or not.

**VNT SOL #1**
**Range: ______ ON/OFF**
**VNT SOL #2**
**VNT SOL #3**
**Range: ______ 0 to 100%**

Chrysler variable nozzle turbo (VNT) engines do not have a wastegate, but have three computer-controlled solenoids to control turbo nozzle opening. These parameters indicate whether the PCM has turned the solenoids on or off.

Solenoid 1 is turned either fully on or fully off; it is not pulse-width modulated. Both Solenoids 2 and 3 are pulse-width modulated. These parameters display the percentage of on-time.

**WAIT TO START**
**Range: ______ ON/OFF**

Wait to start lamp status on the instrument panel for diesel engines.

The engine control module turns the lamp on and off based on charge air temperature sensor input. When the ignition is first turned on, the lamp illuminates for a 2-second bulb check. If the intake manifold air temperature is below 59°F (15°C), the wait to start lamp illuminates and the intake heater preheat cycle begins. The lamp stays on until the preheat cycle is complete.

During engine operation, the wait to start lamp flashes if the charge air temperature sensor input is below minimum or above maximum value. A fault is stored when this occurs.

**WASTEGATE(%)**
**Range: ______ 0 to 100%**

On some 1990 and later models with turbocharged engines, the PCM controls the wastegate actuator with a pulse-width-modulated (PWM) solenoid. The solenoid modulates pressure applied to the actuator and thus controls the wastegate opening.

The display indicates on-time for the solenoid as a percentage. It also indicates the amount of wastegate opening:

- Readings should be low at idle, part throttle, or other low-boost conditions.
- Readings should be high under high boost pressure conditions.

**WASTEGATE SOL**
**Range: ______ ON/OFF**

On some 1990 and later turbocharged engines, this parameter displays the status of the wastegate solenoid.

**WASTEGATE SOL(%)**
**Range: ______ 0 to 100%**

The turbo wastegate is controlled by the PCM duty cycling a 12V signal to the solenoid. Ground is hardwired to the chassis. An increase in duty cycle increases boost.

**WATER IN FUEL(V)**
**Range: ______ 0 to 5.0 V**

Displays the signal voltage from the water in fuel sensor on some models with diesel engines. The higher the voltage, the greater the amount of water in the fuel.

**WIDE OPEN THROT**
**Range: ______ YES/NO**

Reads YES to indicate maximum throttle opening on many engines and reads NO at all other times. The engine must be running for this parameter value to change.

With the key on and the engine off, a fully open throttle produces maximum TP sensor voltage; but this parameter should read NO.

**WOT DIVERT**
**Range: ______ YES/NO**

On some engines, the air injection diverter solenoid is switches off at full throttle to avoid catalytic converter overheating, which diverts air pump output to the atmosphere and results in a YES reading.

**Z1 VOLTAGE**
**Range: ______ ACTIVE/INACTV**

Voltage on circuit Z1 is active, or high, when the auto shutdown relay is energized.

# Transmission Parameters

This section defines data parameters available from the transmission or transaxle control module (TCM) on Chrysler and Jeep vehicles.

**1-2 RANGE SW**
**3 RANGE SW**
**OD RANGE SW**
**R RANGE SW**
**Range: ______ ON/OFF**

Displays the range switch selected by the PRNDL. Reads ON if the switch is on and OFF if off.

The AW4 transmission has six shift lever positions and ranges: Park, Reverse, Neutral, Drive, 1-2, and 3. Drive, 1-2, and 3 provide electronically-controlled shifting. The D range provides 1st through 4th (OD) gear. Park, reverse, and neutral are mechanical only. Reverse activates a range switch only to turn on the brake lamps.

**2-3 LOCKOUT LMP**
**2-3 LOCKOUT SOL**
**Range: ______ ON/OFF**

Displays the skipshift feature status on Viper models. The PCM controls lockout based on engine running conditions. Under light to moderate throttle, the lockout solenoid blocks the 2nd and 3rd shift gates. During a skipshift, the solenoid energizes and both of the parameters read ON. Once a skipshift completes, both read OFF.

**3/4 SHIFT SOL**
**Range: ______ ON/OFF**

Displays the 3/4 shift solenoid status.

**BATTERY VOLTS**
**Range: ______ 0 to 15.7 V**

Displays the direct input signal to the PCM that indicates current battery voltage. The reading should be close to normal charging system regulated voltage with the engine running.

**BRAKE SW**
**Range: ______ ON/OFF**

Displays the brake switch signal to the transmission control module (TCM) status. The TCM relies on this input to turn off the torque converter clutch when the brakes are applied. It reads ON when the brake switch contacts are closed.

**C3(V)**
**C4(V)**
**Range: ______ 0 to 25.6 V**

Displays inputs from manual valve lever position (MVLP) sensor or transmission range sensor (TRS) switches. A voltage reading indicates the switch is open.

- C3 should read 0 V when the gear selector is in park, 3rd gear, or low.
- C4 should read 0 V when the gear selector is in neutral, low, or overdrive.

If C3 or C4 do not display 0 V under these conditions, inspect the switch and circuitry.

**CURRENT GEAR**
**PRESENT GEAR**
**Range: ______ see description**

Displays the forward gear that is currently engaged—it is not the shift lever position—and reads as follows:

- 1ST when operating in first gear or with the shift lever in P-R-N
- 2ND in second gear
- 3RD in third gear
- 4TH in fourth gear
- ???? during a shift

**DOWNSHIFT SW**
**Range: ____ ON/OFF**

Displays the status of a normally open downshift switch that is operated by moving the gear shift lever to the left.

The display only reads ON when the switch contacts are closed to complete the circuit and allow current. When the system functions properly, each time the switch contacts close, the transmission downshifts one gear.

**Engine RPM**
**Range: ____ 0 to engine max**
**TURBINE RPM**
**Engine Speed (RPM)**
**Turbine Speed(RPM)**
**INPUT RPM**
**OUTPUT RPM**
**Output Speed(RPM)**
**Range: ____ 0 to trans max**

Three sensors provide engine speed, turbine acceleration, and output shaft speed data to the TCM. The engine parameter is provided by the ignition system. Engine speed is used for controlling torque converter lockup and to determine torque capacity.

For diagnostics, the engine parameter is also compared to an engine speed signal from the engine control module. The TCM receives engine RPM signals on both the CCD data bus from the engine computer and directly from the ignition system.

The turbine and input parameters are the same, the vehicle has one or the other. The PCM compares this reading to the engine and output parameters to determine operating ratio, clutch and torque converter slippage, and torque capacity. In addition, turbine or input change information is used to control shifts.

The TCM compares the output parameter to the turbine parameter for determining gear ratio and detecting clutch slippage. In addition, the output parameter is compared to throttle data to determine shift points.

**GEAR**
**Range: ____ see description**

Displays the selected gear. The TCM looks at the PRNODDL, hydraulic pressure, and speed sensors to determine automatic gear selection.

Depending on selector position, the display reads REV, NEUT, 1ST, 2ND, 3RD, or 4TH.

**GOV PRESS SOL**
**Range: ____ LOW/HIGH**

Displays the governor pressure solenoid valve state.

**GOV PRESS(psi)**
**DES GOV PR(psi)**
**Range: ______ see description**

The governor pressure parameter indicates the actual transmission fluid line pressure. The governor pressure sensor measures the solenoid valve output pressure and provides this feedback to the PCM. The desired parameter is the line pressure the PCM is attempting to maintain.

Governor pressure should increase approximately 1 psi per vehicle MPH. The governor pressure solenoid valve controls governor pressure by regulating the transmission line pressure. The PCM applies a pulse-width-modulated signal to the valve to generate the governor pressure needed for upshifts and downshifts.

**GOV PR DUTY CYC**
**Range: ______ 0 to 100%)**

Displays the duty cycle of the governor pressure solenoid valve. The valve controls governor pressure by regulating transmission line pressure. The TCM outputs a pulse width modulated signal to the valve to generate the pressure needed for upshifts and downshifts.

**GOV PR SNSR(V)**
**GOV PRESS(V)**
**Range: ______ 0 to 5.00 V**

Displays the feedback signals from the governor pressure sensor to the TCM. The governor pressure solenoid valve regulates transmission line pressure to develop governor pressure. The pressure sensor measures the solenoid valve output and provides feedback.

**J2 CIRCUIT(V)**
**SWITCH BATT(V)**
**REV LIGHT 1(V)**
**REV LIGHT 2(V)**
**Range: ______ 0 to 25.6 V**

Displays TCM control voltages. The J2 circuit is the battery voltage feed to the TCM. Voltage is present at all times, even with the ignition turned off, to supply power for TCM memory.

The SWITCH BATT parameter is the ignition voltage that turns on the TCM.

The REV LIGHT 1 and REV LIGHT 2 parameters display the supply voltage on either side of the backup lamp relay.

**LIMP IN**
**Range: ______ YES/NO**

The TCM continually checks for electrical and internal transmission problems. When a problem is sensed, a fault code sets.

Most fault codes cause the TCM to go into the limp-in mode. In this mode, electrical power is removed and transmission operation is limited to the following:

- Neutral
- Park
- Reverse
- Second gear

Upshifts and downshifts are not allowed. The vehicle may still be driven in for service.

**LOCK-UP**

**Range: ON/OFF**

Displays the TCC lockup relay valve status. The lockup relay valve controls fluid flow to the converter lockup clutch. The lockup relay valve is operated by line pressure from the 1-2 shift valve and controlled by solenoid no. 3.

This parameter should read ON only when the lockup clutch is engaged.

**L-R PRESS SW**
**2-4 PRESS SW**
**OD PRESS SW**

**Range: OPEN/CLSD**

These three pressure switches, L-R, 2-4, and OD, are built into the transmission solenoid assembly. During automatic shifting, the TCM uses this pressure switch data to verify proper solenoid operation and gear selection. The TCM recognizes each gear selected as a specific combination of open and closed pressure switches.

**MODE**

**Range: POWER/COMFORT**

Displays the shift mode selection switch status. The switch is located on the instrument panel. The Comfort mode provides normal shift speeds and points, and the Power mode provides higher shift speeds and points.

The reading should match the switch setting. This switch was eliminated in 1992, and this parameter always reads POWER on 1992 and later vehicles.

**MODULE ID**

**Range: 1 or 2**

Displays the TCM identification number. Use this parameter to determine if the correct module is installed in the vehicle. Modules are not interchangeable.

MODULE ID reads as follows:

- 1 for vehicles with the AW4 transmission and a 4.0L engine
- 2 for vehicles with the AW4 transmission and a 2.5L engine

**OD INHIBIT**

**Range: YES/NO**

Displays the inhibit switch status. Reads YES if the PCM is preventing the transmission from shifting into overdrive.

**OD OFF LAMP**

**Range: ON/OFF**

Displays the status of a momentary switch on the instrument panel that enables or disables the PCM-controlled overdrive. OD OFF LAMP reads as follows:

- ON = automatic shifts into 4th gear overdrive are prevented
- OFF = automatic shifts into 4th gear overdrive occur

An indicator lamp in the switch illuminates when the switch is ON. When the ignition is turned off, the switch resets. When a transmission overheating occurs, the TCM automatically inhibits overdrive operation, the indicator lamp illuminates, and this parameter reads ON.

**O-D OVERRIDE**

**Range: ON/OFF**

Displays the status of a momentary push-button switch located in the instrument panel that switches the PCM-controlled overdrive override mode on and off.

O-D OVERRIDE reads as follows:

- ON = automatic shifts into overdrive occur
- OFF = shifts into overdrive are prevented

**OD OVERRIDE LMP**
**Range: ________ ON/OFF**

Reads ON when the PCM has commanded the overdrive override indicator lamp to light. On a properly functioning system, an illuminated lamp indicates that overdrive operation is inhibited.

**OD SWITCH**
**Range: ________ ON/OFF**

Displays the dash-mounted push button overdrive switch status and reads as follows:

- ON when the switch contacts are closed to prevent the transmission from shifting into overdrive
- OFF when the contacts are open to allow shifting into overdrive

**OUT SHAFT(RPM)**
**OUTPUT RPM**
**Range: ________ 0 to vehicle max**

Displays the transmission output shaft speed

**OVERDRIVE SOL**
**Range: ________ ON/OFF**

This parameter, used on rear-wheel-drive trucks, shows if the TCM has energized the overdrive solenoid for the transmission. It reads as follows:

- YES when all requirements to allow overdrive engagement are met
- NO when they are not

This parameter indicates that the PCM command has been given. It is not a feedback signal to indicate that overdrive has actually engaged or responded to the command.

**PART NO.**
**Range: ________ variable**
**VERSION NO.**
**Range: ________ 0.0 to F.F**
**IGN CYCLES**
**Range: ________ 0 to 255**

Displays the TCM part number and revision, as well as the number of ignition cycles since the transaxle memory was last reset.

**PRNODDL**
**NEUTRAL SW 1**
**REV LIGHT SW 1**
**NEUTRAL SW 2**
**REV LIGHT SW 2**
**C1 SWITCH**
**C2 SWITCH**
**C3 SWITCH**
**C4 SWITCH**
**Range: ________ OPEN/CLSD**

For the A604 (41TE) transaxle, the TCM monitors four inputs from the PRNODDL and neutral-start switches. For the 42LE transaxle, the TCM monitors four inputs from the manual valve lever position sensor (MVLPS) sensor. These TCM inputs indicate what gear is selected by the driver.

The TCM uses this information to determine the gear range and shift pattern to use. The TCM recognizes each shift lever selection as a specific combination of open (off) and closed (on) contacts in the switches. The combinations are shown in the following two tables:

**Table 12-3** *Shift lever position and switch state combinations*

| PRNODDL Display | Switch State | | | |
|---|---|---|---|---|
| | NS1 | RL1 | NS2 | RL2 |
| PARK | CLSD | OPEN | CLSD | OPEN |
| REV | OPEN | CLSD | OPEN | CLSD |
| NEUT | CLSD | OPEN | OPEN | CLSD |
| OD | OPEN | CLSD | OPEN | OPEN |
| DRIVE | OPEN | OPEN | OPEN | CLSD |
| LOW | OPEN | OPEN | CLSD | OPEN |

**Table 12-4** *Shift lever position and switch state combinations*

| PRNODDL Display | Switch State | | | |
|---|---|---|---|---|
| | RL1 (C1) | RL2 (C2) | NS1 (C3) | NS2 (C4) |
| PARK | CLSD | CLSD | CLSD | OPEN |
| REV | OPEN | CLSD | OPEN | OPEN |
| NEUT | CLSD | CLSD | OPEN | CLSD |
| OD | OPEN | OPEN | OPEN | CLSD |
| DRIVE (3) | OPEN | OPEN | CLSD | OPEN |
| LOW | OPEN | CLSD | CLSD | CLSD |

The parameters are abbreviated as follows:

C1 = C1 SWITCH

C2 = C2 SWITCH

C3 = C3 SWITCH

C4 = C4 SWITCH

NS1 = NEUTRAL SWITCH 1

NS2 = NEUTRAL SWITCH 2

RL1 = REVERSE LIGHT SWITCH 1

RL2 = REVERSE LIGHT SWITCH 2

For the 1995 and earlier A604 (41TE), the PRNODDL, NS1, NS2, RL1, and RL2 parameters display. The PRNODDL, C1, C2, C3, and C4 parameters display for the 1993 and later 42LE and for the 1996 and later 41TE. Chrysler may refer to the PRNODDL position switch as the MVLPS or TRS sensor.

**PR SENS OFF(V)**
**TRNSDCR OFF SET**
**PRESS SENS OFF**
**Range:** ________ **0 to 5.00 V**

The pressure sensor offset voltage is used internally by the PCM to calculate actual governor pressure. The governor pressure transducer reads absolute pressure. This offset value is used to compensate for barometric pressure and correct the governor pressure reading.

**REV LOCKOUT SOL**
**Range:** ________ **ON/OFF**

Displays the PCM command status for the reverse lockout solenoid and reads as follows:

- ON when vehicle speed is below 5 MPH (8 KPH) and the TCM energizes the solenoid, which completes a ground path that allows the transmission to shift into reverse
- OFF when vehicle speed is above 5 MPH (8 KPH) and the ground is open, which prevents the transmission from shifting into reverse

**SHIFT LEVER**
**Range:** ________ **P-N–/-R-DL**

This park/neutral switch parameter indicates whether an automatic transmission is in park, neutral, or one of the drive ranges.

SHIFT LEVER reads as follows:

- P-N– if the transmission is in either park or neutral
- -R-DL if the transmission is in any forward gear or reverse

**SNSR SUPPLY(V)**
**Range:** ________ **0 to 5.00 V**

This parameter displays voltage available to the transmission sensors.

**SOLENOID 1**
**SOLENOID 2**
**SOLENOID 3**
**Range:** ________ **ON/OFF**

Displays the shift solenoids 1, 2 and 3 status.

- Shift solenoid 1 controls line pressure for 2-3 upshifts and 3-2 downshifts.
- Shift solenoid 2 controls line pressure during 1-2 and 3-4 upshifts and during 4-3 and 2-1 downshifts.
- Shift solenoid 3 controls line pressure to the TCC lockup relay valve.

SOLENOID 1 should read as follows:

- ON whenever the vehicle is not moving and the transmission is in either 1st or 2nd gear
- OFF whenever the transmission is in 3rd or 4th gear

SOLENOID 2 should read as follows:

- ON whenever the transmission is in either 2nd or 3rd gear
- OFF whenever the vehicle is not moving or the transmission is in low (1st) or 4th gear

SOLENOID 3 should read as follows:

- ON when the TCC is engaged
- OFF whenever the vehicle is not moving, and should remain OFF until torque converter clutch lockup is wanted

For additional information, see the “LOCK-UP” on page 291.

**TABLE ID**
**Range: ______ 0 to 255**

No definition is currently available for this parameter.

**TCC INHIBIT**
**Range: ______ YES/NO**

Reads YES when a PCM command is preventing torque converter clutch engagement.

**TCC LOCKED**
**Range: ______ FULL/PARTIAL/NO**

Displays the torque converter clutch (TCC) status. The hydraulically applied TCC is controlled electronically through the solenoid assembly.

**TCC SOL**
**Range: ______ ON/OFF**

Displays the PCM command status for the torque converter clutch (TCC) solenoid and reads ON when the PCM is energizing the TCC solenoid.

**THROTTLE(°)**
**Range: ______ 0 to 161°**
**THROTTLE(%)**
**Range: ______ 0 to 100%**
**THROTTLE POS(V)**
**Range: ______ 0 to 5.0 V**
**TPS(V)**
**Range: ______ 0 to 5.0 V**
**TPS ANGLE(°)**
**Range: ______ 0 to 135°**

The TCM uses a signal from the throttle position (TP) sensor to help determine shift points and shift quality. The TCM receives the throttle position sensor voltage signal from the engine computer on the CCD data bus, and directly from the TP sensor. For self-diagnostic purposes, the transmission controller compares these signals.

**TRANS OVRHT LMP**
**TRANS TEMP LMP**
**Range: ______ ON/OFF**

Displays the PCM command signal to the transmission temperature indicator on the instrument cluster and read as follows:

- ON indicates that the transmission is overheating and the lamp should be lit
- OFF indicates normal operation

**TRANS PWR RLY**
**Range: ______ ON/OFF**

Displays the ON and OFF status of the transmission power relay. The transmission power relay provides battery voltage to the overdrive solenoid, the torque converter clutch solenoid, and the variable force, or governor pressure, solenoid.

**TRANS STATE**
**Range: ______ COLD/COLD!/COLD!/WARM/HOT**

Displays the temperature of the transmission fluid. The TCM uses this input to change shift characteristics based on fluid temperature.

**TRANS TEMP(°F)**
**Range: ____________________ -83.2 to 376°F**
**TRANS TEMP(°C)**
**Range: ____________________ -64 to 191°C**

Displays the automatic transmission fluid temperature. The TCM internally calculates this value on 1989–95 vehicles. For 1996 and later models, the TCM relies on the signal from the transmission fluid temperature (TFT) sensor. The engine must be running for an accurate value to display.

**TRANS TEMP(V)**
**Range: ____________________ 0 to 5.00 V**

Displays the temperature of the automatic transmission fluid as voltage. As fluid temperature increases, so does the voltage.

**Trans Temperature Voltage(V)**
**Range: ____________________ 0 to 5.0 V**

Displays the output voltage from the transmission fluid temperature (TFT) sensor.

**UPSHIFT SW**
**Range: ____________________ ON/OFF**

Displays the normally open upshift switch status, which is operated by moving the gear selector lever to the right.

UPSHIFT SW reads ON if the switch contacts are closed to complete the circuit and allow current. When the system functions properly, the transmission upshifts one gear each time the switch contacts close.

# Body Parameters

This section defines data parameters available from various electronic control modules that regulate body systems on Chrysler and Jeep vehicles. Available systems include:

- Body Control Module (BCM)
- Engine Control Node (ECN)
- Electronic Instrument Cluster (EIC)
- Stand-Alone Serial Bus Traveler (SASBT)
- Serial Bus Traveler (SBT)
- Electronic Vehicle Information Center (EVIC)
- Electronic Temperature and Compass (ETC)
- Air Suspension (AS)

Many of the parameters in this section are listed in groups because they all perform a similar function, though for different circuits in the system. To find the description of a specific parameter, locate the parameter name in the Chrysler parameter list on “Alphabetical Parameter List” on page 235.

**A/T PRESS. SW**
**BRAKE FLUID SW**
**BRAKE PAD INP**
**CLNT LEVEL SW**
**OIL LEVEL SW**
**Range: ____________________ OPEN/CLSD**

Displays the various engine control node (ECN) switches. The ECN collects input data from the switches and sensors in the front area of the vehicle. The engine node transmits data to the electronic vehicle information center (EVIC).

**4 WHEEL DRIVE**
**A/C STATUS**
**AUTO DOOR LOCK**
**BLEND MOTOR**
**BLOWER MOTOR**
**BR LAMP OUTAGE**
**CARGO LAMP**
**CHECK GAGES LMP**
**CHIME**
**COURTESY LAMP**
**DCKLID REL SOL**
**DECKLID AJAR**
**DECKLID SW**
**DOME LAMP**
**DOOR AJAR SW**
**DOOR LOCK RLY**
**DOOR HANDL SW**
**DOOR UNLOCK RLY**
**DRVR DOOR AJAR**
**DRVR DOOR JAMB**
**DRVR DOOR UNLCK**
**FOG LAMP RELAY**
**GATE AJAR**
**GATE AJAR SW**
**HAZARD SW**
**HEADLAMP DELAY**
**HEADLMP OUTAGE**
**HEADLAMPS**
**HIGH BEAMS**
**HIGH BEAM SW(V)**
**HI LOW BEAM**
**HOOD AJAR**
**HORN**
**IGN RUN/START**
**KEY IN IGN SW**
**LIFT GATE AJAR**
**L TURN SIGNAL**
**LOW BEAMS**
**LR DOOR AJAR**
**PASS DOOR AJAR**
**R DEFOG SW**
**R TURN SIGNAL**
**RR DOOR AJAR**
**SEAT BELT SW**
**TCC FULL LOCK**
**TRAC SW**
**WASHER SWITCH**
**WIPERS PARKED**

**Range: ______________________________ see description**

Displays the various switches operated by the body control module (BCM). Most display OPEN or CLSD (closed). However, a few display YES or NO, ON or OFF, HI (high) or LOW, PRSD (pressed) or RLSD (released), or some other variation.

These switch parameters may either display the electrical state of the switch, or the mechanical state of the component the switch services. Switch states may not match the state of their associated components.

For example, the driver door ajar parameter may indicate switch state and read OPEN when the door is actually closed on some models. On others, the same parameter may read OPEN, indicating mechanical state, when the door is actually open. Generally, it is adequate to verify that a switch state alternates between states.

**AUTO HDLMP(V)**
**DOOR STALL**
**MODE DOOR(V)**
**TMP AIR DR(V)**
**Range: ____ 0 to 327.7 V**
**PANEL (V)**
**A/C SWITCH(V)**
**BATTERY(V)**
**Range: ____ 0 to 18.9 V**
**BATTERY1(V)**
**BATTERY2(V)**
**IGN/RUN(V)**
**Range: ____ 0 to 16 V**
**IGNITION(V)**
**Range: ____ 0 to 16.6 V**
**FUEL LEVEL (V)**
**Range: ____ 0 to 8.7 V**
**DOME SW(V)**
**Range: ____ 0 to 5 V**
**DOOR LOCK(V)**
**Range: ____ 0 to 9.9 V**
**OIL PRESS (V)**
**Range: ____ 0 to 9.2 V**
**Engine TEMP(V)**
**Range: ____ 0 to 15.6 V**
**EVAPO TEMP(V)**
**Range: ____ off 1.2, on 2.65 V**

Displays the various body control module (BCM) control voltages. The BCM communicates over the CCD or PCI bus network. The BCM transmits data to the electronic vehicle information center (EVIC) and to the electronic instrument cluster (EIC). The BCM receives data from the engine control node (ECN), powertrain control module (PCM), transmission control module (TCM), and air suspension control module.

**COOLANT SW(V)**
**FOG LAMPS**
**F WIPER SW(V)**
**HEADLAMP SW(V)**
**HIGH BEAM SW(V)**
**IGNITION SW(V)**
**I-WIPE DELAY(V)**
**I-WIPE ENABLE(V)**
**L B-PILLAR SW(V)**
**L DR KEY SW(V)**
**L DR LCK SW(V)**
**LGATE HNDL SW(V)**
**LGATE KEY SW(V)**
**OH L-GATE SW(V)**
**OH PWR DR SW(V)**
**OUT AMB TMP(V)**
**PARK LAMPS**
**WR TOP SW(V)**
**RADIO SW(V)**
**R B-PILLAR SW(V)**
**R DR KEY SW(V)**
**R DR LCK SW(V)**
**R WIPER SW(V)**
**TURN SGNL SW(V)**
**WASHER LVL(V)**
**WIPER MODE(V)**
**Range: ____ 0 to 5.00 V**

Displays the various body control module (BCM) control voltages. The BCM communicates over the CCD or PCI bus network. The BCM transmits data to the electronic vehicle information center (EVIC) and to the electronic instrument cluster (EIC). The BCM receives data from the engine control node (ECN), powertrain control module (PCM), transmission control module (TCM), and air suspension control module.

**BODY TYPE**
**Range: ____ G/J or C/Y**

This parameter displays vehicle body type as identified by the BCM.

**COMMON WIRE(V)**
**Range: ____ 0 to 4.92 V**

Displays the common wire voltage shared by all air conditioning system door motors.

**COMPRESSR RELAY**
**EXHST SOL**
**FRNT LT SOL**
**FRNT RT SOL**
**REAR SOLENOID**
**Range: ____ ON/OFF**

These air suspension (AS) control module parameters display the state of various air suspension solenoids and relays.

**COMP/TEMP**
**US/METRIC SW**
**Range: ____ OPEN/CLSD**

These electronic temperature and compass (ETC) parameters display the state of the electronic temperature and compass switches.

**DISPLAY(V)**
**Range: ____ 0 to 69.0 V**
**IGNITION(V)**
**E2(V)**
**Range: ____ 0 to 16.9 V**
**FUEL LEVEL(V)**
**Range: ____ 0 to 8.9 V**

Displays the control voltage of the various stand-alone serial bus traveler (SASBT) circuits. The SASBT is only installed in a vehicle when there are no other body modules. The SASBT shares some serial data with the PCM.

The display parameter reading is the voltage that actually illuminates the vacuum fluorescent display (VFD). The E2 parameter is the voltage that drives the digital readouts on the traveler. The fuel level parameter displays a voltage representing the fuel level in the fuel tank, the actual voltage range varies according to tank capacity. The ignition parameter shows the ignition primary voltage.

**ECONOMY SWITCH**
**FUEL SWITCH**
**INFO. SWITCH**
**RESET SWITCH**
**SET SWITCH**
**TIME SW**
**TEMP SWITCH**
**US/METRIC SW**
**Range: ____ OPEN/CLSD**

These electronic vehicle information center (EVIC) parameters display the various switch states.

The EVIC displays body and engine information that is based on data received from the BCM. Although the information is displayed on the EVIC, the BCM actually calculates and stores the information.

**FRNT RT SNSR A**
**FRNT RT SNSR B**
**FRNT RT SNSR C**
**FRNT LT SNSR A**
**FRNT LT SNSR B**
**FRNT LT SNSR C**
**REAR HT SNSR A**
**REAR HT SNSR B**
**REAR HT SNSR C**
**Range: ____ OPEN/CLSD**

These air suspension (AS) control module parameters display the state of various suspension sensors.

**IGNITION STATUS**
**Range: ____ ON/OFF**

This electronic instrument cluster (EIC) parameter displays the status of the ignition switch.

**INTER WIPER (V)**
**Range: ____ 0 to 17.6 V**

Displays the position of the wiper switch. When the switch is closed, wipers off, the display reads 0 V. As the switch opens, voltage and wiper speed increases.

**L17 SIGNAL**
**Range: ____ OPEN/CLSD**

Displays the headlamp switch status.

**MAN AC BLND(V)**
**Range: ____ 0 to 327.7 V**

Displays the voltage that indicates the position of the temperature control knob. When set to cold, voltage is low. When set to warm, voltage is high.

**MODE SW MUX(V)**
**Range: ____ 0 to 327.7 V**

Displays the voltage that indicates the position of the air climate mode switch. For each setting, such as air conditioning, heat, and defrost, this parameter displays a unique voltage.

**OPTICAL HORN**
**Range: ____ OPEN/CLSD**

Displays the momentary flash-to-pass headlamp switch status.

**OUTSIDE TEMP (V)**
**Range: ____ 0 to 5.0 V**

This electronic temperature and compass (ETC) parameter shows the voltage output from the temperature sensor in the engine control node (ECN). This data is sent on the data bus to the BCM for conversion to an actual temperature value.

Sensor voltage and temperature are inversely related:

- Low temperature produces high voltage—5.0 V represents the maximum cold
- High temperature produces low voltage—0 V represents the maximum hot temperature

**P-BRK/LO FLU**
**Range: ____ TRUE/FALSE**

A fluid level switch is located in the master cylinder reservoir. If a low fluid condition occurs, the switch closes and the ECM turns on the red brake warning lamp. The display reads TRUE when the switch is closed.

A parking brake switch is connected to the low fluid input to the ECM. When the parking brake is applied, the switch is closed to ground, and the low fluid circuit becomes grounded. The grounded circuit causes the red brake warning lamp to illuminate. If the vehicle is driven with the parking brake applied, the amber check antilock lamp illuminates and a low fluid fault sets.

**PROPER SUPPLY V**
**Range: ____ YES/NO**

This electronic instrument cluster (EIC) parameter displays the status of the supply voltage to the vacuum fluorescent display (VFD) and reads as follows:

- YES if the supply voltage is adequate
- NO if voltage is too low to power the VFD

**NOTE:**
A NO reading may also indicate a power supply failure or low battery voltage at the cluster.

**STEP SWITCH**
**US/METRIC SW**
**Range: ______ OPEN/CLSD**

Displays the serial bus traveler switch states.

**SUNLOAD(V)**
**Range: ______ 0 to 5.00 V**

Displays the signal voltage from the sunlight sensor. This sensor measures light intensity, not temperature. The greater the voltage, the greater the light intensity.

**TRIP RESET SW**
**TRIP/ODOM SW**
**US/METRIC SW**
**LOW OIL PR**
**Range: ______ OPEN/CLSD**

These electronic instrument cluster (EIC) parameters displays various electronic instrument cluster switch states.

**VERSION NO.**
**Range: ______ 0.0 to F.F**

Displays the version of the vehicle electronic control modules. Version numbers are available for the BCM, electronic instrument cluster (EIC) module, engine control node (ECN) module, serial bus traveler or stand-alone serial bus traveler (SASBT), electronic vehicle information center (EVIC), air suspension (AS) module, and electronic temperature and compass (ETC) module.

# Antilock Brake System (ABS) Parameters

This section defines data parameters available from the ABS electronic control module (ECM) on Chrysler and Jeep vehicles.

**2WD/4WD**
**Range:** ______ **2WD/4WD**

Controller Antilock Brake (CAB) from the transfer case switch as to which state the ABS is in.

**ACCUMULATOR(V)**
**Range:** ______ **0 to 5 V**
**STARTER(V)**
**Range:** ______ **0 to 13.5 V**

These Bendix 10 ABS parameters are voltage signals provided by the dual function pressure switch (DFPS) and read as follows:

- 0 V when accumulator pressure rises above 1000 psi and the DFPS accumulator warning contacts close
- 5 V when accumulator pressure is below 1000 psi and the DFPS accumulator warning contacts open, which disables antilock operation and the amber ABS warning lamp lights

**NOTE:**
If the switch is open for two minutes, a diagnostic trouble code (DTC) sets.

The DFPS also provides a ground for the ABS pump motor, and this ground circuit is opened to prevent the pump motor from running during engine cranking. On 1990 and early 1991 Bendix 10 systems, the DFPS grounds through the starter solenoid. On these early vehicles, the starter parameter should read battery voltage during engine cranking, and 0 V at all other times. For late 1991 to 1993 models with Bendix 10 ABS, the DFPS grounds through the switch casing and this parameter is not functional.

**ACT LF DUMP SOL**
**ACT LF ISO SOL**
**ACT REAR DUMP**
**ACT REAR ISO**
**ACT RF DUMP SOL**
**ACT RF ISO SOL**
**DES LF DUMP SOL**
**DES LF ISO SOL**
**DES REAR DUMP**
**DES REAR ISO**
**DES RF DUMP SOL**
**DES RF ISO SOL**
**Range:** ______ **OPEN/CLOSED**

Dodge trucks and full-size vans use a Kelsey-Hayes ABS. It is available in both rear wheel and four wheel systems. The rear wheel only system has one channel and both rear wheels are controlled together. The four wheel system adds a separate channel for each front wheel that are controlled independently for a total of three channels. There are two solenoids per channel, a normally open isolation solenoid and a normally closed dump solenoid. The actual, desired, and electrical state of each can be monitored.

Under normal conditions, all solenoids should be off, all isolation solenoids should open, and all dump solenoids should be closed. When the CAB detects a lockup condition through the wheel speed sensors, the pump motor is activated and the affected channel goes into antilock mode.

The isolation valve is energized closing off any additional hydraulic pressure from reaching the wheel. The dump solenoid is then energized releasing existing pressure and stopping the lockup condition. The two valves cycle back and forth applying and releasing pressure until the pedal is released or the lockup stops.

**BOOST PRESS(V)**
**PRESSURE(V)**
**Range: ____________ 0 to 5 V**

These Bendix 10 parameters display the output signals from the boost and primary pressure transducers.

- The boost pressure transducer senses the boost servo pressure.
- The primary pressure transducer senses the master cylinder primary pressure.

Both transducers convert measured pressure into a 0.25 to 5.0 V linear scale. The ABS ECM compares these two signals to determine proper operation.

Both readings should be close to equal. However, boost pressure is typically a few hundredths of a volt higher due to frictional loss in the master cylinder piston seals.

**BRAKE LAMP SW**
**Range: ____________ ON/OFF**
**BRAKE SW(V)**
**Range: ____________ 0 to Batt+**

These Bendix ABX-4 ABS parameters indicate the position of the brake switch. Either one or the other displays, depending on the vehicle.

For the antilock system to operate, the brake lamp switch parameter must read ON, or the brake switch parameter must read battery voltage.

**BRAKE SW**
**Range: ____________ OPEN/CLOSED**

This Teves ABS parameter shows the position of the normally-open brake switch and reads as follows:

- OPEN when the pedal is released
- CLOSED when the brake pedal is pressed

**DIFF PRESS**
**Range: ____________ OPEN/CLOSED**

This Bendix 9 parameter indicates the status of the pressure differential switch, which is built into the proportioning valve.

DIFF PRESS reads as follows:

- OPEN indicates pressure between the front and rear fluid channels is balanced.
- CLOSED indicates a pressure difference greater than 70 psi exists between the front and rear brake channels. If this occurs, the red brake warning lamp on the instrument panel turns on. The differential pressure switch is active in both normal and ABS braking modes.

**FLS SW #2**
**Range: ____________ OPEN/CLOSED**

Monitors the brake fluid level switch and reads as follows:

- OPEN when the fluid is low
- CLOSED when the brake reservoir is full

**FLUID LEVEL SW**
**Range: ______ OK/LOW**

The fluid level switch is mounted in the master cylinder and sends a signal to the CAB if the fluid level is too low to run the ABS.

**LF CONTINUITY**
**RF CONTINUITY**
**LR CONTINUITY**
**RR CONTINUITY**
**Range: ______ YES/NO**

These Bendix ABX-4 parameters monitor the four wheel speed sensor circuits for continuity and read as follows:

- YES during normal operation
- NO if a wheel speed sensor circuit is open for the related continuity parameter

**LF DUMP SOL**
**LF ISO SOL**
**REAR DUMP SOL**
**REAR ISO SOL**
**RF DUMP SOL**
**RF ISO SOL**
**Range: ______ ON/OFF**

Dodge trucks and full-size vans use a Kelsey-Hayes ABS. It is available in both rear wheel and four wheel systems. The rear wheel only system has one channel and both rear wheels are controlled together. The four wheel system adds a separate channel for each front wheel that are controlled independently for a total of three channels. There are two solenoids per channel, a normally open isolation solenoid and a normally closed dump solenoid. The actual, desired, and electrical state of each can be monitored.

Under normal conditions, all solenoids should be off, all isolation solenoids should open, and all dump solenoids should be closed. When the CAB detects a lockup condition through the wheel speed sensors, the pump motor is activated and the affected channel goes into antilock mode. The isolation valve is energized closing off any additional hydraulic pressure from reaching the wheel. The dump solenoid is then energized releasing existing pressure and stopping the lockup condition. The two valves cycle back and forth applying and releasing pressure until the pedal is released or the lockup stops.

**LF ISOL CYCLE**
**LR ISOL CYCLE**
**RF ISOL CYCLE**
**RR ISOL CYCLE**
**Range: ______ ON/OFF**

The Bendix 10 ABS system includes three build valves, three decay valves, and four isolation valves. Each front wheel has independent build and decay valves, while the rear wheels share a common build valve and a common decay valve.

An isolation valve at each wheel is used to isolate the calipers and wheel cylinders from the master cylinder during ABS operation. When an isolation valve parameter reads ON, pressure at the wheel is modulated through the build and decay valves.

**LF SOL**
**RF SOL**
**LR SOL**
**RR SOL**
**Range: ______________________________ BUILD/DECAY**
**LF SOL(V)**
**RF SOL(V)**
**LR SOL(V)**
**RR SOL(V)**
**Range: ______________________________ 0 to battery+**

These Bendix ABX-4 parameters indicate the status of the build and decay solenoids. There are four build and decay solenoids, one for each wheel. The solenoids are spring-loaded in the released position during normal braking and the parameters read BUILD and 0 V. The ABS control module sends a 12 V signal to actuates each valve, then the parameters read DECAY and 12 V.

When a solenoid parameter reading is BUILD and 0 V, the valve for that wheel directs fluid through a path from the master cylinder to the wheel brakes. When a solenoid parameter reading is DECAY and 12 V, the valve for that wheel directs fluid through a path from the wheel to the sump.

**LF VALVE**
**RF VALVE**
**LR VALVE**
**RR VALVE**
**Range: ______________________________ BUILD/DECAY**

These Bendix 4 and 6 ABS parameters indicate the status of the build and decay valves. There are four valves, one for each wheel.

When BUILD displays, the valve for that wheel provides a fluid path from the wheel brake to the isolation valve. When DECAY displays, the valve for that wheel provides a fluid path from the wheel brake to the fluid sump.

**LF WHEEL(MPH)**
**LR WHEEL(MPH)**
**RF WHEEL(MPH)**
**RR WHEEL(MPH)**
**REAR WHEELS**
**Range: ______________________________ 0 to vehicle max**

Used on all Bendix and Teves systems, indicate the speed signals transmitted by each of the wheel sensors to the PCM. Wheel speeds should be equal to each other, as well as to vehicle speed as the vehicle is driven in a straight line without braking.

Wheel speeds vary as the vehicle turns a corner, and they vary during braking without ABS operation as well. During ABS braking, wheels speeds should remain close to equal.

**LOW ACCUM**
**Range: ______________________________ TRUE/FALSE**

This Bendix 9 parameter indicates the accumulator circuit pressure switch status. The switch is mounted next to the master-cylinder and power booster assembly.

LOW ACCUM reads as follows:

- TRUE means that the pressure in the accumulator circuit has dropped below approximately 1050 psi. When this occurs, the amber check antilock lamp on the instrument cluster illuminates. Approximately 20 seconds later, the red brake warning lamp illuminates as well.

- FALSE means that the pressure in the accumulator circuit is within acceptable limits, or above 1050 psi.

**LOW FLUID SW**
**Range: ____ ON/OFF**

This Bendix 10 ABS parameter shows the state of the low fluid switch, which is located in the hydraulic fluid reservoir. When the brake fluid level is low, the switch closes and the display reads ON. The reading is OFF during normal operation.

With the switch closed, the red brake warning lamp on the instrument panel lights and the parameter reads ON. When the switch is closed at speeds above 3 MPH (5 KPH), the antilock warning lamp also lights and ABS braking is disabled as well.

**MODULATOR RLY**
**Range: ____ TRUE/FALSE**

This Bendix 9 parameter indicates the status of the modulator power relay.

Two seconds after engine startup, the modulator power relay is energized to supply 12 V to the solenoids in the pressure modulator. In addition, when the modulator power relay closes, the amber check antilock lamp on the instrument cluster shuts off.

**MOTOR SPEED**
**Range: ____ ON/OFF**

This Teves ABS parameter indicates the status of the ABS pump motor. When the pump motor runs, a rotation sensor transmits an AC signal to the ABS control module. To determine when the pump is on, the ABS control module compares the rotation sensor signal frequency to an internal reference frequency.

**MP COIL(V)**
**Range: ____zero to 13.5 V**
**MP RELAY COIL**
**Range: ____ ON/OFF**

The Bendix 4 and Bendix ABX-4 ABS motor pump relay turns the pump motor on and off. The voltage parameter indicates the control voltage applied to the coil side of the motor pump relay. The ON/OFF parameter is a pump motor feedback signal to the ABS module. The ABS control module actuates the motor pump relay by internally grounding the circuit. When displayed voltage reaches approximately 12 V, the relay is de-energized and the relay coil parameter should read OFF. When coil voltage reads zero, the relay is energized and the relay coil parameter should read ON.

**PED TRVL SNS**
**Range: ____ see description**

This Teves ABS parameter monitors the position of the brake pedal. The sensor consists of a moveable plunger and a variable resistor with seven steps of resistance. Step 1 represents the brake pedal is completely released, step 7 represents the brake pedal fully pressed. The ABS control module uses this input as an actuator for the pump motor. The sensor is mounted in the power brake booster.

**PS SWITCH**
**Range: ____ OPEN/CLOSED**
**TC SWITCH**
**Range: ____ PRESSED/RELEASED**

These Teves ABS parameters are used only on vehicles with traction control. The pressure switch, which is located in the hydraulic control unit (HCU), is normally-closed and opens when the brakes are applied. The ABS controller uses the pressure switch input to determine when to deactivate the traction control. The traction control (TC) switch is driver activated. The switch must be pressed for 0.25 seconds to disable traction control.

**PUMP**
**PUMP MOTOR**
**MTR PMP CONTROL**
**MTR PUMP RELAY**
**Range: ______ ON/OFF**
**POWER RELAY**
**Range: ______ ON/OFF**
**PUMP(V)**
**MP MONITOR(V)**
**Range: ______ 0 to 13.5 V**

These Kelsey-Hayes, Bendix 4, Bendex 9, ABX-4, and 6 ABS parameters indicate the status of the hydraulic pumps and motor. The hydraulic control unit (HCU) on these systems contains two pump assemblies, one for the primary circuit and one for the secondary. One electric motor drives both pumps. The motor only runs during an ABS stop. The motor pump relay supplies power to the motor.

The motor pump relay parameter is the ABS ECM command to the motor pump relay. All of the other parameters display feedback signals from the pump motor.

Bendix 4 and 6 systems use the PUMP parameter and ABX-4 uses the MTR PMP CONTROL (motor pump control) parameter. Bendix 4 and ABX-4 systems display the MP MONITOR(V) (monitor voltage) parameter and Bendix 6 displays PUMP(V).

When the motor pump relay parameter reads ON, the pump or motor pump control parameter should also read ON. At the same time, the monitor or pump voltage parameter should display battery voltage.

When the motor pump relay reads OFF, the pump or motor pump control parameter should read OFF, and the monitor or pump voltage parameter should read approximately 0 V.

**RED BRAKE LAMP**
**Range: ______ ON/OFF**

This Bendix ABX-4 parameter indicates the ON/OFF status of the red brake warning lamp on the instrument panel. Two switches wired in parallel turn on this lamp. One is a mechanical switch in the parking brake and the other is a pressure switch in the hydraulic system. Both switches are normally open. The display reads OFF when the parking brake is released and there is pressure in the hydraulic system.

**REFERENCE(V)**
**PUMP MOTOR(V)**
**IGNITION(V)**
**Range: ______ 0 to battery+**

These Teves parameters display various system voltages. The reference parameter displays the power feed to the pump motor relay. The pump motor parameter is a feedback signal from the ABS pump motor. The ignition parameter displays the switched battery (B+) voltage.

When the pump motor is energized the pump motor parameter should read battery voltage. Due to electromotive induction (EMI) during an ABS stop, the control module expects to monitor battery voltage from the pump motor for about 400 milliseconds to 3.3 seconds. Then, the reading should go to 0 V.

**SOL UNDERVOLT**
**Range:** ______ **TRUE/FALSE**

This Bendix 9 parameter monitors the status of the 12 V power circuit to the pressure modulator solenoids and reads as follows:

- TRUE when an under-voltage condition occurs
- FALSE when there is 12 V on the circuit

**STOP LAMP SW**
**Range:** ______ **ON/OFF**

This Bendix 4, 6, and 10 ABS parameter indicates the position of the brake switch. This parameter must read ON for the ABS to operate.

**SYSTEM RELAY**
**Range:** ______ **ON/OFF**
**SYSTEM RLY(V)**
**Range:** ______ **0 to 13.5 V**

On Bendix 4, 6, and 10 systems, the system relay energizes at vehicle startup to supply voltage to the ABS.

When the relay state parameter reads ON, the relay voltage parameter should display battery voltage. When the relay state parameter reads OFF, the relay voltage parameter should read approximately 0 V. After vehicle startup, if voltage drops below 9 V, a DTC is set and ABS is disabled.

**SY RLY COIL(V)**
**Range:** ______ **0 to 13.5 V**
**SYS RELAY COIL**
**Range:** ______ **ON/OFF**

On Bendix ABX-4 systems, the ABS control module actuates the system relay by internally grounding the circuit. The displayed voltage is the control voltage signal to the coil side of the system relay. The relay coil state parameter is a feedback signal.

When battery voltage displays, the relay is de-energized and the relay coil state should read OFF. When the display reads 0 V, the relay is energized and the relay coil state parameter should read ON.

**WARNING LAMP**
**WARN LAMP INP**
**YEL ABS LAMP**
**Range:** ______ **ON/OFF**
**WARN LAMP(V)**
**Range:** ______ **0 to 13.5 V**

Bendix 4, ABX-4, 6, and 10 ABS control modules supply a ground to the antilock warning lamp circuit during engine cranking and when a fault is detected. WARNING LAMP is the output command to the lamp. WARN LAMP INP (warning lamp inoperative) and WARN LAMP(V) (warning lamp voltage) are the feedback signals.

Whenever the lamp is off, both state parameters should read OFF and battery voltage should display. When the lamp is on, both state parameters should read ON and the voltage parameter should display about 0 V. Some vehicles do not display the voltage parameter. YEL ABS LAMP is the desired state of the yellow ABS lamp.

Chapter 13

# Ford Data Parameters

This chapter contains information for interpreting data parameters on Ford vehicles.

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


- "Ford Operations" on page 52
- "Ford Testing" on page 68
- "Ford Communications Problems" on page 716


## Alphabetical Parameter List

### Numerics



### A

## B

# C

## D

## E

## F

## H

## I

## K



## L

## M

## N



## O

## P

## R

## S

## T

## U



## V

## W

# 4x4 Parameters

**4_LOW_LED**
**Range:** ________ **ON/OFF**

Displays the 4x4 low status.

**4WDCPWMST(%)**
**Range:** ________ **0 to 100%**

**4WDCPWMOU**
**4WD CLUTCH**
**PWM STATUS**
**Range:** ________ **ON/OFF**

Displays the 4WD clutch PWM status.

**4WDHIGLMP**
**Range:** ________ **ON/OFF**

Displays the 4WD HIGH indicator lamp status.

**4WDINP_SW**
**Range:** ________ **2-W DRIVE, GND, OPEN, 4-W LOW, NEUTRAL, A4WD, 4W AUTO/HI**

Displays the 4WD switch status.

**4WDLOWLMP**
**Range:** ________ **ON/OFF**

Displays the 4WD LOW warning indicator.

**4WDMODE_L**
**Range:** ________ **ON/OFF**

Displays the 4WD mode lamp status.

**4X4_BOO**
**Range:** ________ **ON/OFF**

Brake ON/OFF status.

**4X4CCWRLY**
**Range:** ________ **ON/OFF**

Displays the transfer case shift relay (L2H) counterclockwise status.

**4X4_CWRLY**
**Range:** ________ **ON/OFF**

Displays the 4WD HIGH indicator LED.

**ABS_ACTIVE**
**Range:** ________ **ON/OFF**

Displays the clockwise relay control status.

**ABS_MSG**
**Range:** ________ **PRESENT/NOT PRESENT**

Displays the CAN message from the ABS status.

**ABS_PWR_R**
**Range:** ________ **ON/OFF**

Displays the antilock braking system power relay output status.

**CCNT**
**Range:** ____ **actual**

Displays the number of continuous codes present.

**CLCH_SOL (%)**
**Range:** ____ **0 to 100%**

Displays the PWM Output control command #1 status.

**COPENPLAT**
**Range:** ____ **actual**

Displays the currently open contact plates status.

**CW_CCW**
**Range:** ____ **actual**

Displays the clockwise relay control status.

**FR_OUTSHA**
**Range:** ____ **actual**

Displays the front shaft speed status.

**HALLPOWER**
**Range:** ____ **ON/OFF**

Displays the hall-effect sensor power status.

**HIGH_LAMP**
**Range:** ____ **ON/OFF**

Displays the 4WD HIGH indicator LED status.

**IGN_SW**
**Range:** ____ **START/RUN**

Displays the ignition switch status.

**IGNITION(V)**
**Range:** ____ **actual**

Displays the ignition status.

**IWE_SOL**
**IWE_SOLST**
**Range:** ____ **ON/OFF**

Displays the integrated wheel ends solenoid status.

**LF_WSPD**
**Range:** ____ **actual**

Displays the left front wheel speed sensor speed.

**LR_WSPD**
**Range:** ____ **actual**

Displays the left rear wheel speed sensor speed.

**LFDR_SW**
**Range:** ____ **AJAR/CLOSED**

Displays the left front door ajar switch status.

**LOW_LAMP**
**Range:** ____ **ON/OFF**

Displays the 4WD Low indicator status.

**MTR_CCW**
**Range:** ________ **ON/OFF**

Displays the counterclockwise shift motor driver output state.

**MTR_CW**
**Range:** ________ **ON/OFF**

Displays the clockwise shift motor driver output state.

**NSAFETYSW**
**Range:** ________ **NEUTRAL/OFF**

Displays the neutral safety switch state.

**NTF_4X4M**
**NTF_CMD**
**Range:** ________ **ON/OFF**

Displays the neutral tow function state.

**NTF_LAMP**
**TOW_LAMP**
**Range:** ________ **ON/OFF**

Displays the neutral tow light state.

**OILPRES**
**Range:** ________ **actual**

Displays the all-wheel drive oil pressure before any FMEM substitution.

**OIL_TMP**
**Range:** ________ **actual**

Displays the all-wheel drive oil temperature before any FMEM substitution.

**PCM_MSG**
**Range:** ________ **PRESENT/NOT PRESENT**

Indicates if a CAN message is missing from the PCM.

**PLATE_A**
**Range:** ________ **OPEN/CLOSED**

Displays the transfer case contact plate switch A state.

**PLATE_B**
**Range:** ________ **OPEN/CLOSED**

Displays the transfer case contact plate switch B state.

**PLATE_C**
**Range:** ________ **OPEN/CLOSED**

Displays the transfer case contact plate switch C state.

**PLATE_D**
**Range:** ________ **OPEN/CLOSED**

Displays the transfer case contact plate switch D state.

**PLATE_PWR**
**Range:** ________ **ON/OFF**

Displays the contact plate power state.

**PMP_AMP**
**Range:** ______ **actual**

Displays the pump current, actual amperage.

**R_PUTSHA**
**Range:** ______ **actual**

Displays the rear shaft speed.

**RF_WSPD**
**Range:** ______ **actual**

Displays the right front wheel speed sensor speed.

**RR_WSPD**
**Range:** ______ **actual**

Displays the right rear wheel speed sensor speed.

**RPM_ENG_E4WD**
**Range:** ______ **actual**

Displays the engine speed.

**SELTESTDTC**
**Range:** ______ **actual**

Displays the diagnostic trouble codes state.

**SHMOTCCLO**
**Range:** ______ **ON/OFF**

Displays the counterclockwise shift motor driver short to ground status.

**SHMOTCLOC**
**Range:** ______ **ON/OFF**

Displays the clockwise shift motor driver short to ground status.

**TCYC_FS**
**Range:** ______ **ACTIVE/PASSIVE**

Displays the traction control system state.

**TPI**
**Range:** ______ **0 to 5V**

Displays the throttle position state.

**TRCASEGND**
**Range:** ______ **0V**

Displays the transfer case contact plate ground return.

**VBATT**
**Range:** ______ **0 to 15V**

Displays the battery positive voltage.

**VLV_AMP**
**Range:** ______ **actual**

Displays the valve current an actual amperage.

**VLVCHAR**
**Range:** ______ **not available**

Displays the valve characteristic signal.

**VSS(KPH/MPH)**

**Range: ______________________________ actual**

Displays the vehicle speed.

# Powertrain Control Module (PCM) Parameters

This section defines data parameters available from the engine control module or the powertrain control module (PCM) on Ford vehicles.

**3/2 SHIFT SOL**
**4/3 SHIFT SOL**
**Range: ______ ON/OFF**

Displays the state of the two solenoids used to activate the 3-2 and 4-3 downshift valves during deceleration. It reads ON when the solenoids are energized.

**4X4Low**
**Range: ______ ON/OFF**

Displays the state of the 4-wheel drive low switch on the instrument panel. The switch sends a signal to the PCM when 4x4 low is ON, which is used to adjust the transmission shift schedule.

4x4Low reads as follows:

- ON when the switch circuit is closed
- OFF when the switch is open

**A_CT(°C/°F)**
**Range: ______ actual**

Displays the evaporator temperature state.

**A_CT(V)**
**Range: ______ not available**

Displays the evaporator temperature signal voltage.

**A/CClutchSw**
**Range: ______ ON/OFF**

Displays the state of the A/C cycling switch. The PCM uses this parameter to adjust engine speed for added load.

A/CClutchSw reads as follows:

- ON when the switch is closed
- OFF when the switch is open

**A/CPrs(V)**
**Range: ______ 0.0 to 5.0 V**

Displays the condition of the air conditioning pressure (ACP) switch and reads as follows:

- 0 V when the switch is closed
- 4.0–5.0 V when the switch is open

On some models, the PCM turns on the high-speed cooling fan if ACP readings indicate A/C compressor head pressure is over 325 psi. The PCM may also use the signal to control idle speed and the A/C clutch.

**AAT(°C/°F)**
**Range: ______ actual**

Displays the ambient air temperature.

**ACFD_BAT**
**Range: ______ ON/OFF**

Displays the A/C full demand switch for the battery area status.

**ACFD_PAS**
**Range: ______ ON/OFF**

Displays the A/C full demand switch for the passenger area status.

**AC_RC_SW**
**Range: ______ ON/OFF**

Displays the A/C recirculation switch status.

**ACCS**
**Range: ______ ON/OFF**

Displays the air conditioning compressor cycling switch status.

**ACCS=A/C**
**Range: ______ ON/OFF**

Displays the position of the air conditioning cycle switch (ACCS). It reads ON if the A/C switch on the instrument panel is on, or the PCM is commanding A/C on.

In some cases, the A/C compressor may not turn on even though the switch is closed. Several other switch or sensor signals may prevent the PCM from engaging the A/C compressor clutch.

**ACClutchHEV**
**Range: ______ ON/OFF**

Displays the air conditioning clutch status

**ACDS1**
**Range: ______ ENABLE/DISABLE**

Displays the air conditioning diagnostic switch 1 status.

**ACDS2**
**Range: ______ ENABLE/DISABLE**

Displays the air conditioning diagnostic switch 2. status

**ACL=ACCEL**
**Range: ______ ON/OFF**

Displays the accelerometer status.

**AclPedl(V)**
**Range: ______ 0.0 to 5.0 V**

Displays the accelerator pedal (AP) sensor signal voltage to the PCM on diesel control systems. The AP sensor is similar to the throttle position sensor on a gasoline engine.

The AP sensor signal is used to calculate the fuel injection quantity and to control the exhaust backpressure regulator. The MIL lights if the AP sensor signal does not match the IVS signal at idle. A faulty AP sensor allows the engine to run at low idle speed only.

**ACP**
**Range: ______ ON/OFF**
**ACP**
**Range: ______ OPEN/CLOSED**
**ACP**
**Range: ______ actual**

Displays the air conditioning pressure switch. status

**ACRDV**
**Range: ______ ON/OFF**

Displays the A/C refrigerant distribution valve command.

**ACRDV_F**
**Range: ____ YES FAULT/NO FAULT**

Displays the A/C refrigerant distribution valve status.

**ACT_MNT**
**Range: ____ ON/OFF**

Displays the active mount control command.

**ACTF**
**Range: ____ YES/NO**

Displays the inlet air temperature status.

**ACTMNT_F**
**Range: ____ YES FAULT/NO FAULT**

Displays the active mount control status.

**AFT_ADDS**
**Range: ____ not available**

Displays the passenger side power sliding door module status.

**AFT2_ADDS**
**Range: ____ not available**

Displays the adaptive fuel table 2 status.

**AIR**
**Range: ____ ON/OFF**

PCM command to the electric air pump and reads ON when the PCM has commanded the air pump on. The parameter also indicates the secondary air injector. The AIR and AIRMonitor parameters should read the same.

**AIR A**
**Range: ____ ON/OFF**

Displays the PCM command to the secondary air relay. It reads ON when the PCM is energizing the relay solenoid to close the relay contacts and run the air pump.

**AIR_FLT**
**Range: ____ YES FAULT/NO FAULT**

Displays the secondary air injection status.

**AIRBA**
**Range: ____ ON/OFF**

Displays the secondary air bypass actual status.

**AIRBypass**
**AIR B**
**Range: ____ ON/OFF**

Displays the air bypass solenoid, which controls vacuum to the air bypass valve, status. If bypass is activated, air is directed to either the catalyst or an upstream-downstream valve. When the system is deactivated, air is blocked from the catalyst or routed to atmosphere.

These parameters read as follows:

- ON when the air bypass solenoid is on and air bypass voltage is low
- OFF if the solenoid is off and air bypass voltage is high

**AIRCON_SW_STATUS**
**Range: ______ ON/OFF**

Displays the air conditioning switch status.

**AIRD**
**Range: ______ ON/OFF**

Displays the secondary air injection divert state.

**AIRDA**
**Range: ______ ON/OFF**

Displays the secondary air divert actual status.

**AIRDivert**
**AIR D**
**Range: ______ ON/OFF**

Displays the state of the air diverter solenoid, which controls vacuum to the air diverter valve. When the air diverter system is activated, air is routed upstream on many systems.

These parameters read as follows:

- ON when the air diverter solenoid is on and air bypass voltage is low
- OFF when the solenoid is off and voltage is high

**AIREVAL_DC_MODE1**
**Range: ______ YES/NO**

Displays whether the secondary air system was evaluated.

**AIRFault**
**Range: ______ YES/NO**

Displays the secondary air injection system condition and reads YES when a fault is present.

**AIRM**
**Range: ______ ON/OFF**

Displays the status of the secondary air monitor.

**AIRMonitor**
**Range: ______ ON/OFF**

Displays the status for the electric air pump based on a PCM feedback signal and reads ON if the PCM detects a voltage change when the pump is commanded on. The AIR and AIRMonitor parameters should read the same.

**ANTISCAN**
**Range: ______ACTIVE/OFF**

Displays the anti-scan function status.

**AP(%)**
**Range: ______ 0 to 100%**

Displays the accelerator pedal position.

**AP(V)**
**APP1(V)**
**APP2(V)**
**APP3(V)**
**Range: ____ 0 to 5.00 V**

Displays the voltage signal of the accelerator pedal position on a diesel engine control system. The accelerator position (AP) sensor is a three-wire potentiometer.

**Table 13-1** *Normal AP sensor voltage readings*

| SENSOR | CLOSED THROTTLE | WIDE OPEN THROTTLE |
|---|---|---|
| APP1 | 3.9–4.2 V | 0.7–1.2 V |
| APP2 | 1.4–1.6 V | 3.6–4.1 V |
| APP3 | 0.8–1.1 V | 3.1–3.5 V |

**AP_MODE_TCM**
**Range: ____ PT/WOT/CT**
**AP_PER_TCM(%)**
**Range: ____ l0 to 100%**

Displays the accelerator pedal position.

**APP_MODE**
**Range: ____ CT/PT/WOT**

Indicates whether the APP sensor mode is closed throttle (CT), partial throttle (PT), or wide open throttle (WOT).

**APP_F**
**Range: ____ NO FAULT/FAULT**

Displays the accelerator pedal position status.

**APP1(V)**
**Range: ____ 0 to 5V**

Displays the accelerator pedal position sensor 1 status.

**APP_LOW(V)**
**Range: ____ 0 to 5V**

Displays the closed throttle status.

**ARPMDES(RPM)**
**Range: ____ not available**

Displays the ancillary RPM desired, which is the engine speed required to maintain the vehicle speed being commanded by the speed control system.

**AST**
**AST2**
**Range: ____ not available**

Displays the time since start in seconds.

**AXLE**
**Range: ____ not available**

This parameter indicates the axle ratio.

**BARO(Hz)**
**Range: ____________________ 125 to 160 Hz)**

Displays the barometric pressure in cycles per second, or Hertz (Hz) and should read as follows:

- 160 Hz at sea level
- 125 Hz at an elevation of 10,000 feet

**BARO(V)**
**Range: ____________________ 2.6 to 4.6 V**

Displays the barometric pressure as voltage and should read as follows:

- 4.6 V at sea level
- 2.6 V at an elevation of 10,000 feet

**BLoWerMoToR**
**Range: ____________________ ON/OFF**

Displays the blower motor status.

**BLSHORT BATT**
**Range: ____________________ YES/NO**

Displays the presence of a short to battery positive in the blower motor circuit. A YES reading means that a short exists.

**BLSHORT GND**
**Range: ____________________ YES/NO**

Displays the presence of a short to ground in the blower motor circuit. A YES reading means that a short exists.

**BOO**
**Range: ____________________ ON/OFF**

Displays the brake ON/OFF switch status.

**BOO=BRAKE SW**
**Range: ____________________ ON/OFF**

Displays the brake pedal switch status. Whenever the brake pedal is pressed, the brake ON/OFF (BOO) switch sends a battery voltage signal to the PCM.

BOO=BRAKE SW should read as follows:

- ON when the brake pedal is pressed
- OFF at all other times

Depending on the vehicle, the PCM may adjust engine idle speed with the brakes applied and the A/C turned on, or may turn the A/C off after a preset time. On vehicles with locking torque converters, the PCM may unlock the torque converter when the brakes are applied.

**BP=BARO (kPa)**
**BP=BARO (”HG)**
**Range: ____________________ see description**

Displays the barometric pressure, which is calculated by the PCM based on the frequency of the barometric pressure (BP) sensor signal.

This parameter reads as follows:

- 102 kPa (30.1 inHG at sea level).
- 78 kPa (23 inHG at 7,000 feet).

Actual readings vary with weather conditions that cause barometric pressure to change.

**BPA**
**Range: ______ ON/OFF**

Displays the brake pressure applied switch status.

**BPA_SW**
**Range: ______ ON/OFF**

Displays the brake pedal position status.

**BPO**
**Range: ______ YES/NO**

Displays the battery power off request status.

**BPO_Hz**
**Range: ______ not available**

Displays the battery power off signal.

**BPP_BOO**
**Range: ______ ON/OFF**

Displays the brake pedal position.

**BrakeOnOff**
**Range: ______ ON/OFF**

Displays the brake pedal switch state and reads as follows:

- ON when the brakes are applied
- OFF when the brakes are not applied

This parameter should read the same as the BOO=BRAKE SW parameter.

**CAMDC 1**
**CAMDC 2**
**Range: ______ 0 to 99%**

Displays the duty cycle of the variable cam timing solenoids.

- CAMDC 1 = bank 1
- CAMDC 2 = bank 2

**CAMDCR**
**Range: ______ 0 to 99%**

Displays the “On” time of the variable camshaft timing (VCT) solenoid as requested by the PCM.

CAMDCR should read as follows:

- Near 0% with the engine running at a warm idle, camshaft fully advanced with no EGR
- Near 50% with a warm engine and the vehicle operating at a steady cruise speed

**CAMERR1**
**CAMERR2**
**Range: ______ 0 to 360°**

Displays the variable cam timing error in crankshaft degrees.

- CAMERR 1 = bank 1
- CAMERR 2 = bank 2

**CANP=PURGE**
**Range: ______ ON/OFF**

Displays the canister purge solenoid state. The solenoid opens the canister purge (CANP) valve to regulate the flow of fuel vapors from the EVAP canister to the intake manifold.

- When the engine is at operating temperature, the solenoid turns ON. This opens the canister purge valve and purging occurs.
- When the engine is at idle or below operating temperature, the solenoid turns OFF. The valve closes and purge stops.

**CASeGND(V)**
**Range:** ____ **-16.0 to 16.0 V**

Displays the voltage difference between the PCM case ground and the hardwired Fuel Level Input from the fuel pump driver module.

- Above 0.050 V indicates high resistance
- 0.027 V is a typical reading

**CAT MONITOR**
**CAT mon ready**
**Range:** ____ **YES/NO**

Indicates whether the Catalyst Efficiency Monitor has completed and read as follows:

- YES if the monitor completed
- NO if it did not

**CATCAL1(Hz)**
**CATCAL2(Hz)**
**Range:** ____ **1 to 4 Hz**

Displays the catalyst calibrated frequency for each cylinder bank, which is determined by the PCM based on engine load and RPM. See CATTST for further information.

**CATEVAL_DC_MODE1**
**Range:** ____ **YES/NO**

Displays the catalyst monitor evaluated status.

**CATTST1(Hz)**
**CATTST2(Hz)**
**Range:** ____ **1 to 4 Hz**

Displays the Steady State CAT monitor measured frequency for banks 1 and 2. These parameters are only used in 1996 OBD-II vehicles. The reading is the frequency of the rear O2S during a catalyst efficiency monitor test. This number is compared to a calibrated frequency number determined by the PCM (CATCAS) based on engine load and RPM.

If the CATTST value is greater than CATCAL, a Diagnostic Trouble Code (DTC) is stored. The DTCs associated with this test are DTCs P0420 and P0430. The MIL is activated after a fault is detected on two consecutive drive cycles.

If the CATTST value is less than CATCAL the catalyst monitor will indicate YES or passed.

**CCC=TCC**
**Range:** ____ **LOCKED/OFF**

Displays the PCM command to the torque converter clutch control (TCC) solenoid and reads:

- LOCKED when the TCC is engaged
- OFF when the TCC is disengaged

**CCL**
**Range:** ____ **ON/OFF**

Displays the fuel cap off indicator lamp state.

**CCLF**
**Range: ________ YES FAULT/NO FAULT**

Displays the fuel cap off indicator lamp fault state.

**CCMSTAT_DC_MODE1**
**Range: ________ YES/NO**

Displays the comprehensive components monitor evaluated state.

**CCS**
**Range: ________ ON/OFF**

Displays the coast clutch solenoid state.

**CCS_FLT**
**Range: ________ YES FAULT/NO FAULT**
**CCSFault**
**Range: ________ YES/NO**

Displays the presence of a fault in the coast clutch solenoid circuit. Reads YES or YES FAULT when a circuit fault is present.

**CCSA**
**Range: ________ ON/OFF**

Displays the PCM feedback signal indicating the actual state of the coast clutch solenoid. When activated, fourth gear is disabled to allow engine braking in third gear. CCSA and the CoastClSol readings should simultaneously display ON or OFF.

**CHT(°C/°F)**
**CHT SENSOR(°)**
**Range: ________ ON/OFF**

Displays the cylinder head temperature.

**CHT_COLD(°C/°F)**
**Range: ________ actual**

Displays the cylinder head temperature cold value.

**CHT_HOT(°C/°F)**
**Range: ________ actual**

Displays the cylinder head hot value.

**CHT_V(°C/°F)**
**Range: ________ not available**

Displays the cylinder head temperature.

**CHTFM**
**Range: ________ YES FAULT/NO FAULT**

Displays the cylinder head temperature status.

**CHTIL**
**Range: ________ ON/OFF**
**CHTILFault**
**Range: ________ YES/NO**
**CHTIL_FLT**
**Range: ________ FAULT/NO FAULT**

Displays the operating status of the Cylinder Head Temperature Indicator Lamp (CHTIS).

- CHTIL reads ON when the lamp is on.
- CHTILFault reads YES if a fault was detected.

**CKP_PROF**
**Range: ____________________ YES/NO**

Displays the learned misfire correction profile state.

**CLRDIST_NOMIL**
**Range: ____________________ actual**

Displays the distance since the last time diagnostic trouble codes were cleared.

**CMPFM**
**Range: ____________________ YES/NO**
**CMPFM**
**Range: ____________________ YES FAULT/NO FAULT**

Displays the camshaft position (CMP) failure mode, which indicates if a fault was detected in the camshaft position (CMP) sensor circuits. Reads YES if a fault occurred.

When the engine is cranking, or if operating in CMPFM mode, two spark plugs fire simultaneously until the CMP is determined by the PCM. This allows the engine to run even though the PCM is unable to determine if cylinder number 1 is on compression.

**CMPFM2**
**Range: ____________________ YES FAULT/NO FAULT**

Displays the camshaft position sensor 2 status.

**CmprCompMon rdy**
**Range: ____________________ YES/NO**

Indicates whether the Component monitor has successfully completed and reads as follows:

- YES if the monitor completed
- NO if it did not

**CMPS_lp_Lev**
**Range: ____________________ HIGH/LOW**

Displays the camshaft position sensor level state.

**CMPS_Status**
**Range: ____________________ OK/FAULT**

Displays the camshaft position sensor state.

**COAST**
**Range: ____________________ ON/OFF**

Displays the speed control actuator coast switch state.

**CoastClSol**
**Range: ____________________ ON/OFF**

Displays the PCM command to the coast clutch solenoid, which allows engine braking in third gear when fourth gear is disabled by the transmission control switch. Reads ON when the coast clutch solenoid is activated.

**CoastClSol(mA)**
**Range: ____________________ 0 to 1000 mA**
**CoastClSol(%)**
**Range: ____________________ 0 to 100%**

Displays the PCM command to the coast clutch solenoid. When activated, coast clutch solenoid allows engine braking in third gear if fourth gear is disabled by the transmission control switch.

The milliamp parameter displays the coast clutch solenoid current, and the percent parameter displays the duty cycle of the pulse width modulated solenoid signal.

**CPC_AMP**
**Range:** ________ **not available**

Displays the converter pressure control state.

**CPP**
**Range:** ________ **ON/OFF**

Displays the clutch pedal position switch state.

**CPP_ST**
**Range:** ________ **NOT DEPRESSED/DEPRESSED**

Displays the clutch pedal position switch state.

**CPP/TCS**
**Range:** ________ **ON/OFF**

Indicates the following:

- Manual transmission vehicles—the status of the clutch pedal position switch (CPP)
- Automatic transmission vehicles—the status of the transmission control switch (TCS)

CCP/TCS reads as follows:

- ON when the switch is closed
- OFF when the clutch pedal or TCS is pressed and the switch opens

**CRUISE**
**Range:** ________ **ON/OFF**

Displays the cruise control status. Reads ON if the driver selectable cruise control switch is on.

**CRUISE_SW**
**Range:** ________ **ON/OFF**

Displays the speed control command switch state.

**CSEGND(V)**
**Range:** ________ **-16.0 to 16.0 V**

Displays the voltage difference between the PCM case ground and signal return.

- Above 0.050 V indicates high resistance
- 0.027 V is a typical reading

**CylHdTemp(V)**
**Range:** ________ **0.25 to 4.75 V**

Displays the cylinder head temperature as voltage. The higher the voltage, the lower the temperature.

**DCDC_ENA**
**Range:** ________ **ON/OFF**

Displays the DC to DC converter enabled status.

**DCDC_F**
**Range:** ________ **YES FAULT/NO FAULT**

Displays the DC to DC converter status.

**DPFE(V)**
**Range:** ________ **0.45 to 4.60 V**

Displays the differential pressure feedback EGR (DPFE) sensor signal, which displays exhaust pressure to the PCM. The PCM uses DPFE to compute optimum EGR flow.

Pressure feedback EGR systems control EGR flow rate by monitoring pressure drop across a remotely located sharp-edged orifice. There are several sensor designs, some have an aluminum housing and use a 0.55 V offset, others have aluminum or plastic housings and use a 1.0 V offset. Typically, sensor output should be as shown in Table 13-2.

**Table 13-2** *Outputs for DPFE sensors with 0.55 V and 1.0 V offsets*

| 0.55 V Offset | | | 1.0 V Offset | | |
|---|---|---|---|---|---|
| **inHg** | **kPa** | **Volts** | **inHg** | **kPa** | **Volts** |
| 8.83 | 29.81 | 4.66 | 8.56 | 28.9 | 4.95 |
| 6.62 | 22.36 | 3.64 | 4.3 | 14.4 | 2.97 |
| 4.41 | 14.90 | 2.61 | 0 | 0 | 1.0 |
| 2.21 | 7.46 | 1.58 | | | |
| 0 | 0 | 0.55 | | | |

**DPFEGR**
**Range:** ____________ **not available**

Displays the delta feedback pressure exhaust gas recirculation state.

**DRIVE CounT**
**Range:** ____________ **0 to 255**

Displays the number of times the engine has been started since the last DTC P1000 (monitor readiness set).

**DRIVECNT**
**Drive_COUNT**
**Range:** ____________ **actual**

Displays the valid drive counters.

**DSD**
**Range:** ____________ **not available**

Displays the desired idle speed (rpm).

**DTC**
**Range:** ____________ **actual**

Displays the number of diagnostic trouble codes stored.

**DTC_CNT**
**Range:** ____________ **actual**

Displays the DTC count and includes DTCs needing no action.

**DTC CouNT (PCM)**
**Range:** ____________ **see description**

Displays the number of continuous or pending codes that have set. The number changes each time a new code sets.

**EBP(V)**
**Range: ________________________________ 0 to 5 V**

Displays the voltage signal from the exhaust backpressure sensor, which is used by the PCM to control the exhaust backpressure regulator (EPR). As voltage increases, so does pressure:

**Table 13-3** *Outputs for exhaust backpressure sensor*

| Volts | psi | kPa |
|---|---|---|
| 0.00 | 0.00 | 0.00 |
| 0.25 | 8.00 | 55.1 |
| 1.45 | 20.0 | 137 |
| 4.45 | 50.0 | 344 |
| 4.75 | 53.0 | 365 |
| 5.00 | 60.0 | 413 |

**ECT(°C)**
**Range: ________________________________ -40 to 199**
**ECT(°F)**
**Range: ________________________________ -40 to 389**
**ECT(V)**
**Range: ________________________________ 0.0 to 5.0**
**ECT**
**Range: ________________________________ NORM/COLD/HOT**

Displays the engine coolant temperature (ECT) sensor signal as temperature or voltage. The ECT is a thermistor installed in the engine coolant passages. A 5 V reference signal is applied to the ECT. As temperature increases, sensor resistance decreases to provide a variable voltage signal to the PCM. The PCM converts ECT sensor voltage to temperature.

These parameters read as follows:

- The temperature parameter reads 185° to 220°F (85° to 105°C) on a warm engine at idle.
- A temperature reading of -40°C or -40°F may indicate an open sensor or circuit.
- A temperature reading above 185°C or 366°F may indicate a short in the sensor or circuit.
- The voltage parameter reads 0.70 to 0.40 V on a warm engine at idle.

**ECT_FF (°C/°F)**
**Range: ________________________________ actual**

Displays the engine coolant temperature.

**ECTF**
**Range: ________________________________ YES FAULT/NO FAULT**

Displays the engine coolant temperature state.

**EFTA**
**Range: ________________________________ not available**

Displays the fuel rail pressure state.

**EGR_EVAL**
**Range: ________________________________ YES/NO**

Displays whether the exhaust gas recirculation system has been evaluated.

**EGR_Fault**
**Range:** ____ **YES FAULT/NO FAULT**

Displays the exhaust gas recirculation state.

**EGR MONITOR**
**EGR mon ready**
**Range:** ____ **YES/NO**

Displays whether the EGR system monitor has successfully completed.

**EGRBARO**
**Range:** ____ **0 to 5 V**

Displays the EGR Baro sensor voltage signal. The signal is used by the PCM to control EGR flow. The greater the EGR flow, the lower the voltage.

**EGRCFault**
**Range:** ____ **YES/NO**

Indicates if the PCM has detected a fault in the EGR control solenoid circuit and reads YES when a fault is present.

**EGRCvacsol**
**Range:** ____ **ON/OFF**

Displays the state of a normally closed solenoid that regulates vacuum to the EGR valve with a variable duty cycle. Reads as follows:

- ON when the solenoid is enabled
- OFF when it is disabled

**EGRDC(%)**
**Range:** ____ **0 to 100%**

Displays the exhaust gas recirculation valve duty cycle.

**EGRDtyCycl(%)**
**Range:** ____ **0 to 100%**

Displays the duty cycle of the EGR vacuum regulator valve or EVR. The EVR controls the amount of EGR flow.

EGRDtyCycl reads as follows:

- 0% when the EVR is fully open and allowing vacuum to vent to atmosphere
- 100% when the EVR is fully closed allowing vacuum to open the EGR valve

**EGREVAL_DC_MODE1**
**Range:** ____ **YES/NO**

Indicates if the exhaust gas recirculation system has been evaluated.

**EGRFOpen**
**Range:** ____ **YES/NO**

Indicates whether the PCM has detected an open circuit in the EGR vacuum regulator valve or EVR circuit and reads YES when a fault is present.

**EGRFShort**
**Range:** ____ **YES/NO**

Indicates whether the PCM has detected a short circuit in the EGR vacuum regulator valve or EVR circuit and reads YES when a fault is present.

**EGRMC1**
**EGRMC2**
**EGRMC3**
**EGRMC4**
**Range: ____ ON/OFF**

Displays the EGR motor control state for the indicated EGR motor control number.

**EGRMC1F**
**EGRMC2F**
**EGRMC3F**
**EGRMC4F**
**Range: ____ YES FAULT/NO FAULT**

Displays the EGR motor control fault state for the indicated EGR motor control number.

**EGRMDSD**
**Range: ____ not available**

Displays the EGR motor position desired.

**EGRTPDC(%)**
**Range: ____ 0 to 100%**

Displays the EGR throttle position.

**EGRVP(V)**
**EGRTP(V)**
**Range: ____ 0.30 to 4.50 V**

Displays the voltage signal sent to the PCM by the EGR valve position sensor, which indicates the position of the EGR valve pintle.

- A low reading indicates low EGR flow
- A high reading indicates high EGR flow

**EGRVPDES**
**Range: ____ 0 to 14%**

Displays the desired EGR.

**EGRVR(%)**
**Range: ____ 0 to 90%**

Displays the signal sent to the PCM by the EGR valve position sensor as a percentage.

A low reading indicates low EGR flow, while a high reading indicates high EGR flow.

**EGRVR_FLT**
**Range: ____ No fault/Short/Open/Yes Fault/Invalid**

Displays the exhaust gas recirculation vacuum regulator fault state.

**EGRVentsol**
**Range: ____ ON/OFF**

Displays the PCM command to the EGR vent solenoid. Reads ON when the solenoid is energized to bleed vacuum from the EGR valve and close it.

**EGRVFault**
**Range: ____ ON/OFF**

Indicates whether the PCM has detected a fault in the EGR vent solenoid circuit. Reads YES when a fault is present.

**ElecPrsCtrl**
**Range: ______ 0 to 100 psi**

Displays the PCM commanded electronic control pressure for the transmission. This is a calculated parameter based on PCM-controlled pulse-width output.

**EngFuelTA(V)**
**EngFuelTB(V)**
**Range: ______ 0 to 5.00 V**

Displays the engine fuel temperature sensor voltage on diesel, flexible-fuel, and natural-gas powered vehicles.

- EngFuelTA = bank 1
- EngFuelTB = bank 2

**EOT(V)**
**Range: ______ 0 to 5 V**
**EOT(°)**
**EngOilTemp(°)**
**EOT_DEG(°C/°F)**
**Range: ______ 0 to 212°F or -17.8 to 100°C**

Displays the engine oil temperature (EOT) in volts and degrees.

**EOT_M(°C/°F)**
**Range: ______ actual**

Displays the engine oil temperature.

**EOTF**
**Range: ______ YES FAULT/NO FAULT**

Displays the engine oil temperature state.

**EOTM**
**Range: ______ HOT/COLD/NORM/DEF**

Displays the general state, or mode, of the engine oil temperature (EOT) on diesel powertrain control systems.

Possible states are HOT, COLD, NORM (normal), and DEF (default). If the engine oil temperature is out of range, EOTM reads DEF.

**EPC(psi)**
**Range: ______ 0 to 100 psi**

Displays the PCM commanded transmission electronic control pressure (EPC). This is a calculated parameter base on PCM-controlled Pulse-Width output.

**EPC(V)**
**Range: ______ 2 V to battery voltage**

Displays the average operating voltage of the pulse-width-modulated electronic pressure control solenoid.

A low average voltage reading indicates a higher EPC pressure; a higher reading indicates a lower EPC pressure.

**EPCV(V)**
**Range: ______ not available**

Displays the electronic pressure control voltage.

**EPR(%)**
**Range: _______________ 0 to 100%**

Displays the position of the exhaust pressure regulator (EPR) as a percentage.

**ETC_ACT**
**Range: _______________ Actual degrees**
**ETC_DSD**
**Range: _______________ Desired degrees**

Displays the actual (ACT) and desired (DSD) electronic throttle control position.

**ETC_CTRL**
**Range: _______________ not available**

Displays the throttle control for drive shaft balance.

**EVAP mon ready**
**Range: _______________ YES/NO**

Indicates whether the evaporative monitor has successfully completed and reads as follows:

- YES if the monitor completed.
- NO if it did not complete.

**EVAPC**
**EVAPCV(%)**
**Range: _______________ 0 to 100%**

Displays the PCM-commanded canister purge valve duty cycle. Reads 100% when the canister purge valve is closed and not allowing fuel vapors from the evaporative canister.

**EVAPCPFault**
**Range: _______________ YES/NO**

Indicates whether the PCM detects a fault in the canister purge solenoid circuit and reads YES when a fault is present.

**EVAPCP**
**Range: _______________ ON/OFF**

Indicates whether the canister purge solenoid is on (ON) or off (OFF).

**EVAPCP_FLT**
**Range: _______________ YES FAULT/NO FAULT**

Indicates whether an evaporative emission canister purge fault exists.

**EVAPCV**
**Range: _______________ 0 to 100%**

Displays the duty cycle of the EVAP canister vent solenoid, which controls the amount of air entering the EVAP system.

EVAPCV reads as follows:

- 0% when the solenoid is fully open
- 100% when the solenoid is fully closed

**EVAPCVA**
**Range: _______________ ON/OFF**

Displays the evaporative emission canister vent valve status.

**EVAPCVF1**
**Range: _______________ YES FAULT/NO FAULT**

Displays the evaporative emission canister vent valve status.

**EVAPCVFault**
**Range: ______ YES/NO**
**EVAPCVFLT**
**Range: ______ YES FAULT/NO FAULT**

Indicates whether the PCM detects a fault in the canister vent solenoid circuit.

**EVAPEVAL_DC_MODE1**
**Range: ______ YES/NO**

Displays the evaporative system monitor evaluated status.

**EVAPPrgFlw(V)**
**Range: ______ 0 to 5 V**

Indicates the presence of purge flow from the canister to the engine. Voltage should increase as purge flow increases.

EVAPPrgFlw reads as follows:

- 0.4 to 1.3 V at idle
- 0.4 to 4.0 V at steady cruise

**EVAPSTA**
**Range: ______ not available**

Displays the evaporative emissions monitor status.

**EVAPVM(%)**
**Range: ______ 0 to 100%**

Displays the evaporative emission vapor management valve status command.

**EVAPVM_Fault**
**Range: ______ YES FAULT/NO FAULT**

Displays the evaporative emission vapor management fault status.

**EVAPVMA**
**Range: ______ ON/OFF**

Displays the commanded state of the EVAPVM.

**EVMV**
**Range: ______ OFF/ON/VARYING**

Displays the evaporative emission vapor management valve status.

**EVP(V)**
**STE=EVP(V)**
**Range: ______ 0.30 to 4.50 V**

Displays the EGR valve position (EVP) sensor signal, which reflects EGR valve pintle position. The EVP sensor is mounted on the EGR valve.

The spring-loaded EGR valve is operated by a vacuum signal from the EGR vacuum regulator solenoid. As supply vacuum overcomes spring force, the diaphragm moves. This lifts the pintle off of its seat and allows exhaust gas to recirculate. The amount of flow is proportional to the pintle position. Specifications are model dependant.

**EVR(%)**
**Range: ______ 0 to 100%**

Displays the duty-cycle of the signal output by the PCM to operate the EGR vacuum regulator (EVR) solenoid.

The EVR solenoid is a pulse-width-modulated (PWM) device that controls manifold vacuum to the EGR valve. The PCM outputs to the EVR regulates the vacuum output to the EGR valve. As the duty-cycle is increased, so is the vacuum output to the EGR valve.

EVR(%) reads as described in Table 13-4.

**Table 13-4** *EVR(%) readings*

| EVR(%) | inHg Range | kPa Range |
|---|---|---|
| 0% | 0 to 0.75 | 0 to 2.53 |
| 33% | 0.55 to 2.05 | 1.86 to 6.9 |
| 90% | 5.69 to 6.95 | 19.2 to 23.47 |

**ExhBackPrs**
**Range: ______ 0 to 2368 psi**

Displays the exhaust back pressure sensor as determined by a variable-capacitor type sensor in the right exhaust manifold on diesel powertrain control systems.

**FAN**
**Range: ______ LOW/HIGH/OFF**

Displays the operational status of the engine cooling fan.

**FAN_FLT**
**Range: ______ No Fault/LFC Fault/HFC FAULT**

Displays the engine cooling fan operation status.

**FAN Monitor**
**Range: ______ ON/OFF**

Displays the feedback signal that determines if the fan has been successfully commanded on or off by the PCM. The PCM monitors the fan side of the CCRM (or IRCM).

- ON indicates high input voltage
- OFF indicates low input voltage

**FAN_REQ**
**Range: ______ ON/OFF**

Displays the cooling fan state requested.

**FANM(HIGH)**
**Range: ______ ON/OFF**

Indicates whether the PCM is commanding the fan to run at high speed and reads ON when the fan is running at high speed.

**FANSSM**
**Range: ______ HIGH/LOW**

Displays the fan speed sensor monitor state.

**FANSS**
**Range: ______ not available**

Displays the electronic cooling fan speed sensor status.

**FDSP_ESCS_GPL**
**Range: ______ ON/OFF**

Displays the glow plug lamp state.

**FFINF(%)**
**Range:** ______ **not available**

Displays the inferred flex fuel.

**FFLRND**
**Range:** ______ **YES/NO**

Displays the flex fuel learned status.

**FICM_LPWR**
**FICM_VPWR**
**Range:** ______ **10.5 to 15.5 V**
**FICM_MPWR**
**Range:** ______ **40 to 52 V**

Displays the voltage readings from the fuel injector control module (FICM).

- LPWR = Logic power
- MPWR = Main power
- VPWR = Vehicle power

**FICMSYNC**
**Range:** ______ **YES/NO**

Displays the synchronization from the FICM (Fuel Injector Control Module) status.

**FIRMSHFT**
**Range:** ______ **ON/OFF**

Displays the firm shift status.

**FLIFM**
**Range:** ______ **YES/NO**

Displays the fuel level input FMEM flag.

**FLI_PERCENT(%)**
**Range:** ______ **not available**

Displays the fuel level state.

**FP**
**Range:** ______ **ON/OFF**

Displays the fuel pump status.

**FlexFuel(Hz)**
**Range:** ______ **-32,512 to 32,768**

Displays the flexible fuel output frequency.

**FLG_MLUSFM**
**Range:** ______ **YES FAULT/NO FAULT**

Indicates whether the torque converter is unlocking due to slipping.

**FLG_OTLK**
**Range:** ______ **YES FAULT/NO FAULT**

Indicates whether the transmission is in over temperature lock up mode.

**FLG_SS4**
**Range:** ______ **ON/OFF**

Displays the shift solenoid 4 state.

**FLI(V)**
**Range: ______ 0 to 5V**

Displays the fuel level input voltage.

**FLInput(V)**
**FueLvlinput(V)**
**Range: ______ 0 to 32.0 V**
**FLInput(%)**
**FueLvlimput(%)**
**Range: ______ 0 to 100%**

Displays the fuel level in the fuel tank as a voltage. A voltage or percentage at the high end of the sensor range indicates a high fuel level.

The PCM must receive a signal of 25–75% before beginning the evaporative emission monitor.

**FLI_SG(V)**
**Range: ______ 0 to 5V**

Displays the fuel level input voltage.

**FPA STATE**
**Range: ______ ON/OFF**

Displays the actual state of the fuel pump power circuit and reads as follows:

- ON when the pump is running
- OFF when it is not

**FP=FUEL PUMP**
**Range: ______ ON/OFF**

Displays the status of the fuel pump relay.

- The fuel pump turns ON when the ignition switch is turned on and the fuel pump relay is energized.
- The fuel pump shuts OFF if the ignition switch is not turned to the start position and the PCM de-energizes the fuel pump relay after approximately one second.

The PCM operates the fuel pump when the ignition is in the start position to provide fuel while the engine is cranking. Once the engine starts the PCM continues operating the fuel pump unless the engine speed drops below 120 RPM or the inertia fuel switch (IFS) is activated.

**FP_FLT**
**Range: ______ YES FAULT/NO FAULT**

Displays the fuel pump fault status.

**FPFault**
**Range: ______ YES/NO**

Indicates whether the PCM has detected a fault in the fuel pump circuit and reads YES when a fault is present.

**FPM**
**Range: ______ ON/OFF**
**FPM(%)**
**Range: ______ not available**

Displays the fuel pump monitor status.

**FPMode**
**Range:** ______

**FPMonitor**
**Range:** ______ **ON/OFF**

Indicates whether the fuel pump has turned on or off in response to a command from the PCM.

**FRP(psi)**
**Range:** ______ **37 to 150 psi**

Displays the fuel rail pressure (FRP) in psi on natural gas powered vehicles.

**FRP(V)**
**Range:** ______ **0 to 5V**

Displays the fuel rail pressure as voltage.

**FRP_DSD**
**Range:** ______ **not available**

Displays the fuel pressure desired.

**FRP_FAULT**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the fuel rail pressure status.

**FRP_PRESS**
**Range:** ______ **not available**

Displays the fuel rail pressure.

**FRPFM**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the fuel rail pressure transducer status.

**FRT1FM**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the fuel rail temp sensor #1 status.

**FSVFault**
**FuelSolVlv**
**Range:** ______ **YES/NO**

Indicates whether the PCM detects a fault in the fuel solenoid valve circuit on flexible-fuel vehicles and reads YES when a fault is present.

**FSVMonitor**
**Range:** ______ **ON/OFF**

Displays the fuel solenoid valve (FSV) circuit state on flexible-fuel vehicles. Reads ON when the PCM has turned on the fuel solenoid valve.

**FTIV_HEV(%)**
**Range:** ______ **not available**

Displays the fuel tank isolation valve status as a percentage.

**FTIV_F**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the fuel tank isolation valve status.

**FTP(KPA/PSI)**
**Range:** ______ **actual**

Displays the fuel tank pressure transducer status.

**FTP_FAULT**
**Range: ______ YES FAULT/NO FAULT**

Displays the fuel tank pressure transducer status.

**FUEL mon ready**
**Range: ______ YES/NO**

Indicates whether the Fuel monitor has successfully completed and reads as follows:

- YES if the monitor completed
- NO if it did not

**FUEL_RAIL_TEMP(°C/°F)**
**Range: ______ actual**

Displays the fuel rail temperature.

**FuelPumpA**
**Range: ______ ON/OFF**

Displays the actual state of the commanded fuel pump output and should read the same as the fuel pump monitor and fuel pump command output displays. All three should be ON or OFF at the same time.

**FUELPW(mS)**
**Range: ______ 0 to 99.9**

Displays the time in milliseconds (mS) that the PCM commands the fuel injectors to turn on for diesel powertrain control systems.

- A high reading indicates more on-time.
- A low reading indicates less on-time.

**FUELPW**
**Range: ______ not available**

Displays the fuel-injection pulse width.

**FUELPW1(mS)**
**FUELPW2(mS)**
**Range: ______ 0 to 99.9**

Displays the current commanded pulse width of the injectors affected by O2S1 and O2S2. The displayed value is the pulse width that was commanded at the time of the last update.

On some vehicles, updating may occur only when a PIP signal is being received, and the last updated value is retained after the PIP signal stops. In these cases, a value greater than zero may display during KOEO.

**FUELPW2(%)**
**Range: ______ 0 to 99.9**

Displays the fuel pulse width #2 as a percentage.

**FuelRailPrs(V)**
**Range: ______ 0 to 4.5 V**

Displays the fuel rail pressure in volts on natural gas powered vehicles. As voltage increases, so does pressure.

- 0 V = 37.6 psi (260 kPa)
- 4.5 V = 150 psi (1034 kPa)

**FUEL STATUS**
**FUEL SYS**
**FUEL SYS1**
**FUEL SYS2**
**FUELSYS**
**Range: _____ see description**

Indicates whether the vehicle is operating in open or closed loop. It is similar to the OPEN/CLSD LOOP but provides more information about the cause of the open- or closed-loop condition. FUEL SYS1 and FUEL SYS2 refer to bank 1 and 2.

Interpret readings as follows:

- CL = normal closed loop
- CL FLT = One O2S is not switching and the PCM is using the other one for feedback
- OL = normal open loop
- OL DRV = Open loop because of driver action or other special circumstances
- OL FLT = Open loop with O2S problem or primary side coil failure

**FuelTankPrs(V)**
**Range: _____ 0 to 5.0 V**

Displays the signal voltage from the fuel tank pressure sensor. The Evaporative Emissions Monitor requires input from this sensor.

With the gas cap removed, signal voltage should be between 2.4 and 2.8 V. During the evaporative emissions test, expect voltage to decrease while the PCM applies vacuum to the fuel tank.

**G_SDN**
**Range: _____ YES/NO**

Displays the generator shutdown request status.

**GEAR**
**Range: _____ 1st/2nd/3rd/4th/5th/6th/REV**

Displays the PCM/TCM commanded gear position on vehicles with electronic transmissions.

**GEAR_MAX**
**Range: _____ actual**

Displays the highest gear allowed.

**Gear_OSC**
**Range: _____ actual**

Displays the gear command by output state control.

**GEAR_RAT**
**Range: _____ actual**

Displays the gear ratio.

**GENLMP**
**GEN_LAMP**
**Range: _____ ON/OFF**

Displays the generator lamp circuit status.

**GEN_FAULT**
**Range: _____ YES/NO**

Displays the generator status. Reads YES when the PCM detects a generator output fault.

**GEN_MON**
**Range: ____ LOW/HIGH**
**GEN_MON(%)**
**Range: ____ 0 to 100%**

Displays the generator monitor status.

**GENB_F**
**Range: ____ YES FAULT/NO FAULT**

Indicates whether a fault is present in the generator B circuits.

**GENB_FAULT**
**Range: ____ YES/NO**

Indicates whether a fault is present in the generator B+ circuit. Reads YES when there is a fault.

**GENF**
**Range: ____ YES FAULT/NO FAULT**

Indicates whether a generator output fault exists.

**GENFDC(%)**
**Range: ____ 0 to 100%**

Displays the generator field duty cycle.

**GENFIL**
**Range: ____ YES/NO**

Indicates whether a fault exists in the generator lamp circuit.

**GENVDSD**
**Range: ____ not available**

Displays the generator voltage desired.

**GlowPlugCtrl(%)**
**Range: ____ 0 to 100%**

Displays the glow plug control (GPC) duty cycle on diesel truck powertrain control systems. At high battery voltage, the PCM cycles the current on and off to prevent damage to the glow plugs.

GlowPlugCtrl reads as follows:

- 0% = the glow plug circuit is off
- 100% = the circuit is on continuously

Related parameters that may display are GPCTM and GPLTM.

**GPC(%)**
**Range: ____ not available**

Displays the glow plug control percentage.

**GPC_L**
**Range: ____ not available**

Displays the glow plug current, left bank.

**GPC_R**
**Range: ____ not available**

Displays the glow plug current, right bank.

**GPCoilTiMe**
**Range: 10 to 120 seconds**

Displays the glow plug control time on diesel powertrain control systems, which shows the actual time the glow plugs would be switched on for if the engine were started under current conditions.

The time interval is based on engine oil temperature and reads as follows:

- About 10 seconds on a warm engine
- 120 seconds on a cold engine

**GPCTM**
**Range: not available**

Displays the glow plug coil on time.

**GPLTM**
**Range: not available**

Displays the glow plug lamp time if active.

**GPLampTiMe**
**Range: 2 to 10 seconds**

Displays the glow plug lamp time on diesel powertrain control systems, which shows the length of time that the “wait to start” lamp would be illuminated if the ignition was switched on under current conditions.

The lamp comes on every time a key reset occurs, and it remains on from 2 to 10 seconds depending upon engine temperature.

**GR_RATIO**
**Range: actual**

Displays the transmission gear ratio.

**GTQ_OUT_ENG**
**Range: not available**

Displays the measured generator torque.

**HCATEVAL_DC_MODE1**
**Range: YES/NO**

Indicates whether the heated catalyst monitor was evaluated.

**HFC**
**Range: ON/OFF**

Displays the fan control high speed state.

**HFC_FLT**
**Range: YES FAULT/NO FAULT**

Displays the fan control high fault status.

**HFCA**
**Range: ON/OFF**

Displays the actual state of the commanded output to the fan. It should be the same as the fan monitor and fan command output displays; all three should display ON or OFF at the same time.

**HFCFault**
**Range: YES/NO**

Indicates whether the PCM detects a fault with the high speed cooling fan circuit and reads YES if a fault is present.

**HO2S11(mA)**
**HO2S12(mA)**
**HO2S21(mA)**
**HO2S22(mA)**
**Range: ____ 0 to 1000 mA**

Displays the actual current in the heated oxygen sensor (HO2S) heater circuit in milli-amps.

The two-digit numbers after HTR in the parameter refer to the HO2S position:

- 11—Bank 1, Upstream
- 12—Bank 1, Downstream
- 21—Bank 2, Upstream
- 22—Bank 2, Downstream

**HO2S MONITOR**
**HO2S mon ready**
**Range: ____ YES/NO**

Indicates whether the heated oxygen sensor (HO2S) monitor has successfully completed.

**HPRC_ENA**
**Range: ____ ON/OFF**

Displays the heater pump command.

**HPRC_F**
**Range: ____ YES FAULT/NO FAULT**

Displays the heater pump status.

**HTR11Fault**
**HTR11F**
**HTR12Fault**
**HTR12F**
**HTR21Fault**
**HTR21F**
**HTR22Fault**
**HTR22F**
**Range: ____ YES/NO**

Indicates whether the PCM detects a fault in the oxygen sensor (O2S) heater circuit. Reads YES when a fault is present. The numbers after HTR in the parameter refer to the O2S position:

- 11—Bank 1, Upstream
- 12—Bank 1, Downstream
- 21—Bank 2, Upstream
- 22—Bank 2, Downstream

**HTR11A**
**HTR11**
**HTR12A**
**HTR12**
**HTR21A**
**HTR21**
**HTR22A**
**HTR22**
**Range:** ______ **ON/OFF**

Displays the O2S heater state. The state should be the same as for the corresponding HTRX data parameter; both should read ON or OFF at the same time.

- HTR11/HTR11A = bank 1 upstream O2S, should read the same as HTRX1
- HTR12/HTR12A = bank 1 downstream O2S, should the same as HTRX2
- HTR21/HTR21A = bank 2 upstream O2S, should read the same as HTRX1
- HTR22/HTR22A = bank 2 downstream O2S, should read the same as HTRX2

**HTR13**
**Range:** ______ **ON/OFF**

Displays the heated exhaust gas oxygen sensor heater (bank 1, sensor 3) state.

**HTR21F**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the heater control for O2S21 fault status.

**HTR23**
**Range:** ______ **ON/OFF**

Displays the heated exhaust gas oxygen sensor heater (bank 2, sensor 3) state.

**HTRCM11**
**Range:** ______ **not available**

Displays the heater current monitor for heated exhaust oxygen sensor 11 status.

**HTRCM12**
**Range:** ______ **not available**

Displays the heater current monitor for heated exhaust oxygen sensor 12 status.

**HTRCM21**
**Range:** ______ **not available**

Displays the heater current monitor for heated exhaust oxygen sensor 21 status.

**HTRCM22**
**Range:** ______ **not available**

Displays the heater current monitor for heated exhaust oxygen sensor 22 status.

**HTREVAL_DC_MODE1**
**Range:** ______ **YES/NO**

Indicates whether the heated exhaust oxygen sensor heater system was evaluated.

**HTRX1**
**HTRX2**
**Range:** ______ **ON/OFF**

Displays the PCM-command status for the upstream (HTRX1) or downstream (HTRX2) O2S heater. ON means the heater is on.

**IAC(%)**
**IAC=IDLE AIR(%)**
**Range:** ____ **0 to 100%**

Displays the PCM output command to the idle air bypass solenoid. The percentage displayed corresponds to the IAC valve amperage (current and voltages in Table 13-5.)

**Table 13-5** *IAC(%) and IAC=IDLE AIR(%) readings*

| Percentage Reading | IAC Valve Voltage | IAC Valve Amperage |
|---|---|---|
| 10% | 1 V | 0.1 A |
| 50% | 5 V | 0.5 A |
| 80% | 8 V | 0.8 A |
| 100% | 10–12 V | 1.0 A |

The idle air control (IAC) solenoid is used to regulate the amount of air that bypasses the throttle at idle, and thus the idle speed. A lower number indicates the valve is open for a shorter period, providing less idle air. A higher number indicates that the valve is open longer, providing more idle air.

An adaptive IAC strategy is used by the PCM to compensate for wear, vacuum leaks, and throttle plate coking. When engine conditions meet IAC adaptive strategy learning requirements, the PCM monitors and determines the values for ideal idle calibration. These values are stored in PCM memory as a correction factor for controlling idle speed.

**IAC_CELL0**
**IAC_CELL1**
**IAC_CELL2**
**Range:** ____ **DRIVE/AC OFF**

Displays the airflow time learned for cells 0, 1, and 2.

**IAC_CELL3**
**Range:** ____ **NEUTRAL/AC OFF**

Displays the airflow time learned for cell 3.

**IAC_MODE**
**Range:** ____ **not available**

Displays the idle air control status.

**IAC_TRIM**
**Range:** ____ **not available**

Displays the short term airflow trim before KAM was learned.

**IACDTCY(%)**
**Range:** ____ **0 to 100%**

Displays the idle air control valve duty cycle.

**IACF**
**IACFault**
**Range:** ____ **YES/NO**
**IAC_FLT**
**Range:** ____ **YES FAULT/NO FAULT**

Indicate whether the PCM detects a fault in the idle air control (IAC) system and reads YES if a fault is present.

**IAT**
**IAT(°C)**
**IAT(°F)**
**IAT_C**
**IAT2**
**IAT2_TEMP**
**IAT_T**
**IAT2_VOLTS**
**Range: ____ 0 to 255°C or °F**

Displays the intake air temperature. The IAT2 sensor provides a manifold air temperature signal to the PCM and is located in the intake manifold.

**IAT(V)**
**IAT2(V)**
**Range: ____ 0.0 to 5.0 V**

Displays the voltage signal from the intake air temperature sensor. A 5 V reference signal is applied to the IAT. As temperature increases, the sensor resistance decreases, which provides a variable intake air voltage signal to the PCM.

**IAT=ACT(°C)**
**Range: ____ -40 to 199°C**
**IAT=ACT(°F)**
**Range: ____ -40 to 389°F**
**IAT=ACT(V)**
**Range: ____ 0.0 to 5.0 V**

Displays the intake air temperature (IAT) sensor signal as temperature or voltage. The IAT is a thermistor that is typically installed in the air cleaner. A 5 V reference signal is applied to the IAT. As temperature increases, the sensor resistance decreases, which provides a variable intake air voltage signal to the PCM. The PCM converts IAT voltage signals to temperature readings.

IAT readings, along with MAF or MAP, are primary parameters used by the PCM to calculate the amount of air entering the engine, which is critical for determining the amount of fuel required. The IAT reading should be close to the ambient air temperature on a cold engine and should rise steadily as the engine warms up. Readings on a warm engine differ greatly between vehicles because of under-hood temperature variations and hot-soak conditions.

**IAT_FAULT**
**Range: ____ YES FAULT/NO FAULT**

Indicates the inlet air temperature status.

**ICP(V)**
**Range: ____ 0.0 to 5.0 V**

Displays the injector control pressure (ICP) sensor signal, which indicates absolute pressure for the fuel injection on a diesel engine. The ICP sensor is mounted on the left cylinder bank.

The display may be the unconverted voltage signal, or it may be the PCM converted equivalent pressure in psi or megapascal (MPa). On any of these scales, a low reading indicates low injection pressure and a high reading indicates higher injection pressure.

**ICP_DES**
**Range: ____ actual**

Displays the injector control pressure desired.

**ICP_PRESS**
**Range: ______________ actual**

Displays the injector control pressure.

**IGN_RUN_PCM**
**Range: ______________ actual**

Displays the ignition key status.

**ILINE_V**
**Range: ______________ actual**

Displays the generator command.

**IMRC**
**Range: ______________ ON/OFF**

Displays the intake manifold runner control state.

**IMRCM(V)**
**Range: ______________ 0 to 5V**

Displays the intake manifold runner control monitor voltage.

**IMRC1M(V)**
**IMRC2M(V)**
**Range: ______________ not available**

Displays the position of the intake manifold runner control valves on cylinder Bank 1 (IMRC1M) and Bank 2 (IMRC2M). Depending on the vehicle, a high voltage may mean that the valve is open or that the value is shut.

**IMRCFault**
**Range: ______________ YES/NO**
**IMRCFLT**
**Range: ______________ YES FAULT/NO FAULT**

Indicates whether the PCM detected a fault in the intake manifold runner control system and reads YES when a fault is present.

**IMS_SRC**
**Range: ______________ actual**

Displays the intermediate shaft speed.

**IMTV(%)**
**IMTV1_PER(%)**
**IMTV2_PER(%)**
**Range: ______________ 0 to 100%**

Displays the PCM-command status for the intake manifold tuning valves. IMTV1 is bank 1 and IMTV2 is bank 2. At 100% the valve should be fully open.

**IMTVF**
**IMTV_FLT**
**IMTV2_FLT**
**Range: ______________ YES FAULT/NO FAULT**
**IMTVFault**
**Range: ______________ YES/NO**

Displays the intake manifold tuning valve fault status.

**IMTV**
**IMTV1**
**IMTV2**
**Range: ______________________________ ON/OFF**

Displays the intake manifold tuning valve state for the indicated cylinder bank.

**INJ**
**Range: ______________________________ YES FAULT/NO FAULT**

Indicates the injector fault status.

**INJ PW1(mS)**
**INJ PW2(mS)**
**Range: ______________________________ 0 to 99.9**

Displays the length of time in milliseconds (mS) that the PCM commands the fuel injectors to energize. These parameters are used on multiport fuel injection systems.

On Electronic Fuel Injection (EFI) systems, the PCM simultaneously pulses half of the fuel injectors at a time. INJ PW1(mS) refers to those injectors installed in bank #1, and INJ PW2(mS) refers to the injectors in bank #2. Depending on the engine, banks #1 and #2 may be staggered.

These parameters read as follows:

- A high pulse width indicates more on-time and a richer mixture.
- A low pulse width indicates less on-time and a leaner mixture.

There are no definite specifications for injector pulse width, but the reading should change as engine speed and load change.

On EFI systems, these parameters read as follows:

- 1 to 5 mS at idle
- About 18 mS at wide open throttle (a little higher for some engines)

Since the PCM on SEFI systems pulses each injector individually, the readings represent, at best, the “average” injector pulse width for each bank. Ford SEFI systems use these parameters to allow the PCM to conduct rationality tests on the fuel delivery, the mass airflow (MAF) sensor, and the throttle position (TP) sensor.

**INJ_TIM**
**Range: ______________________________ actual**

Displays the injector timing before top dead center.

**INJ1**
**INJ2**
**INJ3**
**INJ4**
**INJ5**
**INJ6**
**INJ7**
**INJ8**
**INJ9**
**INJ10**
**Range: ______________________________ YES FAULT/NO FAULT**

Indicates whether there is an injector fault according to injector number.

**INJnFault**
**Range: ________________________ YES/NO**

Indicates whether there is an injector fault according to injector number.The “n” in INJnFault is a variable from 1 to 10, depending on the indicated cylinder.

**InjPrsReg(%)**
**Range: ________________________ 0 to 100%**

Displays the on-time of the pulse-width-modulated injector pressure regulator on a diesel engine as a percentage. The PCM controls the fuel volume by varying the injection oil pressure with the injector pressure regulator. The injector pressure regulator is a ground-side controlled 12 V regulator.

**InManRunCtrl(%)**
**Range: ________________________ 0 to 100%**

Displays the PCM-command status for the intake manifold runner control valve. At 100% the pulse-width-modulated valve should be fully open.

**InManRunCtrl**
**Range: ________________________ ON/OFF**

Displays the intake manifold runner control valve status. Reads as follows:

- ON = the valve is open
- OFF = the valve is close

Normally this valve is closed when the engine speed is below 3000 RPM.

**IPR(%)**
**Range: ________________________ 0 to 100%**

Displays the injector control pressure regulator position.

**ISS(RPM)**
**Range: ________________________ actual**

Displays the input shaft speed.

**ISS_DIR**
**Range: ________________________ FORWARD/REVERSE**

Displays the input shaft direction.

**ISS_F**
**Range: ________________________ YES FAULT/NO FAULT**

Indicates whether the input shaft speed signal is reliable.

**ISS_FAULT**
**Range: ________________________ YES/NO**

Indicates whether a fault is detected in the input shaft speed (ISS) circuit.

**ITS1**
**Range: ________________________ GEAR1/NOT GEAR1**

Displays the 1st gear indicator.

**ITS2**
**Range: ________________________ NOT GEAR/GEAR**

Displays the 2nd gear indicator.

**ITSD**
**Range:** ______ **DRIVE/NOT DRIVE**

Displays the drive status.

**ITSR**
**Range:** ______ **REVERSED/NOT REVERSED**

Displays the reverse indicator.

**IVS**
**Range:** ______ **YES/NO**

Displays the idle validation switch (IVS) state, which verifies that the accelerator pedal (AP) is in the idle position on diesel powertrain control systems.

The IVS provides a check on the AP sensor. The MIL lights if the IVS signal does not match the AP sensor signal. A faulty IVS or AP sensor allows the engine to run at low idle speed only.

**KAMFUSE**
**Range:** ______ **ON/FAULT**

Displays the keep alive memory power status.

**KEYPOS**
**Range:** ______ **actual**

Displays the ignition key status.

**KNOCK_1**
**Range:** ______ **not available**

Displays the knock sensor 1 status.

**KNOCK_2**
**Range:** ______ **not available**

Displays the knock sensor 2 status.

**LCF_FLT**
**Range:** ______ **YES FAULT/NO FAULT**

Indicates whether there is a fan control low fault.

**LFC**
**Range:** ______ **ON/OFF**

Displays the fan control low speed status.

**LFC=LO FAN**
**HFC=HI FAN**
**HighFanCtrl**
**Range:** ______ **ON/OFF**

Displays the fan relay status. Some engines have a two-speed electric fan, which the PCM controls through LFC and HFC outputs to the fan relays.

The high speed relay is a normally open for all models. However, the low speed fan relay is normally closed for Escort and Tracer, and normally open for Probe.

When the fan is off:

- HFC should read OFF.
- LFC should read OFF for Probe and ON for Escort and Tracer.

With the low speed fan on:

- HFC should read OFF.

- LFC should read ON for Probe and OFF for Escort or Tracer.

When the high speed fan is on:

- HFC should read ON.
- LFC should read OFF for all models.

**LFCFault**
**Range:** ____________________ **YES/NO**

Indicates whether the PCM has detected a low speed fan control module fault.

**LFT1(%)**
**LFTRIM 1(%)**
**LONGFT1(%)**
**LFTRIM 2(%)**
**LONGFT2(%)**
**Range:** ____________________ **–35% to +35%**

The long-term fuel trim (LFTRIM) numbers represent the operation and long-term correction of fuel-metering on a fuel-injected engine. The value shows if the PCM is commanding a rich or a lean mixture.

Similar to short-term fuel trim (SFTRIM), the LF TRIM number can range from -35% to +35%, with 0% as the midpoint. A number above zero percent indicates the PCM has commanded a long-term rich mixture correction. A number below zero percent indicates the PCM is commanding a lean mixture.

The LF TRIM number follows the short-term fuel (ST FUEL) number and makes long-term corrections to the fuel-metering in response to a pattern or trend of short-term fuel changes.

Compare LF TRIM numbers to injector on-time. Numbers above zero percent indicate increased on-time. Numbers below zero percent indicate decreased on-time. LF TRIM corrections operate only in closed loop. In open loop, the number goes to a fixed value.

**LOAD(%)**
**LOAD_FF(%)**
**ENG LOAD(%)**
**Range:** ____________________ **0 to 100%**

Displays the engine load as calculated by the PCM based on engine speed (RPM), number of cylinders, airflow, and cylinder air charge compared to the theoretical air charge that occurs at standard PCM temperature and pressure (volumetric efficiency). The resulting ratio—called engine load—is expressed as a percentage.

The engine load parameters read as follows:

- 20–40% = a normal load at idle
- Less than 80% = normal driving
- More than 100% = under hard acceleration in cold temperatures or high barometric pressure, or on supercharged vehicles

**LOS_BRAK**
**Range:** ____________________ **YES/NO**

Indicates if a hybrid is operating in limited mode due to the regenerative braking system.

**LOS_ENG**
**Range:** ____________________ **YES/NO**

Indicates if a hybrid is operating in limited mode due to an engine condition.

**LOS_ETC**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the electronic throttle control.

**LOS_EQ**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the E-quizzer.

**LOS_GEN**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the generator.

**LOS_HV**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the high voltage battery.

**LOS_IPC**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the independent plausibility checker.

**LOS_KEY**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the key position.

**LOS_LV**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the 12-Volt battery.

**LOS_MOT**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the electric motor.

**LOS_OWC**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the one way clutch.

**LOS_TCM**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the transmission control module.

**LOSSTRT**
**Range: YES/NO**

Indicates if a hybrid is operating in limited mode due to the engine no start.

**LowFanCA**
**Range: ON/OFF**

Displays the actual state of the commanded output to the fan. It should read the same as the fan monitor and fan command output; that is, all three should be ON or OFF at the same time.

**LowFanCtrl**
**Range: ON/OFF**

Displays the state of the low-speed fan control on vehicles with multiple fan speed control.

**LowFPumpFault**
**Range: YES/NO**

Indicates whether the PCM has detected a fault in the low speed fuel pump circuit.

**LPC_AMP**
**Range: ________________ not available**

Displays the transmission line pressure.

**LT TRIM B1(%)**
**LT TRIM B2(%)**
**Range: ________________ -20 to +20%**

Long-term fuel trim (LT TRIM B1 or B2 = BANK 1, or BANK 2) numbers represent the operation and long-term correction of fuel-metering on a fuel-injected engine. The value shows if the PCM is commanding a rich or a lean mixture.

Similar to short-term fuel trim (“ST TRIM B1(%)” on page 398), the LT TRIM parameter ranges from -20% to +20% with 00% as the midpoint:

- A number above zero percent indicates the PCM has commanded a long-term rich mixture correction.
- A number below zero percent indicates the PCM is commanding a lean mixture.

LT TRIM follows the short-term fuel (ST FUEL) number and makes long-term corrections to the fuel-metering in response to a pattern or trend of short-term fuel changes.

Compare LT TRIM numbers to injector on-time. Numbers above zero percent indicate increased on-time. Numbers below zero percent indicate decreased on-time. LT TRIM corrections operate only in closed loop. In open loop, the number goes to a fixed value.

**M_DPFE**
**Range: ________________ actual**

Displays the EGR sensor input at the time of a misfire.

**M_IAT**
**Range: ________________ actual**

Displays the intake air temperature (IAT) at the time of a misfire.

**M_LOAD(%)**
**Range: ________________ actual**

Displays the engine load at the time of a misfire.

**M_PNP**
**Range: ________________ actual**

Displays the Park/Neutral Position (PNP) at the time of a misfire.

**M_RPM**
**Range: ________________ actual**

Displays the engine speed at the time of a misfire.

**M_RUN**
**Range: ________________ actual**

Displays the engine running time at the time of a misfire.

**M_SOAK**
**Range: ________________ actual**

Displays the engine-off soak time in minutes prior to a misfire.

**M_TP**
**Range: ________________ actual**

Displays the throttle position at the time of a misfire.

**M_TRIP**
**Range: ________________ actual**

Displays the number of trips since the time of a misfire.

**M_VSS**
**Range: ________________ actual**

Displays the vehicle speed at the time of a misfire.

**M_WHEEL**
**Range: ________________ actual**

Displays the learned misfire correction profile at the time of a misfire.

**MAF(gm/S)**
**AIRFLOW(g/S)**
**Range: ________________0 to 255**

Displays the amount of air flowing into the engine in grams per second. It is the same as the MAF=MASS AIR(gm/sec) parameter. Reading should be low at idle and higher at high RPM.

**MAF(V**
**Range: ________________ 0 to 5.0 V**

Displays the voltage signal from the mass airflow (MAF) sensor to the PCM.

It is the same as the MAF=MASS AIR(V) parameter. The reading should be low at idle and higher at high RPM.

**MAF_Fault**
**MASS AIR FLOW_STATUS**
**Range: ________________ YES/NO**

Indicates whether a fault has occurred in the MAF circuit.

**MAF_RATE**
**Range: ________________ not available**

Displays the mass airflow rate.

**MAF=MASS AIR(V)**
**Range: ________________0.5 to 5.0 V**
**MASS AIR(gm/sec)**
**Range: ________________0 to 255**

Displays the MAF sensor output in volts on EEC-IV systems with DCL. They display a value in grams per second calculated by the PCM based on the MAF sensor signal on EEC-V (OBD-II) systems.

The MAF sensor, which is located between the air cleaner and the throttle body, measures the mass of air flowing to the engine. The PCM uses this value to calculate the injector pulse width needed to obtain an optimal air-fuel ratio.

MAF sensor readings should be low at idle and should increase as the throttle opens.

**MAFF**
**Range: ________________ YES FAULT/NO FAULT**

Displays the mass airflow status.

**MAN LEV POS**
**Range: ________________ see description**

Displays the position of the gear selector lever. Reads PARK, REV, NEUT, O/D, DRIVE, MAN1, or MAN2 depending on position.

**MAN LEV POS(V)**
**Range: ______ see description**

Displays the status of the manual lever position (MLP) sensor, which is a ratiometric sensor with six resistors in series. The PCM looks at the voltage for each shift lever position.

Typical readings are:

- Park = 4.41 V
- Reverse = 3.60 V
- Neutral = 2.83 V
- Drive = 2.09 V
- 2nd = 1.37 V
- 1st = 0.68 V

**MAN VAC**
**Range: ______ 0 to 35 “HG**

Displays the PCM calculated value that indicates engine manifold vacuum as determined by inputs from various system sensors. Values should equal actual vacuum gauge readings.

**MAP(Hz)**
**Range: ______ see description**

Displays the manifold absolute pressure (MAP) sensor output signal frequency, which is relative to intake manifold vacuum. The MAP sensor frequency increases as vacuum decreases.

MAP(Hz) reads as follows:

- 80 Hz at 101.6 kPa (30 inHG of manifold vacuum)
- 159 Hz at zero manifold vacuum

The PCM uses the MAP signal to determine engine load and regulate the air-fuel ratio, ignition timing, and EGR flow, and to compensate for altitude.

**MAP(psi)**
**Range: ______0 to 30 psi**

Displays the manifold absolute pressure on turbocharged diesel powertrain systems in pounds per square inch (psi). The PCM uses the MAP sensor signal to decrease fuel during acceleration until reaching a specified boost pressure. This decreases tailpipe smoke.

**MAP_DI2**
**Range: ______ 0 to 5V**

Displays the manifold absolute pressure sensor status.

**MAP_F**
**Range: ______ YES FAULT/NO FAULT**

Displays the manifold absolute pressure sensor status.

**MAP_PCM**
**Range: ______ actual**

Displays the manifold absolute pressure sensor status.

**MAP_V**
**Range: ______ 0 to 5V**

Displays the manifold absolute pressure sensor status.

**MAP2**
**Range: ______ actual**

Displays the manifold absolute pressure sensor status.

**MASTERKEY**
**Range: ______ PRESENT/NOT PRESENT**

Displays the master key present status.

**MAT**
**Range: ______ actual**

Displays the input signal from the manifold air temperature sensor to the PCM on diesel systems. The PCM uses this signal and other sensor signals to determine fuel injection rate.

**MECP_ENA**
**Range: ______ ON/OFF**

Displays the motor electronics coolant pump state.

**MECP_F**
**Range: ______ YES FAULT/NO FAULT**

Displays the motor electronics coolant pump status.

**MECT_V(V)**
**Range: ______ not available**

Displays the motor electronics coolant temperature.

**MIN_KEY**
**Range: ______ actual**

Displays the minimum number of keys required.

**MFC**
**Range: ______ ON/OFF**

Displays the medium fan control state.

**MFC_FLT**
**Range: ______ YES FAULT/NO FAULT**

Displays the medium fan control status.

**MFDES**
**Range: ______ 0 to 255 mG**

Displays the PCM calculation of the mass fuel desired (MFDES) per stroke of the injection pump to operate the engine under the current speed, load, and temperature conditions on diesel powertrain systems.

The readings are in milligrams (mG):

- 8 to 10 mg at idle
- About 60 mg at full throttle

**MGP**
**Range: ______ -10 to 30 psi)**

Displays the manifold gauge pressure (MGP).

**MIL**
**Range: ______ ON/OFF**
**MILFault**
**Range: ______ YES/NO**

Indicates whether a fault has occurred in the MIL circuit:

**MIL_FLT**
**Range: ____________________ YES FAULT/NO FAULT**

Indicates whether a MIL driver fault exists.

**MISF_EVAL**
**Range: ____________________ YES/NO**

Indicates whether the misfire monitor was evaluated.

**MISFEVAL_DC_MODE1**
**Range: ____________________ YES/NO**

Indicates whether the misfire monitor evaluation is complete.

**MISFire**
**Range: ____________________ YES/NO**

Indicates whether a misfire has occurred. Crankshaft acceleration is measured for each cylinder firing event. Should the acceleration drop below a specified threshold, a misfire is deemed to have occurred.

**MPLRN**
**Range: ____________________ YES/NO**

Displays the learned status of the misfire wheel. Reads as follows:

- YES if the PCM has learned and stored the misfire wheel profile
- NO if the profile has not been learned

**M_SDN**
**Range: ____________________ YES/NO**

Displays the electronic motor shutdown request.

**MTQ_OUT_ENG**
**Range: ____________________ actual**

Displays the total number of misfires.

**N_KEYCODE**
**Range: ____________________ actual**

Displays the number of keys stored.

**NM**
**Range: ____________________ actual**

Displays the total number of misfires.

**NUMKEYS**
**Range: ____________________ actual**

Displays the number of keys stored in the module.

**O2 B1-S1(V)**
**O2 B1-S2(V)**
**O2 B2-S1(V)**
**O2 B2-S2(V)**
**Range: ____________________ 0 to 1.800**

Oxygen sensors (O2SS) are the primary sensors used to determine if the engine is running rich or lean. The O2S generate a voltage signal ranging from 0 to a little over 1 V:

- 0.800 V or higher signal indicates a rich exhaust
- 0.200 V or lower signal indicates a lean exhaust

An O2S must be hot (above 500°F/260°C), and the PCM must be operating in closed loop before the PCM responds to the sensor signal. EEC-IV V-type engines have separate sensors for the left and right banks, or for the front and rear banks on a transverse engine.

EEC-V systems have additional oxygen sensors after each catalyst. Ford calls these downstream sensors catalyst monitor sensors (CMS). This means EEC-V vehicles with dual exhaust have four sensors:

- B1-S1—The upstream sensor for bank 1
- B1-S2—The downstream sensor for bank 1
- B2-S1—The upstream sensor for bank 2
- B2-S2—The downstream sensor for bank 2

**O2OEVAP**
**Range: ____________________________________________ YES/NO**

Indicates whether the EVAP purge leak check monitor has completed.

- YES indicates the leak check was performed and the PCM can run a purge monitor idle test.
- NO indicates that the purge monitor is being prevented because the leak check failed.

**O2OTEST**
**Range: ____________________________________________ YES/NO**

Indicates whether the minimum soak time has elapsed to enable an EVAP monitor test.

- YES indicates the purge monitor test is enabled.
- NO indicates the purge monitor is being prevented due to insufficient soak time.

**O2S1(mV)**
**O2S2(mV)**
**O2S11(mV)**
**O2S12(mV)**
**O2S21(mV)**
**O2S22(mV)**
**Range: ____________________________________________0 to 1800**

The oxygen sensors (O2SS) are the primary sensors used to determine if the engine is running rich or lean. The O2S generate a voltage signal ranging from 0 to a little over 1 V (0 to 1000 mV).

- A high millivolt signal indicates a rich exhaust.
- A low signal indicates a lean exhaust.

An O2S must be hot (above 500°F/260°C), and the PCM must be operating in closed loop before the PCM responds to the sensor signal. EEC-IV V-type engines have separate sensors for the left and right banks, or for the front and rear banks on a transverse engine.

EEC-V systems have an additional O2S after each catalyst. Ford calls these downstream sensors catalyst monitor sensors (CMS). This means EEC-V vehicles with dual exhaust have four sensors:

- O2S11 — The upstream sensor for bank 1
- O2S12 — The downstream sensor for bank 1
- O2S21 — The upstream sensor for bank 2
- O2S22 — The downstream sensor for bank 2.

**O2S11FM**
**O2S12FM**
**Range: ____________________________________ YES FAULT/NO FAULT**

Displays the heated exhaust oxygen sensor status for the indicated sensor.

**O2S11(V)**
**O2S12(V)**
**O2S13(V)**
**O2S21(V)**
**O2S22(V)**
**O2S23(V)**
**Range: ____ 0 to 1V**

Displays the heated exhaust oxygen sensor voltage for the indicated sensor:

- O2S11 — bank 1 sensor 1
- O2S12 — bank 1 sensor 2
- O2S13 — bank 1 sensor 3
- O2S11 — bank 2 sensor 1
- O2S12 — bank 2 sensor 2
- O2S13 — bank 2 sensor 3

**O2SEVAL_DC_MODE1**
**Range: ____ YES/NO**

Displays the oxygen sensor monitor evaluated status.

**OCTANE**
**Range: ____ actual**

Displays the octane of the fuel.

**OCTANE ADJ**
**Range: ____ ON/OFF**
**OCT ADJ**
**OCTADJ**
**Range: ____ YES/NO**

Displays the status of the octane adjust shorting bar, which is used to retard spark. Reads ON when the bar is removed, and OFF at all other times.

**NOTE:**
Removing the shorting bar retards spark about 3 degrees.

**ODS(RPM)**
**Range: ____ actual**

Displays the overdrive drum speed.

**OFMFLG**
**Range: ____ YES FAULT/NO FAULT**

Displays the pressure control failure mode status.

**OPEN/CLSD LOOP**
**LOOP**
**Range: ____ OPEN/CLSD**

Indicates whether the PCM is operating the engine in open or closed loop and read as follows:

- OPEN during warm-up
- CLSD when the engine reaches normal operating temperature and the PCM responds to O2S voltage

Some failure conditions (many associated with trouble codes) will cause the PCM to return to open-loop operation. Additionally, some vehicles normally return to open-loop operation at idle.

This occurs because the O2S cools off at idle, and the PCM returns to open loop because the signal is no longer reliable.

To restore closed-loop operation, accelerate and hold engine speed at a high idle to warm the sensor.

**OSFMFLG**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the output-shaft speed failure mode status.

**OSS(RPM)**
**Range:** ______ **actual**

Displays the output shaft speed.

**OSS_DIR**
**Range:** ______ **FORWARD/REVERSE**

Displays the output shaft direction.

**OSS_F**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the EGR motor position desired.

**OSS_FAULT**
**Range:** ______ **YES/NO**

Indicates whether a fault is detected in the output shaft speed (OSS circuit).

**OSS=TSS(RPM)**
**Range:** ______ **0 to vehicle max**

Displays the PCM calculated RPM value for the transmission turbine shaft. The turbine speed sensor (TSS) is a voltage-generating magnetic pickup. The processor converts the voltage signal of the TSS to an RPM value.

**OTEMP_FMFLG**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the transmission over temperature status.

**OUT_CODE**
**OUTCODE_BIT**
**Range:** ______ **actual**

Displays the outcode status.

**OutShftSp(RPM)**
**Range:** ______ **actual**

Displays the PCM calculated RPM value for the transmission output shaft. The output shaft speed sensor (OSS) is a voltage-generating magnetic pickup. The processor converts the voltage signal of the OSS to an RPM value.

**OverdriveCancel**
**Range:** ______ **NOT DEPRESSED/DEPRESSED**

Displays the overdrive cancel switch/Hold switch state.

**P/S PRESS(HIGH)**
**PwrStrPrs**
**Range:** ______ **YES/NO**

Displays the status of the power steering pressure (PSP) switch, which closes under high pressure and read as follows:

- YES when the steering wheel is turned right or left to full lock
- NO at all other times

If it does not change between NO and YES as the wheel turns through its full range, there may be a problem with the switch or other component in the power steering system.

**PARK_INPT**
**Range: PARK/NOT PARK**

Displays the Park position input state.

**ParkBrakeApply**
**Range: YES/NO**

Displays the state of the parking brake applied switch on diesel powertrain control systems. The parking brake applied switch is located under the instrument panel.

ParkBrakeApply reads as follows:

- YES with the brake applied
- NO with the brake not applied

This switch disables speed control when it is applied and it also prevents operation of the power take off (PTO) when it is not applied.

**ParkNeuPos**
**PARK/NEU POS**
**Range: P-N—/-R-DS**

Indicates whether an automatic transmission is in park or neutral or in one of the drive ranges:

- P-N— if the transmission is in either park or neutral
- -R-DL if the transmission is in any forward gear or reverse

The park/neutral switch is a grounding switch that is closed in park or neutral and open in any forward gear or reverse.

**PATS_TYPE**
**Range: TIMED/CODED**

Displays the security access type.

**PATSENABL**
**Range: ENABLE/DISABLE**

Displays the vehicle enable status.

**PBA**
**Range: ON/OFF**

Displays the parking brake switch status.

**PCA**
**Range: actual**

Displays the pressure control solenoid A status.

**PCA_FAULT**
**PCD_FAULT**
**PCE_FAULT**
**PCF_FAULT**
**PCG_FAULT**
**Range: YES/NO**

Indicates whether a fault is detected in pressure control solenoids A, D, E, F, and G respectively.

**PCA_FLT2**
**Range: ____ NO FAULT/FAULT**

Indicates whether a fault is detected in pressure control solenoid A.

**PCAA**
**Range: ____ 0 to 1.2A**

Displays pressure control solenoid A amperage.

**PCB**
**Range: ____ actual**

Displays pressure control solenoid B status.

**PCBA**
**Range: ____ 0 to 1.2A**

Displays pressure control solenoid B amperage.

**PCBFLT**
**Range: ____ NO FAULT/FAULT**

Indicates whether a fault is detected in pressure control solenoid B.

**PCC**
**Range: ____ actual**

Displays pressure control solenoid C status.

**PCCA**
**Range: ____ 0 to 1.2A**

Displays pressure control solenoid C amperage.

**PCC_FLT**
**Range: ____ NO FAULT/FAULT**

Indicates whether a fault is detected in shift solenoid pressure control C.

**PCD**
**Range: ____ actual**

Shift solenoid pressure control D status.

**PCD_AMP**
**Range: ____ 0 to 1.2A**

Displays shift solenoid pressure control D amperage.

**PCD_FLT**
**Range: ____ NO FAULT/FAULT**

Indicates whether a fault is detected in shift solenoid pressure control D.

**PCE**
**Range: ____ actual**

Displays shift solenoid pressure control E status.

**PCE_FLT**
**Range: ____ NO FAULT/FAULT**

Indicates whether a fault is detected in shift solenoid pressure control E.

**PCF**
**Range: ____ actual**

Displays line pressure control status.

**PCF_FLT**
**Range:** ____________ **NO FAULT/FAULT**

Indicates whether a fault is detected in shift solenoid pressure control F (line pressure).

**PCG**
**Range:** ____________ **actual**

Displays the torque converter pressure control status.

**PCG_FLT**
**Range:** ____________ **NO FAULT/FAULT**

Indicates whether a fault is detected in shift solenoid pressure control G (torque converter).

**PCLowOSM**
**Range:** ____________ **ON/OFF**

Displays the low speed engine cooling fan monitor.

**PERDEL1(%)**
**PERDEL2(%)**
**PERDEL3(%)**
**PERDEL4(%)**
**PERDEL5(%)**
**PERDEL6(%)**
**PERDEL7(%)**
**PERDEL8(%)**
**Range:** ____________ **0 to 100%**

Displays the percent delta for the indicated cylinder.

**PEVAP_TMP(°C/°F)(V)**
**Range:** ____________ **actual**

Displays the post evaporator temperature sensor input.

**PFE(V)**
**Range:** ____________ **0.25 to 4.75 V**

Displays the pressure feedback EGR (PFE) sensor signal voltage, which determines exhaust system pressure. The PCM uses this signal to compute optimum EGR flow.

PFE systems control EGR flow rate by monitoring pressure drop across a remotely located sharp-edged orifice. Typically, sensor output should be as described in Table 13-6.

**Table 13-6** *PFE sensor outputs*

| inHg | kPa | Volts |
|---|---|---|
| 3.70 | 12.5 | 4.75 |
| 2.79 | 9.42 | 4.38 |
| 1.85 | 6.25 | 4.0 |
| 0.94 | 3.17 | 3.82 |
| 0 | 0 | 3.25 |
| -5.03 | -17.0 | 1.22 |
| -7.40 | -25.0 | 0.25 |

The PFE pressure transducer is a feedback device. Pressure is varied by valve modulation. The vacuum output of the EGR vacuum regulator (EVR) solenoid modulates the valve. With PFE, the EGR valve serves as a pressure regulator, rather than a metering device.

**PinInputLevel**
**Range: ______ ON/OFF**

Displays the profile ignition pick-up state.

**PIP**
**Range: ______ YES/NO**

Displays the status of the profile ignition pickup (PIP) and reads as follows:

- YES when the PIP is switching between low and high voltage
- NO when there are no PIP signal transitions

**PNP**
**Range: ______NEUTRAL/DRIVE**

Displays the neutral switch circuit status.

**PNP_ONLY**
**Range: ______NEUTRAL/DRIVE**

Displays the park/neutral position switch status.

**PS1**
**Range: ______ OPEN/CLOSED**

Displays the pressure switch 1 status.

**PSP**
**Range: ______ HIGH/LOW**
**PSP(V)**
**PSP(KPA/PSI)**
**Range: ______ not available**

Displays the power steering pressure switch status.

**PSR**
**Range: ______ ON/OFF**

Displays the power sustained relay commanded status.

**PTO**
**Range: ______ ON/OFF**

Displays the power take off status.

**PwTakeOff**
**Range: ______ ON/OFF**

Displays the status of the driver-operated power take off (PTO) switch on diesel powertrain control systems.

**RCAM**
**Range: ______ -15° to +45°**

Displays the actual position of the camshaft in relation to the crankshaft in degrees of rotation and reads as follows:

- Near -15° with the engine running at a warm idle, camshaft fully advanced with no EGR
- Near 40° with a warm engine and the vehicle operating at a steady cruise speed

**RCL_F**
**Range: ______ YES FAULT/NO FAULT**

Displays the cooling fan state.

**RCL_FAULT**
**Range: ____________________ YES/NO**

Indicates whether a fault is detected in the reverse control lamp (RCS) circuit.

**RESUME**
**Range: ____________________ ON/OFF**

Displays the speed control actuator switch resume status.

**REV_SW**
**Range: ____________________ ON/OFF**

Displays the reverse switch status.

**RPM**
**Range: ____________________0 to engine max**

Displays the engine speed and is always shown at the left of the top line on the display. RPM is internally computed by the PCM based on ignition reference pulses or a crankshaft sensor.

**RPMDES**
**Range: ____________________0 to engine max**

Displays the desired engine speed as calculated by the PCM for base idle. This reading should always be close to actual idle RPM.

**SBB_SS2**
**Range: ____________________ ON/OFF**

Displays the shift solenoid 2 state.

**SC_OFF**
**Range: ____________________ ON/OFF**

Displays the speed control actuator switch off status.

**SC_ON**
**Range: ____________________ ON/OFF**

Displays the speed control actuator switch on status

**SCBC**
**Range: ____________________ ON/OFF**

Displays the super charger bypass control status.

**SCBCF**
**Range: ____________________ YES FAULT/NO FAULT**

Displays the super charger bypass control fault status.

**SC VAC SW**
**SC VENT SW**
**Range: ____________________ ON/OFF**

Displays the PCM output commands to the speed control (SC) vacuum and vent solenoids, which control the speed control servo. The SC VAC SW and SC VENT SW readings have the following relationships with throttle position control:

**Table 13-7** *S/C VAC SW and S/C VENT SW readings and throttle position*

| SC Vacuum Switch | SC Vent Switch | Throttle |
|---|---|---|
| ON | OFF | Accelerate |
| OFF | ON | Decelerate |
| OFF | OFF | Steady |

**SCCS**
**Range: ______ see description**

Displays the position of the driver-operated speed control command switch (SCCS). The SCCS parameter displays several range states according to which SCCS button is pressed:

- OFF
- COAST
- ACCEL
- RESUME
- ON

Two hyphens (– –), the default range state, indicates that none of the speed control switch buttons are pressed.

**SCCS(V)**
**Range: ______ 0 to 10.00**

Displays the speed control command switch (SCCS) voltage.

**SCCS_CANCEL**
**Range: ______ ON/OFF**

Displays the speed control cancel switch status.

**SCCS_NULL**
**Range: ______ ON/OFF**

Displays the speed control no switch input status.

**SCCS_OFF_PID**
**Range: ______ ON/OFF**

Displays the speed control actuator switch off status.

**SCCS_ON_PID**
**Range: ______ ON/OFF**

Displays the speed control actuator switch on status.

**SCCS_RESUME**
**Range: ______ ON/OFF**

Displays the speed control actuator switch Resume status.

**SCCS_TAP_DN**
**Range: ______ ON/OFF**

Displays the speed control actuator switch coast status.

**SCCS_TAP_UP**
**Range: ______ ON/OFF**

Displays the speed pressure actuator switch SET/ACCEL status.

**SCICP**
**Range: ______ ON/OFF**

Displays the super charger intercooler pump status.

**SCICPF**
**Range: ______ YES FAULT/NO FAULT**

Displays the supercharger intercooler pump fault status.

**SCP_PARK_BRAKE**
**Range: ______ ON/OFF**

Displays the parking brake applied status.

**SEC_ACCES**
**Range: ______ Denied/In Progress/GrantED**

Displays the vehicle security access status.

**SecAIR mon rdy**
**Range: ______ YES/NO**

Displays the secondary air monitor status and reads YES if the monitor completed.

**SERV_MOD**
**Range: ______ YES/NO**

Displays the passive anti theft system (PATS) service module status.

**SET_ACL**
**Range: ______ ON/OFF**

Displays the speed control actuator switch SET/ACCEL status.

**SFT1(%)**
**SFTRIM 1(%)**
**SHRTFT1(%)**
**SFT2(%)**
**SFTRIM 2(%)**
**SHRTFT2(%)**
**Range: ______-25% to +35%**

The short-term fuel (ST FUEL) numbers are short-term fuel-metering corrections on a fuel-injected engine). It indicates whether the PCM is commanding a rich or a lean mixture.

The SFTRIM parameter ranges from -25% to +35% with 0% as the midpoint:

- A number above zero percent indicates the PCM has commanded a short-term rich mixture correction.
- A number below zero percent indicates the PCM is commanding a short-term lean mixture correction.

The ST FUEL number leads the long-term fuel (LT FUEL) number. When a pattern or trend of short-term corrections to fuel-metering occur, long-term fuel (LT FUEL) responds with a similar correction).

Compare ST FUEL numbers to injector on-time. Numbers above zero indicate increased on-time, below zero indicates decreased on-time. The ST FUEL corrections operate only in closed loop. In open loop, it goes to a fixed value.

**ShiftSol1**
**ShiftSol2**
**ShiftSol3**
**Range: ______ ON/OFF**

Displays the PCM commands for the 1, 2, and 3 shift solenoids and reads ON when the PCM has commanded the shift solenoid to energize.

**ShiftSol1A**
**ShiftSol2A**
**ShiftSol3A**
**Range: ______ ON/OFF**

Displays the shift solenoid 1, 2, and 3 feedback status to the PCM.

When the solenoid circuits and PCM function properly, the command parameter, such as ShiftSol1, and the feedback parameter, such as ShiftSol1A, should both display ON or OFF.

**ShiftSol1Fault**
**ShiftSol2Fault**
**ShiftSol3Fault**
**Range: ______ YES/NO**

Indicates whether a shift solenoid circuit fault is present.

**SHFT_TYP**
**Range: ______ not available**

Indicates the shift type.

**SLIP_DES_SCP**
**Range: ______ 0 to 1200 RPM**

Displays the torque converter slip desired in rpm.

**SPAREKEY_PCM**
**Range: ______ ENABLED/DISABLED**

Displays the spare key programming status.

**SPARK_ACT**
**Range: ______ actual**

Displays the actual spark advance applied by the PCM.

**SPARKADV(°)**
**Range: ______-54 to +54 degrees**

Displays the amount of spark advance in degrees. An advance of more than 54 degrees shows as a negative value; this is normal.

**SPARK ADV(°)**
**SPRKADV(°)**
**IGN ADVANCE(°)**
**Range: ______ -90° to +90°**

Displays total spark advance or retard, including the base timing, that the PCM is commanding.

**SPARKDUR1**
**SPARKDUR2**
**SPARKDUR3**
**SPARKDUR4**
**SPARKDUR5**
**SPARKDUR6**
**SPARKDUR7**
**SPARKDUR8**
**Range: ______ actual**

Displays the spark duration of the indicated cylinder.

**SRC_CAN**
**Range: ________________________________ ENABLE/DISABLE**

Displays the starter motor relay enable status.

**SSA_AMP**
**Range: ________________________________0 to 1.2A**

Displays the shift solenoid pressure control A amperage.

**SSA_SS1**
**Range: ________________________________ ON/OFF**

Displays the shift solenoid 1 state.

**SSA_SS1_FLT**
**Range: ________________________________ YES FAULT/NO FAULT**

Displays the shift solenoid 1 fault status.

**SSB_AMP**
**Range: ________________________________0 to 1.2A**

Displays the soft solenoid pressure control B amperage.

**SSB_SS2_FLT**
**Range: ________________________________ YES FAULT/NO FAULT**

Displays the shift solenoid 2 fault status.

**SSC_SS3**
**Range: ________________________________ ON/OFF**

Displays the shift solenoid 3 state.

**SSC_SS3_FLT**
**Range: ________________________________ _YES FAULT/NO FAULT**

Displays the shift solenoid 3 fault status.

**SSC(%)**
**Range: ________________________________ 0 to 100%**

Displays the shift solenoid pressure control C status.

**SCC_AMP**
**Range: ________________________________0 to 1.2A**

Displays the shift solenoid pressure control C amperage.

**SSD(%)**
**Range: ________________________________ 0 to 100%**

Displays the shift solenoid pressure control D status.

**SSD_SS4**
**Range: ________________________________ ON/OFF**

Displays the shift solenoid 4 state.

**SSE(%)**
**Range: ________________________________ 0 to 100%**

Displays the shift solenoid pressure control E status.

**SSPCA**
**Range: ________________________________0 to 1.2A**

Displays the shift solenoid pressure control A amperage.

**SSPCA_FLT**
**Range: NO FAULT/FAULT**

Displays the shift solenoid pressure control A fault status.

**SSPCB**
**Range: actual**

Displays the shift solenoid pressure control B in KPA/PSI.

**SSPCB_FLT**
**Range: YES FAULT/NO FAULT**

Displays the shift solenoid pressure control B fault status.

**SSPCC**
**Range: actual**

Shift solenoid pressure control C in KPA/PSI.

**SSPCC_FLT**
**Range: YES FAULT/NO FAULT**

Displays the shift solenoid pressure control C fault status.

**STATUS B1**
**Range: see description**

Displays the operating status of fuel bank 1 and reads as follows:

- CL (closed-loop)
- OL (open-loop)
- OL DRIVE
- OL FAULT
- CL FAULT

**ST TRIM B1(%)**
**ST TRIM B2(%)**
**Range: -100% to +100%**

The short-term fuel (ST TRIM) numbers are short-term fuel-metering corrections for a fuel-injected engine. It indicates whether the PCM is commanding a rich or a lean mixture.

Similar to long-term fuel trim (“LT TRIM B1(%)” on page 381), the ST TRIM parameter ranges from -100% to +100% with 000% as the midpoint:

- A number above zero percent indicates the PCM has commanded a short-term rich mixture correction.
- A number below zero percent indicates the PCM is commanding a short-term lean mixture correction.

The ST TRIM number leads the long-term fuel (LT TRIM) number. When a pattern or trend of short-term corrections to fuel-metering occur, long-term fuel (LT TRIM) responds with a similar correction.

Compare ST TRIM numbers to injector on-time. Numbers above zero indicate increased on-time, below zero indicates decreased on-time. The ST TRIM corrections operate only in closed loop. In open loop, it goes to a fixed value.

**SYNC_DI**
**Range: YES/NO**

Indicates if the CMP and CKP are synchronized.

**TC_SLIP**
**Range: ______ 0 to 1200 RPM**

Displays the actual RPM of the torque converter slippage.

**TCC**
**Range: ______ Engaged/Modulated/OFF**

Displays the torque converter clutch (modulated) state.

**TCC(%)**
**Range: ______ 0 to 100%**

Displays the pulse-width-modulated (PWM) signal to the torque converter clutch (TCC) solenoid and reads as follows:

- 0% with exhaust solenoid (TCC solenoid) closed, TCC not applied
- 100% with exhaust solenoid fully open, TCC applied

**TCC_FLT**
**Range: ______ YES FAULT/NO FAULT**

Displays the torque converter clutch fault status.

**TCC_OSC**
**Range: ______ actual**

Displays the output state control of the torque converter.

**TCCA**
**Range: ______ ON/OFF**

Displays the torque converter clutch actual (TCCA) feedback signal to the PCM indicating the status of the torque converter clutch.

Normally, the TCC SOL and TCCA parameters should both read ON or OFF simultaneously.

**TCCA(V)**
**Range: ______ not available**

Displays the voltage signal to the torque converter clutch (TCC) solenoid. Information on this parameter is not available at this time.

**TCCF**
**Range: ______ YES FAULT/NO FAULT**

Displays the torque converter clutch fault status.

**TCCFault**
**Range: ______ YES/NO**

Displays the presence of a PCM detected fault in the torque converter clutch circuit and reads YES when a fault is present.

**TCCMACT(RPM)**
**Range: ______ 0 to vehicle max**

Displays the PCM calculated value of torque converter slippage. The value is derived by subtracting the turbine speed from the engine RPM.

TCCMACT(RPM) reads less than 50 RPM when TCC(%), TCC SOL(%) reads 95% or greater or when TCC SOL reads ON.

**TCC SOL**
**Range: ______ ON/OFF**

Displays the PCM command for the torque converter clutch. When the system functions properly, ON means the torque converter clutch solenoid is energized to lock the converter.

**TCC SOL(%)**
**Range: ______ 0 to 100%**

Displays the pulse-width-modulated (PWM) signal to the torque converter clutch (TCC) solenoid and reads as follows:

- 0% with exhaust solenoid (TCC solenoid) closed, TCC not applied
- 100% with exhaust solenoid fully open, TCC applied

**TCIL**
**Range: ______ ON/OFF**

Displays the transmission control indicator lamp (TCIS) command status. TCIL reads ON when the TCIL in the dash or shifter should be on.

**TCILFault**
**TCIL_FAULT**
**TCIL_FLT**
**Range: ______ YES/NO**

Indicates if a fault has occurred in the Transmission Control Indicator Lamp circuit.

**TCS**
**Range: ______ DEPRESSED/NOT DEPRESSED**

Displays the overdrive cancel switch/hold switch state.

**THEFT_LMP**
**Range: ______ YES FAULT/NO FAULT**

Displays the antitheft indicator lamp control fault status.

**TIRESIZE**
**Range: ______ not available**

Displays the tire size.

**TFT(V)(°C/°F)**
**TFT=TOT(V)**
**Range: ______ 0 to 5.10 V**

Displays the transmission fluid temperature (TFT), which is also referred to by Ford as the transmission oil temperature (TOT), as voltage.

The TFT sensor is a thermistor that changes resistance in response to temperature changes. Resistance decreases as temperature increases to provide a variable voltage signal to the PCM.

TFT=TOT(V) typically reads as follows:

- 0.60 V at 194°F (90°C)
- 3.88 V at 32°F (0°C)

**THTRC(%)**
**Range: ______ 0 to 100%**

Displays the thermostat heater control position.

**THTRCF**
**Range: ______ YES FAULT/NO FAULT**

Displays the thermostat heater control fault status.

**TORQUE(lb-ft)**
**Range: ______ 0 to 999**

Displays the engine torque as calculated by the PCM.

**TORQUE**
**Range: ____ actual**

Displays the PCM calculated engine torque in Nm or ft-lb on diesel powertrain control systems. The torque reading indicates how much load is placed on the engine.

**TorqConvCl**
**Range: ____ ON/OFF**

Displays the output used by the PCM to control the converter clutch by way of a solenoid. ON or OFF displays as the PCM commands the solenoid on or off.

**TOTF**
**Range: ____ YES FAULT/NO FAULT**

Displays the transmission fluid temperature fault status.

**TOWHAUL**
**Range: ____ ON/OFF**

Displays the tow haul switch state.

**TP(V)**
**Range: ____ 0.0 to 5.0 V**

Displays the voltage signal from the throttle position (TP) sensor to the PCM.

**TP_FAULT**
**Range: ____ YES FAULT/NO FAULT**

Displays the throttle position sensor status.

**TP MODE**
**Range: ____ PT/WOT/CT**

Displays the position of the accelerator pedal based on accelerator position sensor readings on diesel powertrain systems.

**TP=TPS(V)**
**Range: ____ 0 to 5.1 V**

Displays the throttle position (TP) sensor voltage signal, which is in proportion to the throttle position. The TP signal allows the PCM to determine throttle opening: low voltage at closed throttle and high voltage at wide open throttle.

TP=TPS(V) reads as follows:

- About 0.5 V at idle
- 4.5 V at WOT

**TP=TPS(%)**
**Range: ____ (range 0 to 100%**

Displays the throttle position (TP) as calculated by the PCM based on TP sensor voltage on models with an autoranging TP sensor. The PCM resets the 0 to 100% range in relation to TP sensor voltage as it senses new minimum and maximum voltages.

**TP1**
**Range: ____ 0 to 5V**

Displays the throttle position sensor 1 voltage.

**TP2**
**Range: ____ 0 to 5V**

Displays the throttle position sensor 2 voltage.

**TP MODE**
**ThrPosMODE**
**Range:** ______ **see description**

Displays the throttle position (TP) as calculated by the PCM based on the TP sensor signal and read as follows:

- C/T - closed throttle at idle and during deceleration
- P/T - part throttle at cruise or during moderate acceleration
- WOT - wide open throttle at de-choke on crank, A/C cutout, or during maximum acceleration

**TPCT(V)**
**TPREL(V)**
**Range:** ______ **0 to 5V**

Throttle position closed throttle (TPCT) indicates the most recent throttle position (TP) sensor voltage reading at closed throttle. This parameter updates each time the throttle is fully closed.

**TPF**
**Range:** ______ **YES/NO**

Displays the throttle position sensor status.

**TQ_CNTL**
**Range:** ______ **not available**

Displays the torque fuel/spark limiting status.

**TR**
**Range:** ______ **Man1/Man2/D/OD/N/R/P**

Displays the selected transmission range.

**TR_DC(%)**
**Range:** ______ **0 to 100%**

Displays the transmission range as a percentage.

**TR_FAULT**
**Range:** ______ **YES/NO**

Indicates whether a fault is detected in the Transmission Range (TR) circuit.

**TR_FREQ(Hz)**
**Range:** ______ **0 to 200 Hz**

Displays the transmission range as frequency.

**TR1**
**TR2**
**TR3**
**TR4**
**Range:** ______ **OPEN/CLOSED**

Displays the digital transmission range switch status for the indicated switch.

**TR3_MODE**
**Range:** ______ **OPEN/CLOSED**

Displays the digital transmission range switch 3 status.

**TRAC_ACT**
**Range:** ______ **ON/OFF**

Displays the traction control system modulating status.

**TRAN_OT_FAULT**
**Range: ________________________________________ YES/NO**

Indicates whether a fault is detected in the transmission over temperature circuit.

**TRANSMIT**
**Range: ________________________________________ ON/OFF**

Displays the anti-theft enabled and transmit command status.

**TransRange_D**
**Range: ________________________________________ see description**

Displays the four possible switch states of the transmission range switches TR1 through TR4 and reads as follows:

- 0 indicates the switch is closed
- 1 indicates the switch is open

Typical readings are as follows

- PARK POSITION = 0000
- Between P & R = 0100
- REVERSE POSITION = 1100
- Between R & N = 0100
- NEUTRAL POSITION = 0110
- Between N & O/D = 1100
- O/D POSITION = 1111
- Between O/D & 2 = 1011
- MANUAL 2 POSITION = 1001
- Between 1 & 2 = 1011
- MANUAL 1 POSITION = 0011

**TRFM**
**Range: ________________________________________ YES FAULT/NO FAULT**

Displays the transmission range fault status.

**TRIM B1-S1(%)**
**TRIM B2-S1(%)**
**Range: ________________________________________-55% to +55%**

Displays fuel trim status. The trim bank x – sensor x (TRIM Bx-Sx) numbers are short-term fuel-metering corrections for a fuel-injected engine. It indicates whether the PCM is commanding a rich or a lean mixture.

The TRIM parameters range from -45% to +35% with 000% as the midpoint:

- A number above zero percent indicates the PCM has commanded a short-term rich mixture correction.
- A number below zero percent indicates the PCM is commanding a short-term lean mixture correction.

The TRIM Bx-Sx number leads the long-term fuel (LT TRIM) number. When a pattern or trend of short-term corrections to fuel-metering occur, long-term fuel (LT TRIM) responds with a similar correction.

Compare ST TRIM numbers to injector on-time. Numbers above zero indicate increased on-time, below zero indicates decreased on-time. The ST TRIM corrections operate only in closed loop. In open loop, it goes to a fixed value.

TRIM B1-S1 should read the same as ST TRIM B1. TRIM B2-S1 should read the same as ST TRIM B2.

**TRIP**
**Range: ________________ YES/NO**

Indicates whether an On-Board diagnostic trip has occurred. A trip is a complete ignition on, engine run, ignition off cycle that tests all components and systems on an OBD-II vehicle.

**TRIP_CNT**
**Range: ________________ actual**

Displays the number of on board diagnostic trips completed.

**TRIP CounT**
**Range: ________________0 to 255**

Displays the number of OBD-II drive cycles completed since the last DTC P1000 monitor readiness set.

**TRS1(V)**
**Range: ________________ 0 to 5V**

Displays the transmission range selector 1 voltage.

**TRS2(V)**
**Range: ________________ 0 to 5V**

Displays the transmission range selector 2 voltage.

**TRS3(V)**
**Range: ________________ 0 to 5V**

Displays the transmission range selector 3 voltage.

**TR_V**
**Range: ________________ see description**

Displays the voltage at processor pin 64 (signal return). Voltage for a digital transmission range (DTR) should match the examples in Table 13-8 below ± 0.3 V.

**Table 13-8** *Sample TR_V readings*

| TR_V Reading | Gear |
|---|---|
| 0.0 V | PARK |
| 1.5 V | REVERSE |
| 1.5 V | NEUTRAL |
| 1.5 V | ODRIVE |
| 0.0 V | MAN2 |
| 0.0 V | MAN1 |

**TrnCtrlIndLamp**
**Range: ________________ ON/OFF**

Displays the transmission control indicator lamp status. Reads ON and the indicator lamp is lit when “Overdrive Cancel” is requested.

**TrnCtrlSw**
**TCSLAMP**
**Range:** ______ **ON/OFF**

Displays the state of the transmission control switch (TCS) and reads as follows:

- OFF = the switch is open
- ON = the driver requests overdrive cancellation and the switch closes

**TrnFluidTmp(V)**
**Range:** ______ **0.0 to 5.0 V**

Displays the voltage signal from the transmission fluid temperature (TFT) sensor to the PCM.

A low voltage reading indicates a high fluid temperature, while a high voltage reading indicates a low fluid temperature.

**TrnRange**
**Range:** ______ **0.0 to 5.0 V**

Displays the voltage at PCM pin 64 to signal return, or ground. This voltage indicates the position of the gear selector lever.

Each position has a typical range, as follows:

- L = 0.29 to 0.79 V
- D2 = 1.29 to 1.53 V
- OD = 1.88 to 2.29 V
- N = 2.53 to 3.04 V
- R = 3.43 to 3.78 V
- P = 4.30 to 4.73 V

**TR=GEAR**
**Range:** ______ **see description**

Displays the driver demanded gear selection from the transmission range sensor and reads as follows:

- MAN1
- MAN2
- DRIVE
- ODRIVE
- REVERSE
- PARK/NEUTRAL

**TSFMFLG**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the turbine speed sensor failure mode status.

**TSLIPRAT**
**Range:** ______ **0 to 1200 RPM**

Displays the transmission slip ratio.

**TSS(rpm)**
**Range:** ______ **actual**

Displays the turbine shaft speed.

**TSS_F**
**Range:** ________ **YES FAULT/NO FAULT**

Indicates whether the turbine shaft speed signal is reliable.

**TSS_FAULT**
**Range:** ________ **YES/NO**

Indicates whether a fault is detected in the turbine shaft speed (TSS) circuit.

**TurbSpdS(RPM)**
**Range:** ________ **0 to 8192**

Displays the speed of the transmission turbine shaft.

**UNLIMITED_KEY**
**Range:** ________ **ENABLED/DISABLED**

Displays the unlimited key mode status.

**V_4X4L**
**Range:** ________ **PRESENT/NOT PRESENT**

Displays the 4x4 low range input.

**V_OCTADJ**
**Range:** ________ **ACTIVE/INACTIVE**

Displays the Octane Adjust/Spark Retard state.

**V_TCASE**
**Range:** ________ **PRESENT/NOT PRESENT**

Indicates whether a manual shift on the fly system is installed on the vehicle.

**VBAT(V)**
**VBATT_PCM(V)**
**Range:** ________ **0 to 15V**

Displays the battery positive voltage.

**VCT 1_FAULT**
**VCT 2_FAULT**
**Range:** ________ **YES/NO**

Indicates whether a fault has occurred in the VCT circuit.

**VCT1**
**VCT2**
**Range:** ________ **7.5 to B+**

Displays the variable valve timing status.

**VCT1F**
**Range:** ________ **YES FAULT/NO FAULT**

Displays the variable cam timing fault status.

**VCT2F**
**Range:** ________ **YES FAULT/NO FAULT**

Displays the variable cam timing 2 status.

**VCTA**
**Range:** ________ **ON/OFF**

Displays the variable cam timing solenoid actual state.

**VCTADV(°)**
**Range: -60° to +60°**

Displays the variable cam timing actual advance status.

**VCTADV2(°)**
**Range: -60° to +60°**

Displays the variable cam timing 2 actual advance.

**VCTADVERR**
**Range: actual**

Displays the variable cam timing advance error status.

**VCTADVERR2**
**Range: actual**

Displays the variable cam timing 2 advance error status.

**VCTDC(%)**
**Range: 0 to 100%**

Displays the variable camshaft timing duty cycle.

**VCTDC2(%)**
**Range: 0 to 100%**

Displays the variable cam timing 2 duty cycle.

**VCTSYS**
**Range: OPEN/CLOSED LOOP**

Displays the variable cam timing system status.

**VehSpdSensr**
**Range: 0 to 255**

Displays the vehicle speed in miles per hour or kilometers per hour.

**VFC(%)**
**Range: 0 to 100%**

Displays the fan speed monitor status.

**VFCDC(%)**
**Range: 0 to 100%**

Displays the variable fan duty cycle.

**VFCF**
**Range: YES FAULT/NO FAULT**

Displays the cooling fan driver fault status.

**VFDES**
**Range: 0 to 255 $mm^3$**

Displays the internal PCM calculation of the volume of fuel desired (VFDES) per stroke from the injection pump to operate the engine for current speed, load, and temperature conditions on diesel powertrain systems.

Readings are in cubic millimeters (mm3) and 10–15 mm3 at idle.

**VGTDC(%)**
**Range: 0 to 100%**

Displays the variable geometry turbocharger status.

**VGT_F**
**Range: ____ YES FAULT/NOFAULT**

Displays the EGR motor position desired.

**VGT_FAULT**
**Range: ____ YES/NO**

Indicates whether a fault is detected in the variable geometry turbo (VGT) circuit.

**VPoWeR**
**Range: ____ 0.0 to 24.0 V**

Displays the vehicle battery voltage.

Some vehicles may normally read lower (8 V) or higher (16 V) than expected. Verify system voltage with a DVOM.

**VPWR(V)**
**Range: ____ B+**

Displays the module supply voltage.

**VPWR=BATT(V)**
**VPoWeR(V)**
**Range: ____ 0 to 25.5 V**

Displays the vehicle battery voltage. The powertrain control system has no specific sensor to measure battery voltage, but some PCMs calculate this parameter from a sensing circuit on the supply voltage circuit.

The reading should be close to normal charging system regulated voltage, or about 13.5 to 14.5 V, at idle. Check against actual voltage measured at the battery or alternator.

This parameter is principally for PCM self-diagnostics. Some PCM functions are modified if voltage is out of range. For example, if voltage drops below a minimum, the PCM may try to recharge the battery by running the engine at a higher idle. This may affect the idle control, fuel metering, and ignition timing parameters.

**VREF(V)**
**Range: ____ 0 to 5.12 V**

Displays the reference voltage that system sensors operate on for some vehicles. The PCM monitors this voltage and provides the parameter.

Nominal reference voltage is 5.0 V. Depending on system calibration and charging system voltage, readings may vary a few tenths of a volt. Some models normally read about 6.5 V. Verify voltage with a DVOM.

**VS SET**
**Range: ____ see description**

Displays the set speed of the speed control system.

**VS_SRC**
**Range: ____ actual**

Displays the transfer case speed sensor speed.

**VSS(MPH)**
**VSS(KPH)**
**Range: ____ 0 to vehicle max**

Displays the measurement provided by the vehicle speed sensor (VSS) pulses to the PCM. The PCM calculates the actual speed. The PCM uses vehicle speed to control fuel injection, ignition timing, and transmission and trans-axle shift timing.

**VSS_FAULT**
**Range: ______ YES FAULT/NO FAULT**

Indicates whether the vehicle speed sensor signal is reliable.

**VSFMFLG**
**Range: ______ YES FAULT/NO FAULT**

Displays the vehicle speed sensor signal status.

**WAC**
**Range: ______ ON/OFF**

Displays the air conditioning clutch at wide open throttle status. Should only read ON during full-throttle acceleration or other heavy-load conditions with the A/C turned on.

**WAC_FLT**
**Range: ______ YES FAULT/NO FAULT**

Indicates whether a wide open throttle A/C cutoff fault is detected.

**WACA**
**Range: ______ ON/OFF**

Indicates whether a wide open throttle A/C cutoff fault is detected.

**WAC=WOT A/C**
**Range: ______ ON/OFF**

Indicates whether the PCM is preventing the A/C system from operating due to undesirable engine conditions. These include operation during engine cranking and wide open throttle.

On almost all vehicles, WAC=WOT A/C reads as follows:

- OFF when the PCM senses undesirable conditions and is currently preventing the A/C clutch from energizing
- ON when the PCM is allowing the A/C clutch to energize

**WACFault**
**Range: ______ YES/NO**

Indicates whether the PCM has set a wide open throttle A/C cutout fault.

**WARM_NOMIL**
**Range: ______ 0 to vehicle max**

Displays the number of warm-ups since the DTCs were cleared.

**WASTEGATE**
**Range: ______ 0 to 100%**

Displays the PCM input that indicates the position of the wastegate as a percentage on diesel powertrain control systems.

**WFS**
**Range: ______ YES/NO**

Indicates whether there is water in the fuel.

**WotA/Ccutoff**
**Range: ______ ON/OFF**

Displays the air conditioning clutch at wide open throttle status. Reads ON when the wide open throttle (WOT A/C) cutoff has been activated and the A/C has been switched off.

# Airbag Parameters

**ABBRGR**
**Bracket(Ω)**
**Range:** ______ **0 to 25.5 Ω**

Displays the resistance of the airbag mounting bracket to chassis ground.

**CRaSHSN1(Ω)**
**CRSHSN1(Ω)**
**CRaSHSN2(Ω)**
**CRSHSN2(Ω)**
**Range:** ______ **0 to 25.5 Ω**

Displays the resistance of the crash sensors.

- CRaSHSN1 = the resistance of sensor number 1
- CRaSHSN2 = the resistance of sensor number 2

**D_Airbag(Ω)**
**D_AirBAG2(Ω)**
**D_AirBAGLoop2(Ω)**
**P_Airbag(Ω)**
**P_AirBAG2(Ω)**
**P_AirBAGLoop2(Ω)**
**Range:** ______ **0 to 25.5 Ω**

Displays the resistance between the two contacts of the airbag.

- “D” = driver side airbag
- “P” = passenger side airbag

**D_Preten(Ω)**
**D_PRETNR(Ω)**
**P_Preten(Ω)**
**P_PRETNR(Ω)**
**Range:** ______ **0 to 25.5 Ω**

Displays the resistance in the shoulder belt pre-tensioner circuit.

- D_Preten refers to the driver side pre-tensioner.
- P_Preten refers to the passenger side pre-tensioner.

**DSBELTR**
**PSBELTR**
**Range:** ______ **0 to 25.5 Ω**

Displays the driver side seat belt buckle switch resistance.

**DTC CouNT (AIRBAG)**
**Range:** ______ **actual**

Displays the number of diagnostic trouble codes (DTCS) in the airbag module memory.

**EXTCRSH**
**Range:** ______ **0 to 18V**

Information on this External Crash Sensor Test Voltage parameter is not available at this time.

**VBATT(V)**
**Range:** ______ **0 to 25 V**

Displays the battery voltage being supplied to the airbag electronic control module (ECM).

# Antilock Brake Parameters

**4WDINP_SW_ABS**
**Range: ______ 2WD/4WD**

Displays the 4WD switch status.

**ABPROS**
**Range: ______ ON/OFF**

Displays the antilock braking system power relay output status.

**ABS_ACTIVE**
**Range: ______ NORMAL/ACTIVE**

Displays the antilock braking system. status

**ABS_MSG_TCM**
**Range: ______ PRESENT/NOT PRESENT**

Indicates whether a CAN message is missing from the ABS module.

**ABS_MTR**
**Range: ______ ACTIVE/INACTIVE**

Displays the status of the ABS pump motor.

**ABS PLS**
**Range: ______ ON/OFF**

Information on this parameter is not available at this time.

**ABS_POWER**
**Range: ______ ON/OFF**

Displays the status of the ABS power relay.

**ABS_PWR_R**
**Range: ______ ON/OFF**

Displays the antilock braking system power relay output status.

**ABS_partbaseno**
**Range: ______ not available**

Displays the module part base number.

**ABS_PartNoIdSuffix**
**Range: ______ actual**

Displays the module part version suffix.

**ABS_SoftVerNo**
**Range: ______ actual**

Displays the software version number.

**ABS_TCS_WIN126_SELTESTDTC**
**Range: ______ actual**

Displays the DTC count. The count includes those needing no action.

**ABSLAMP**
**ABS_LAMP**
**Range: ______ ON/OFF**

Displays the PCM command status to the ABS indicator lamp, reads ON when the Lamp is lit.

**ABSLF I**
**ABSLF O**
**ABSLR I**
**ABSLR O**
**ABSRF I**
**ABSRF O**
**ABSRR I**
**ABSRR O**
**Range: ______ ON/OFF**

Displays the state of the PCM commands to the ABS inlet (I) and outlet (O) valves.

- LF = left front
- LR = left rear
- RF = right front
- RR = right rear

**ABSR I**
**ABSR O**
**Range: ______ ON/OFF**

Displays the PCM commanded status to the rear ABS inlet (I) or outlet (O) valves. This parameter is only used on 4WABS with a rear differential speed sensor instead of a sensor at both rear wheels. In an ABS stop this system controls both rear wheels at the same time.

**ABSPMPRLY**
**Range: ______ ON/OFF**

Displays the ABS pump motor relay state.

**ABSVLVRLY**
**Range: ______ ON/OFF**

Displays the status of the ABS valve control relay.

**ACCR_TEMP (°C/°F)**
**Range: ______ actual**

Displays the brake accumulator temperature.

**ACCR_TRAV**
**Range: ______ ON/OFF**

Displays the brake accumulator travel signal.

**ACU_CHK**
**Range: ______ not available**

Displays the ACU Bleed Check status.

**ARCFault**
**Range: ______ YES/NO**

Indicates whether an automatic ride control DTC has set.

**AutoRideCtrl**
**Range: ______ ON/OFF**

Displays the PCM command status to the automatic ride control system.

**AWD_MSG_ABS_MZ**
**AWD_MSG**
**Range: ______ PRESENT/NOT PRESENT**

Indicates whether there is CAN communication with the 4x4 module.

**BALVLV1**
**Range: ________________________________________________ ON/OFF**

Indicates the status of balance valve 1.

**BALVLV2**
**Range: ________________________________________________ ON/OFF**

Indicates the status of balance valve 2.

**BLD_STAT**
**Range: __________________________________________ DONE/NOT DONE**

Indicates the status of the brake air bleed check.

**BOO ABS**
**Range: ________________________________________________ ON/OFF**

Displays the brake pedal switch status and reads as follows:

- OFF when the brakes are not applied
- ON when the brakes are applied

This parameter should read the same as “BOO=BRAKE SW” on page 350.

**BP_CALST**
**Range: __________________________________________ DONE/NOT DONE**

Indicates the status of the brake pedal travel sensor calibration.

**BPTSCAL**
**Range: ________________________________________________ actual**

Indicates the offset calibration.

**BRAKPRES(KPA/PSI)**
**Range: ________________________________________________ actual**

Displays the ABS main brake pressure.

**BRAKE_LMP**
**Range: ________________________________________________ ON/OFF**

Displays the brake warning lamp state.

**BrakePrsApply**
**Range: ________________________________________________ 0 or 12 V**

Displays the PCM command to the brake pressure applied switch and reads as follows:

- 0 V when the switch is on
- 12 V when the switch is off

**BRK_CHK**
**Range: ____________________________________________ not available**

Displays the brake bleed check status.

**BRK_FLUID**
**Range: ________________________________________________ LOW/OK**

Displays the brake fluid level condition.

**BRK_MSIG(KPA/PSI)**
**Range: ________________________________________________ actual**

Displays the ABS main brake pressure.

**BRK_RSIG**
**Range: ______ PRESSURE**

Displays the ABS redundant brake pressure.

**BRK_WARN**
**Range: ______ ON/OFF**

Displays the state of the brake warning lamp.

**BRKLAMP**
**Range: ______ ON/OFF**

Displays the PCM command to the brake warning indicator lamp on the instrument panel and reads ON when the Lamp is lit.

**BSTLRNCYC**
**Range: ______ ON/OFF**

Displays the status of the booster learn cycle.

**BSTR_BSWF**
**Range: ______ YES/NO**

Displays the booster solenoid brake switch failure status.

**BSTR_MECH**
**Range: ______ PASS/FAIL**

Displays the booster mechanical failure status.

**BSTR_LCCS**
**Range: ______ YES/NO**

Indicates whether the booster learn cycle is complete. YES indicates complete.

**BSTR_LERN**
**Range: ______ PASS/FAIL**

Displays the booster self check/calibration status.

**BSTR_SOL**
**Range: ______ ON/OFF**

Displays the interactive vehicle dynamics booster solenoid status.

**BSTR_SOL1**
**Range: ______ ON/OFF**

Displays the booster solenoid output state.

**BSTR_SW_T**
**Range: ______ ON/OFF**

Displays the booster switch test signal output state.

**BSTRBP_FSNC**
**Range: ______ OPEN/CLOSED**

Displays the booster brake pedal force switch state. The switch is normally closed.

**BSTRBP_FSNO**
**Range: ______ OPEN/CLOSED**

Displays the booster brake pedal force switch state. The switch is normally open.

**CCB_LCCS**
**Range: ______ YES/NO**

Indicates if the current cycle booster learn cycle is complete. YES indicates complete.

**CCB_LCTF**
**Range: ____________ YES/NO**

Indicates if the current cycle booster learn cycle test has failed. Yes indicated failed.

**CCLAS_ICS**
**Range: ____________ YES/NO**

Indicates the if the current cycle lateral acceleration sensor initialization test is complete. YES indicates complete.

**CCLAS_ITF**
**Range: ____________ YES/NO**

Indicates if the current cycle lateral acceleration sensor initialization test has failed. YES indicates failed.

**CCNTABS**
**Range: ____________ actual**

Indicates the total number of continuous (soft) DTCs stored in the ABS control module.

**CCSWA_TPS**
**Range: ____________ YES/NO**

Indicates if the current cycle steering wheel angle lock to lock test passed. YES indicates passed.

**CCYR_ICS**
**Range: ____________ YES/NO**

Indicates if current cycle yaw rate initialization is complete.

**CCYR_ITF**
**Range: ____________ YES/NO**

Indicates if the current cycle yaw rate initialization test is complete. YES indicates complete.

**CONPROV**
**Range: ____________ actual**

Displays the configuration and programming version.

**CUTVLV1**
**Range: ____________ ON/OFF**

Indicates the status of cut valve 1.

**CUTVLV2**
**Range: ____________ ON/OFF**

Indicates cut valve 2.

**DSBL_TOG**
**Range: ____________ ON/OFF**

Indicates the state disable valve toggle.

**DYNOMODE**
**Range: ____________ YES/NO**

Indicates the state of the brake two-wheel dyno mode.

**EVACFILL**
**Range: ____________ DONE/NOT DONE**

Indicates the fill status of the electro-hydraulic EVAC.

**G_INPUT**
**Range: __________ -2 to +2 (G)**

Displays the accelerometer signal.

**G_SENSOR**
**Range: __________ ON/OFF**

Indicates the longitudinal acceleration sensor initialization start.

**IC_MSG_ABS_MZ**
**IC_MSG**
**Range: __________ PRESENT/NOT PRESENT**

Indicates if the CAN message is missing from the IC. NOT PRESENT indicates missing.

**IGNITION(V)**
**Range: __________ VOLTS**

Indicates the status of the ignition.

**IVD_R_IN**
**Range: __________ ON/OFF**

Displays the status of the rear-only dump valve.

**IVD_R_OUT**
**Range: __________ ON/OFF**

Displays the status of the rear-only isolation valve.

**L_ACCEL_EPB**
**Range: __________ Acceleration/G**

Displays the status of the longitudinal acceleration sensor.

**LAS_ICS**
**Range: __________ YES/NO**

Displays the status of the EEPROM - lateral acceleration sensor initialization. YES indicates complete.

**LATACCEL**
**Range: __________ TRUE/FALSE**

Displays the state of the lateral accel sensor initialization start.

**LATACCL**
**Range: __________ actual**

Displays the ABS lateral acceleration rate.

**LATACINPT**
**Range: __________ actual**

Displays the status of the lateral accelerometer input.

**LF_FAIL**
**Range: __________ TRUE/FALSE**

Displays the left front failure test status.

**LF_IN(AMP)**
**Range: __________ actual**

Displays the current of the left front current inlet valve.

**LF_INLET**
**Range:** ____________ **ON/OFF**

Displays the status of the left front inlet valve.

**LF_OUT(AMP)**
**Range:** ____________ **actual**

Displays the current of the front left current outlet valve.

**LF_OUTLET**
**Range:** ____________ **ON/OFF**

Displays the left front outlet valve state.

**LF_PRES**
**Range:** ____________ **actual**

Displays the left front brake pressure applied.

**LF_PRIME**
**Range:** ____________ **ON/OFF**

Displays the traction assist left front priming valve output state.

**LF_SWITCH**
**Range:** ____________ **ON/OFF**

Displays the traction assist left front switching valve output state.

**LF_TC_PRV**
**Range:** ____________ **ON/OFF**

Displays the status of the left front traction control priming valve.

**LF_TC_SWV**
**Range:** ____________ **ON/OFF**

Displays the state of the traction assist left priming valve output.

**LONG_ACCL**
**Range:** ____________ **actual**

Displays the status of the longitudinal accelerometer signal.

**LR_PRES(KPA/PSI)**
**Range:** ____________ **actual**

Displays the left rear brake pressure applied.

**LR_PRIME**
**Range:** ____________ **ON/OFF**

Displays the status of the traction assist left rear priming valve output.

**LR_SWITCH**
**Range:** ____________ **ON/OFF**

Status of the traction assist left rear switching valve output state.

**LR_TC_SWV**
**Range:** ____________ **ON/OFF**

Displays the status of the left rear traction control switching valve.

**LR_TC_VLV**
**Range:** ____________ **ON/OFF**

Displays the status of the left rear traction control valve.

**LF WSPD(MPH/KPH)**
**LF_WSPD(KPH/MPH)**
**LR WSPD(MPH/KPH)**
**LR_WSPD(KPH/MPH)**
**R WSPD(MPH/KPH)**
**RF WSPD(MPH/KPH)**
**RF_WSPD(KPH/MPH)**
**RR WSPD(MPH/KPH)**
**RR_WSPD(KPH/MPH)**
**Range: ______________________________ 0 to 100+ MPH/KPH**

Displays the speed signals being sent by each front wheel speed sensor (LF/RF), each rear wheel speed sensors (LR or RR), or the single rear wheel speed sensor (R) to the electronic control module (ECM).

Wheel speeds should be equal to each other and to vehicle speed as the vehicle is driven in a straight line without braking. Wheel speeds vary when turning a corner and during braking without antilock operation. During antilock braking, wheel speeds should remain close to equal.

Some 4WABS systems use a rear differential speed sensor (R) instead of a sensor at both rear wheels. In an ABS stop this system controls both rear wheels at the same time.

**LR_FAIL**
**Range: ______________________________ TRUE/FALSE**

Displays the left rear failure test status.

**LR_IN(AMP)**
**Range: ______________________________ actual**

Displays the current of the left rear current inlet valve.

**LR_INLET**
**Range: ______________________________ ON/OFF**

Displays the status of the left rear inlet valve.

**LR_OUT(AMP)**
**Range: ______________________________ actual**

Displays the current of the left rear current outlet valve.

**LR_OUTLET**
**Range: ______________________________ ON/OFF**

Displays the status of the left rear outlet valve.

**LR_PRIME**
**Range: ______________________________ ON/OFF**

Displays the state of the traction assist left rear priming valve output.

**LR_SWITCH**
**Range: ______________________________ ON/OFF**

Displays the state of the traction assist left rear switching valve output.

**LR_TC_PRV**
**Range: ______________________________ ON/OFF**

Displays the status of the left rear traction control priming valve.

**LR_TC_SWV**
**Range: ______________________________ ON/OFF**

Displays the status of the left rear traction control switching valve.

**LR_TC_VLV**
**Range: ________________________________ ON/OFF**

Displays the status of the left rear traction control valve.

**LTRL_ACC**
**Range: ________________________________ not available**

Displays the ABS lateral acceleration rate.

**MC_PT_1**
**Range: ________________________________ actual**

Displays the master cylinder travel signal 1.

**MC_PT_2**
**Range: ________________________________ actual**

Displays the master cylinder travel signal 2.

**MIL_DIS**
**Range: ________________________________ actual**

Displays the distance travelled since the MIL was activated.

**MNC_VEL_1**
**Range: ________________________________ actual**

Displays the brake tandem main cylinder velocity signal 1.

**MNC_VEL_2**
**Range: ________________________________ actual**

Displays the brake tandem main cylinder velocity signal 2.

**MN_PR_TRN**
**Range: ________________________________ PASS/FAIL**

Displays the booster main pressure transducer status.

**MODSTATE**
**Range: ________________________________OK, DIAG MODE, CMD STATE, KOEO TEST**

Indicates the module state.

**PART#PRE_ABS**
**Range: ________________________________ actual**

Indicates the part version prefix.

**PCM_MSG**
**Range: ________________________________ PRESENT/NOT PRESENT**

Indicates if there is CAN communication with the PCM. PRESENT indicates communication.

**PRE_CHK**
**Range: ________________________________ ON/OFF**

Indicates the pre-drive check.

**PRIM_VLV**
**Range: ________________________________ ON/OFF**

Indicates the status of the primary low pressure supply valve.

**PMP_MOTOR**
**Range: ________________________________ ON/OFF**

Indicates the status of the hydraulic pump motor.

**PMPSTAT**
**Range: ______ ON/OFF**

Indicates the status of the ABS pump motor.

**PUMP**
**Range: ______ ON/OFF**

Indicates the status of the pump.

**PUMPEFF**
**Range: ______ actual**

Indicates the status of the pump efficiency test.

**PWR RLY**
**Range: ______ ON/OFF**

Indicates whether the relay for the ABS System has been commanded on by the ABS module.

Reads ON when the relay contacts are closed, which directs current to the ABS pump motor.

**R_DIF_SPD**
**Range: ______ actual**

Displays the rear differential wheel speed.

**R_INLET**
**Range: ______ ON/OFF**

Indicates the status of the rear only isolation valve.

**R_OUTLET**
**Range: ______ ON/OFF**

Indicates the status of the right outlet.

**RF_FAIL**
**Range: ______ TRUE/FALSE**

Indicates right front failure test status.

**RF_IN(AMP)**
**Range: ______ actual**

Displays the current of the right front current inlet valve.

**RF_INLET**
**Range: ______ ON/OFF**

Indicates the status of the right front inlet valve.

**RF_OUT(AMP)**
**Range: ______ actual**

Displays the current of the right front current outlet valve.

**RF_OUTLET**
**Range: ______ ON/OFF**

Indicates the status of the right front outlet valve.

**RF_PRES(KPA/PSI)**
**Range: ______ actual**

Displays the right front brake pressure applied.

**RF_PRIME**
**Range:** ______ **ON/OFF**

Indicates the state of the right front priming valve output.

**RF_SWITCH**
**Range:** ______ **ON/OFF**

Indicates the state of the traction assist right front switching valve output.

**RF_TC_PRV**
**Range:** ______ **ON/OFF**

Indicates the status of the front right traction control priming valve.

**RF_TC_SWV**
**Range:** ______ **ON/OFF**

Indicates the status of the front right traction control switching valve.

**ROLLRAT**
**ROLLRATE**
**Range:** ______ **actual**

Displays the roll rate value.

**RR_FAIL**
**Range:** ______ **TRUE/FALSE**

Indicates the status of the right rear failure test.

**RR_IN(AMP)**
**Range:** ______ **actual**

Displays the current of the right rear current inlet valve.

**RR_INLET**
**Range:** ______ **ON/OFF**

Indicates the status of the right rear inlet valve.

**RR_OUT(AMP)**
**Range:** ______ **actual**

Displays the current of the right rear current outlet valve.

**RR_OUTLET**
**Range:** ______ **ON/OFF**

Indicates the status of the right rear outlet valve.

**RR_PRIME**
**Range:** ______ **ON/OFF**

Indicates the state of the right rear priming valve output.

**RR_PRES(KPA/PSI)**
**Range:** ______ **not available**

Displays the right rear brake pressure applied.

**RR_SWITCH**
**Range:** ______ **ON/OFF**

Displays the state of the traction assist right rear switching valve output.

**RR_TC_VLV**
**Range:** ______ **ON/OFF**

Indicates the status of the right rear traction assist valve.

**SAS_CAL**
**Range:** ____ **TRUE/FALSE**

Indicates the status of the steering angle sensor initialization start.

**SECND_VLV**
**Range:** ____ **ON/OFF**

Indicates the secondary low pressure feed valve.

**SECPR_TRN**
**Range:** ____ **PASS/FAIS**

Indicates the status of the booster secondary transducer.

**SELTESTDTC**
**Range:** ____ **actual**

Displays the DTC count. Count includes those that needing no action.

**SEN_CAL**
**Range:** ____ **actual**

Displays the status of the pressure sensor calibration.

**SENVBAT(V)**
**Range:** ____ **actual**

Displays the IVD/DSC sensors supply voltage.

**STEER_ANGL**
**ST_WH_ANG**
**Range:** ____ **actual**

Displays the steering wheel angle sensor.

**SW_TEST**
**Range:** ____ **ON/OFF**

Indicates the switch test signal.

**SWA_CW**
**SWA_CCW**
**Range:** ____ **actual**

Displays the steering wheel angle in degrees clockwise from start.

**SWA_LPS**
**Range:** ____ **YES/NO**

Shows if the SWA Lock to Lock test is passed. YES indicates passed.

**SWA_POS(°)**
**Range:** ____ **actual**

Displays the steering wheel angle in degrees.

**SWA1_CIR**
**Range:** ____ **Open/Sht-B+/Sht-Gnd/Normal**

Indicates the steering wheel angle 1 circuit state.

**SWA1_INPT**
**Range:** ____ **HIGH/LOW**

Indicates the steering wheel angle 1 input state.

**SWA2_CIR**
**Range: ______________________ Open/Sht-B+/Sht-Gnd/Normal**

Indicates the steering wheel angle 2 circuit state.

**SWA2_INPT**
**Range: ______________________ HIGH/LOW**

Indicates the steering wheel angle 2 input state.

**TA_LVAL**
**Range: ______________________ ON/OFF**

Indicates the status of the traction assist left control valve.

**TA_RVAL**
**Range: ______________________ ON/OFF**

Indicates the status of the traction assist right control valve.

**TC_RVAL**
**Range: ______________________ ON/OFF**

Indicates the status of the traction assist right control valve

**TCYC_FS**
**Range: ______________________ ACTIVE/PASSIVE or ON/OFF**

Indicates the status of the traction control system.

**TCYC_SW**
**Range: ____________NOT DEPRESSED/DEPRESSED or ACTIVATED/NOT ACTIVATED**

Indicates the status of the traction control switch.

**TDPT_COMP**
**Range: ______________________ YES/NO**

Indicates if the travel direction plausibility test is complete. YES indicates complete.

**TDPT_PASS**
**Range: ______________________ YES/NO**

Indicates if the travel direction plausibility test is complete. YES indicates complete.

**TRAC SW**
**Range: ______________________ ON/OFF**

Indicates the status of the driver-operated Traction Switch. When ON, TRACtionassist should also display ON.

**TRACtionassist**
**Range: ______________________ ON/OFF**

Reads ON when the PCM has activated the Traction Assist system.

**VALVCAL**
**Range: ______________________ actual**

Displays the status of the valve calibration.

**VALVE_CAL**
**Range: ______________________ DONE/NOT DONE**

Indicates the calibration status of the electro-hydraulic valve.

**VSS_FF**
**Range: ______________________ actual**

Displays the vehicle speed input to overhead trip computer.

**WAKESIG**
**Range: ____ actual**

Displays the wake-up signal.

**XDCR_ACCR(KPA/PSI)**
**Range: ____ actual**

Displays the brake pressure transducer accumulator signal.

**XDCR_LFW(KPA/PSI)**
**Range: ____ actual**

Displays the brake pressure transducer left front wheel signal.

**XDCR_LRW(KPA/PSI)**
**Range: ____ actual**

Displays the brake pressure transducer left rear wheel signal.

**XDCR_RFW(KPA/PSI)**
**Range: ____ actual**

Displays the brake pressure transducer right front wheel signal.

**XDCR_RRW(KPA/PSI)**
**Range: ____ actual**

Displays the brake pressure transducer right rear wheel signal.

**XDCR_TMC(KPA/PSI)**
**Range: ____ actual**

Brake pressure transducer tandem main cylinder signal.

**XDUCERCAL**
**Range: ____ ENERGIZED/DE-ENERGIZED**

Displays the status of the pressure transducer.

**YAW_INPUT**
**Range: ____ NORMAL, OPEN CIRCUIT**

Displays the status of the yaw rate sensor input circuit.

**YAW_RATE(°)**
**Range: ____ actual**

Displays the ABS yaw rate value in degrees.

**YAWRATE**
**Range: ____ ON/OFF**

Displays the yaw rate sensor initialization start status.

**YAWRTSEN(°)**
**Range: ____ actual**

Displays the ABS yaw rate value.

**YR_ICS**
**Range: ____ YES/NO**

Displays the complete status of yaw rate initialization. YES indicates complete.

# Passive Antitheft System (PATS) Parameters

PATS parameters may be located in any of the following locations:

- HEC
- ICM
- PATS
- PCM
- SCIL
- VIC

Refer to the vehicle service manual for a correct PATS location.

**AntiScan**
**Range: ______ ON/OFF**

Indicates if PATS has activated the Antiscan function. The PATS enables Antiscan after an unprogrammed PATS key is used to attempt to start the engine. Antiscan then temporarily locks out all keys from starting the vehicle and flashes a dash-mounted LED or the Theft Lamp indicator.

**C KEYMD**
**Range: ______ ACTIVE/NOTACTIVE**

This parameter should read ACTIVE when PATS has been requested to clear all keys.

**ENABLE S**
**Range: ______ DISABLE/ENABLE**

Information on this parameter is not available at this time.

**FAILSAF**
**Range: ______ ON/OFF**

Information on this parameter is not available at this time.

**M KEY**
**Master KEY**
**Range: ______ NOTPRE/PRESENT**

Indicates whether a Master Key is detected in the ignition switch. Master keys are required to program in new spare keys. Depending upon the type of PATS system, one or two Master keys may be needed to program extra spare keys.

**NUMKEYS**
**Range: ______ 0 to 255**

Displays the number of Master and Spare keys that are programmed into the PATS module.

**PCM ID**
**Range: ______ STORED/NOTSTORED**

Indicates whether the PATS has learned and stored the unique identification (ID) of the powertrain control module (PCM).

**PCM VFY**
**Range: ______ YES/NO**

Indicates whether PATS has verified that the PCM ID matches the ID stored from module initialization.

**SPAREKY**
**Range: DISABLE/ENABLE**

Indicates whether spare key programming is enabled in the PATS module. Spare key programming may not be desired and therefore can be disabled or enabled on certain models.

**V ENABLE**
**Range: DISABLE/ENABLE**

Information on this parameter is not available at this time.

# Generic Electronic Module (GEM) Parameters

**4WDClutch(%)**

**Range: ____________ 0 to 100%**

Displays the amount of transfer case clutch lockup that is commanded by the module. When both front and rear axles rotate at the same speed, 4WDClutch(%) should display 0 to 2%.

**4WDClutchElec**

**Range: ____________ ON/OFF**

Displays the power available to the 4WD magnetic clutch. The value should read ON for about 1 second after shifting from 4WD to 2WD.

**4WDClutchPWM**

**Range: ____________ ON/OFF**

Indicates whether the GEM is controlling the transfer case clutch using pulse-width modulation (PWM). Reads ON when controlling PWM.

**4WDClutchStat**

**Range: ____________ ON/OFF**

Displays the 4WD clutch output status. The module determines actual status of the A4WD magnetic clutch by monitoring the Torque ON Demand Relay output.

4WDClutchStat reads ON when commanded by the GEM/4X4 module.

**4WDHigh**

**Range: ____________ ON/OFF**

Indicates whether the GEM has commanded the transfer case to run in 4WD high mode.

**4WDLOLED**

**Range: ____________ ON/OFF**

Displays the command status of the 4X4 Low indicator LED and reads ON when the 4WD low lamp is illuminated.

**4WDLow**

**Range: ____________ ON/OFF**

Displays the GEM command status to run the transfer case in 4WD low mode. Reads ON when the transfer case is running in 4WD low mode.

**4WD_FrShftSp**
**4WD_RrShftSp**

**Range: ____________ 0 to 255 MPH**

Displays the speed of the front and rear transfer case drive shafts. Using the speeds of these two shafts, the GEM module calculates wheel slippage between the front and rear axles. The amount of wheel slippage is used to determine how much the GEM module applies the 4WD clutch.

**4WDPlate_A**
**PLATE A**
**4WDPlate_B**
**PLATE B**
**4WDPlate_C**
**PLATE C**
**4WDPlate_D**
**PLATE D**

**Range:** ______________________________ **OPEN/CLOSED**

Displays the status of various transfer case contact plates. Refer to the Ford factory manual for a chart identifying plate positions with shift lever positions.

**4WDPlatePwr**

**Range:** ______________________________ **ON/OFF**

Indicates whether power is available to the transfer case shift motor contact plates that limit transfer case shift linkage travel. Reads ON when shifting the transfer case between ranges.

**4WD_Switch**

**Range:** ______________________________ **AUTO/4HI/4LOW**

Displays the GEM module input from the driver-operated 4WD switch. The switch controls transfer case operation.

**ABagCHIME**

**Range:** ______________________________ **ON/OFF**

Displays the commanded status of the Air Bag Chime from the restraint module.

ABagCHIME normally reads OFF and reads ON only if a short or open is detected in the Air Bag lamp circuit by the Restraint module.

**A/C BLndoorPos**

**Range:** ______________________________ **OPEN/CLOSE**

Displays the commanded position of the A/C blend door.

**ACC_Pos**
**RUN_Pos**
**IGN Run**
**START_Pos**
**OFF/LOCK_Pos**
**IGN O/L**

**Range:** ______________________________ **YES/NO**

Displays the current position of the ignition switch. Interpret as follows:

- ACC_Pos reads YES with the switch in accessory position.
- START_Pos reads YES with the switch in cranking position.
- RUN_Pos or IGN_Run reads YES with the switch in run position.
- OFF/LOCK_Pos or IGN_O/L reads YES with the switch in lock position and reads NO when the ignition switch is in the off position or accessory position.

**AccessoryDly**
**ACC DeLaY**

**Range:** ______________________________ **ON/OFF**

Displays the actual status of the accessory power relay and read ON when the relay contacts are closed, allowing some accessories to be turned on after the ignition key has been switched off.

**ALarm EVent1-8**
**Range: ______ see description**

Displays the trigger source for the last 8 perimeter alarm activations. Event # 1 is the oldest and # 8 is the newest. They continue to rotate from 8 to 1 as more events accumulate.

The following descriptions may appear depending upon model and available options: DOOR, BATTERY, DECKLID, DRIVDOOR, DOODAJR, HOOD/TRNK, IGNITION, LRDOOR, NO EVNT, PANIC, PASS DOOR, RADIO, RR/SLI.

**AUTOLMP**
**Range: ______ ON/OFF**

Displays the status of the Automatic Headlamp switch.

**BATSAV**
**BattSaver**
**Range: ______ ON/OFF**

Displays the actual status of the battery saver relay, and reads ON when the relay contacts are closed. This allows some accessories to be turned on after the ignition is switched off.

When the battery saver relay contacts are closed, all the accessories operate. If an accessory is left on with the ignition key off, after approximately one hour the battery saver relay contacts open to shut off the accessories.

**BOO_GEM**
**BOO SW**
**Range: ______ ON/OFF**

Displays the brake ON/OFF (BOO) pedal switch signal to the GEM module. Reads ON when the switch contacts are closed.

**CCW_Shift_Mtr**
**CW_Shift_Mtr**
**Range: ______ ON/OFF**

Displays GEM commands to the counterclockwise (CCW) and clockwise (CW) shift motor relays on 4WD systems. The relays control the directional rotation of the transfer case shift motor.

These parameters read ON when the solenoid for the relay is energized, which closes the relay contacts.

**ChimeReq**
**CHIMERQ**
**Range: ______ ON/OFF**

Displays the command status for the warning chime. Reads ON when the chimes sound.

The module relies on inputs from the door switches, door key cylinder, headlight switch, and seatbelt buckle to determine when to activate the chime.

**ClutchLock**
**Range: ______ ACTIVE/INACTV**

Displays the status of the driver-operated clutch pedal switch on 4WD systems and reads ACTIVE when the switch contacts are closed.

**COOLANT**
**Range: ______notOK/OK**

Displays the coolant level status.

**D DR SW**
**DECKLID**
**Dr DR SW**
**LGATESW**
**LRDR Switch**
**LRDoor SWitch**
**LRDR SW**
**P DR SW**
**Pass DR SW**
**RRDoor SWitch**
**Range:** ____ **CLOSED/OPEN**

Shows whether the indicated door and trunk switches are open or closed and read OPEN when the door is open and switch contacts are closed.

**DIM DEC**
**Range:** ____ **NotAct/ActivE**

Displays the status of the instrument cluster illumination control switch and should read ACTIVE when the OFF button is pressed.

**DIM INC**
**Range:** ____ **NotAct/ActivE**

Displays the status of the instrument cluster illumination control switch and should read ACTIVE when the MAX button is pressed.

**DoorAjarLamp**
**DoorAJR L**
**Range:** ____ **ON/OFF**

Displays the status of the door ajar lamp. Reads ON when the door ajar lamp should be lit.

**DoorLocK**
**DoorUnlock**
**Range:** ____ **LOCK/UNLOCKN**

Displays the command status for the door lock solenoids and reads LOCK when the module has commanded the solenoids to energize towards the lock position.

**Dr SBELT**
**Range:** ____ **IN/OUT**

Indicates whether the passenger side seat belt buckle switch is engaged and the belt is buckled.

**D SBELT**
**Range:** ____ **IN/OUT**

Indicates whether the driver side seat belt buckle switch is engaged and the belt is buckled.

**DTC CouNT**
**Range:** ____ **0 to 20**

Displays the number of diagnostic trouble codes stored in GEM module memory.

**FrWiperMd**
**RearWiperMd**
**Range:** ____ **see description**

Displays the position of the driver-operated front or rear windshield wiper switch. The GEM module uses this information to control the wiper and washer relays. Readings vary by model. The screen may display the selected switch range position or the switch operating status.

The possible range positions include POS1, POS2, POS3, POS4, POS5, POS6, POS7, WASH.

The possible operating states include INT, LOW, HIGH, OPEN, CKT.

**HallPwr**
**Range: ______ ON/OFF**

Indicates whether the module is supplying a reference voltage to the transfer case Hall-effect switches on 4WD systems.

**HatchUnlkSw**
**LF_UnlockSw**
**RF_UnlockSw**
**Range: ______ ON/OFF**

Displays the status of the driver-operated door unlock switches. Reads ON when the switch contacts are closed.

**HeaDLaMP**
**HDLMPSW**
**Range: ______ ON/OFF**

Displays the actual status of the headlamp switch. Reads ON when the switch contacts are closed and the headlamps are on.

**HORN SW**
**Range: ______ ON/OFF**

Displays the actual status of the horn switch. Reads ON when the switch contacts are closed and the horn should be on.

**IllumEntry**
**Range: ______ ON/OFF**

Indicates the presence of a request to turn on the illuminated entry lamps. A request to light the entry lamps may come from any one of the door ajar switches, and a special driver door handle switch whose contacts close when the handle is lifted.

**KeyInIgn**
**Range: ______ ON/OFF**

Indicates if a key is in the ignition switch.

**LFBeltFstnd**
**Range: ______ ON/OFF**

Indicates if the left front seat belt buckle is latched.

**LFDoorAjar**
**LRDoorAjar**
**RFDoorAjar**
**RR/SlidDr_Ajar**
**Trunk/Htch_Ajar**
**Range: ______ ON/OFF**

Indicates whether door and trunk switches are open or closed. NO means the door is shut and switch contacts are closed.

**LF_PwrWndw**
**Range: ______ ENABLE/DISABLE**

Displays the status of the left front window one-touch down feature. Reads ENABLE when this feature is rolling the window down.

**LFWindowDn**
**Range: ______ YES/NO**

Displays the GEM command status for the left front window to roll down and reads YES when the window is rolling down.

**LFWindowMotr(A)**
**Range: ______ 0 to 64**

Displays the amount of current through the left front window motor during use.

**LFWndwPeak(A)**
**Range: ______ 0 to 64**

Displays the maximum amount of current drawn by the left front window motor after use.

**LR TURN**
**RR TURN**
**Range: ______ ON/OFF**

Displays the commanded status of the left rear and right rear turn signal lamps.

**NeuSafetySw**
**Range: ______ ACTIVE/INACTV**

Displays the status of the neutral safety switch on 4WD systems and reads ACTIVE when the switch contacts are closed.

**NeuTowFcnLmp**
**Range: ______ ON/OFF**

Displays the command status for the neutral tow indicator lamp on 4WD systems and reads ON when the lamp is lit and the Neutral Tow function is enabled.

**NeutTowFcn**
**Range: ______ ENABLE/DISABLE**

Indicates if the transfer case is in neutral tow mode on 4WD systems and reads ENABLE when tow mode is in effect.

Neutral tow prevents drive train damage when the vehicle is being towed.

**NTRL SW**
**Range: ______ NotAct/ActivE**

Displays the status of the neutral safety switch. Reads ACTIVE when the switch contacts are closed.

**OverSpdWarn**
**Range: ______ ENABLE/DISABLE**

Indicates a higher-than-normal wheel speed sensor signal. ENABLE displays only when one or more wheels exceeded the maximum vehicle speed or a speed sensor circuit is shorted.

**ParkLmpSw**
**Range: ______ ON/OFF**

Displays the status of the driver-operated park lamp switch and reads ON when the park lamp switch contacts are closed.

**RearDefRly**
**Range: ______ ON/OFF**

Displays the command status to the rear window defroster relay and reads ON when the module is commanding the relay solenoid to energize and close the relay contacts.

**RearDefSw**
**Range: ________________ ON/OFF**

Displays the status of the driver-operated rear window defroster switch and reads ON when the defroster switch contacts are closed.

**RearPosSense**
**Range: ________________ YES/NO**

Indicates whether the rear wiper is in the PARK position.

**RearWasher**
**Range: ________________ ON/OFF**

Indicates whether the GEM is commanding the rear window washer to operate (reads ON).

**RearWASHSW**
**Range: ________________ ON/OFF**

Displays the actual status for the rear window washer switch and reads ON when the washer switch contacts are closed.

**RearWiper**
**Range: ________________ ON/OFF**

Displays the command status for the rear window wiper. Reads ON when the wiper is operating.

**RearWiperDn**
**RearWiperUp**
**Range: ________________ ON/OFF**

Displays the module status for the rear wiper arm down or up command:

- RearWiperDn = ON means the wiper should be moving down to home position.
- RearWiperUp = ON means the wiper should be moving up.

**RearWPRUN**
**Range: ________________ ON/OFF**

Displays the status for the rear window wiper switch. Reads ON when the switch is on.

**RevSel**
**Range: ________________ ON/OFF**

Indicates whether the gear selector is in reverse on 4WD systems and reads ON when the gear selector is in reverse.

**SeatBeltLamp**
**Range: ________________ ON/OFF**

Displays the GEM command status to the seat belt lamp indicator on the instrument panel and reads ON if the GEM has commanded the lamp to light.

**SpdSensWipr**
**Range: ________________ ENABLE/DISABLE**

Displays the status of the windshield wiper mode that makes wiper motion vehicle speed sensitive. Reads ENABLE when the wiper speed increases and decreases with vehicle speed.

**VBatt(V)**
**Range: ________________ 0 to 25 V**

Displays the battery voltage.

**VBatt_GEM(V)**
**Range: ________________ 0 to 25 V**

Displays the battery voltage supplied to the GEM module.

**VBatt_REM(V)**
**Range: ________ 0 to 25 V**

Displays the battery voltage supplied to the REM module.

**VSS_GEM**
**Range: ________ 0 to 120 MPH**

Displays the vehicle speed sensor (VSS) signal being supplied to the GEM module in MPH.

**WasherPumpRly**
**WASHRLY**
**Range: ________ ON/OFF**

Displays the command status to the washer pump relay and reads ON when the module has energized the relay solenoid to close the relay contacts.

**WasherPumpSw**
**Range: ________ ON/OFF**

Displays the status of the driver-operated washer pump switch and reads ON when the switch contacts are closed.

**WEAR OK**
**Range: ________ YES/NO**

Displays the status of the brake pad wear switch and reads as follows:

- YES when the switch contacts are closed
- NO when the switch contacts are open

The dash brake warning indicator illuminates when the switch contacts open.

**WFLUID**
**Range: ________ LOW/OK**

Indicates the status of the washer fluid level.

**Wiper2SpdRly**
**Range: ________ ON/OFF**

Displays the status of the two-speed (high) wiper relay. Reads ON when the relay contacts are closed, allowing the wipers to operate at high speed.

**WiperPk-Pk(mS)**
**Range: ________ 0 to 255 mS**

Displays the windshield intermittent delay time.

**WiperRunRly**
**Range: ________ ON/OFF**

Displays the command status to the wiper run relay. Reads ON when the module has energized the relay solenoid to close the relay contacts.

# Transmission Control Module Parameters

**ACCLUTCH_TCM**
**Range:** ______ **ON/OFF**

Displays the status of the air conditioning clutch.

**AP_PER_TCM**
**APP1_FN_TCM**
**APP1_TCM**
**Range:** ______ **0 to 100%**

Displays the accelerator pedal position 1 as a percentage.

**APP2_TCM**
**Range:** ______ **0 to 100%**

Displays the accelerator pedal position 2 as a percentage.

**APP3_TCM**
**Range:** ______ **0 to 100%**

Displays the accelerator pedal position 3 as a percentage.

**BARO_TCM**
**Range:** ______ **actual**

Displays the barometric pressure.

**BATT_I_REC**
**Range:** ______ **actual**

Displays the battery current received.

**BATT_V_REC**
**Range:** ______ **actual**

Displays the battery voltage received from the transmission control module.

**BOO_TCM**
**Range:** ______ **ON/OFF**

Displays the brake switch input status.

**BRKPEDSW**
**Range:** ______ **ACTIVE/INACTIVE**

Displays the status of the brake pedal switch.

**CCNT_TCM**
**Range:** ______ **actual**

Indicates the presence of continuous codes.

**CLTCHAMP_CMD**
**Range:** ______ **actual**

Displays the commanded current for the clutch actuator.

**CONTRACTOR**
**Range:** ______ **OPEN/CLOSED**

Displays the contractor status.

**CPC_AMP**
**Range:** ______ **0 to 1.2A**

Displays the torque converter pressure control amperage.

**DISTDIG_TCM**
**Range:** ______ **actual**

Displays the distance since the last time diagnostic trouble codes were cleared.

**DRIVECNT_TCM**
**Range:** ______ **actual**

Displays the valid drive counter.

**DRIVEPOS_TCM**
**Range:** ______ **YES/NO**

Indicates whether the selected gear lever position is Drive.

**DTC_CNT_TCM**
**Range:** ______ **actual**

Displays the DTC count (includes those needing no action).

**ECT_TCM (°C/°F)**
**Range:** ______ **actual**

Displays the ECT transmission control module temperature.

**ECT_TCM_DI (°C/°F)**
**Range:** ______ **actual**

Displays the engine coolant temperature.

**ENG_CTO**
**Range:** ______ **actual**

Displays the engine speed clean tachometer output.

**ENG_TORQ**
**Range:** ______ **actual**

Displays the calculated engine torque.

**Engine_STAT**
**Range:** ______ **YES/NO**

Displays the engine running status.

**FIRMSHFT**
**Range:** ______ **ON/OFF**

Displays the firm shift status.

**FLG_MLUSFM**
**Range:** ______ **YES FAULT/NO FAULT**

Indicates whether the torque converter had unlocked due to slipping.

**FLG_OTLK**
**Range:** ______ **YES FAULT/NO FAULT**

Indicates whether the transmission is operating in over temperature lockup mode.

**FRZ_DTC**
**Range:** ______ **actual**

Displays the freeze frame diagnostic trouble codes.

**FUEL_CUT**
**Range:** ______ **YES/NO**

Indicates whether a fuel cut-off signal is present.

**G_SDN_A**
**Range:** ______ **YES/NO**

Indicates whether there is a generator shutdown from e-quizzer.

**G_SDN_B**
**Range:** ______ **YES/NO**

Indicates whether there is a generator shutdown from the vehicle system control.

**G_SDN_C**
**Range:** ______ **YES/NO**

Indicates whether there is a generator shutdown from the powertrain control module.

**Gear**
**Range:** ______ **actual**

Displays the gear commanded by module.

**GEAR_MAX**
**Range:** ______ **actual**

Displays the highest gear allowed.

**Gear_OSCIP**
**Range:** ______ **actual**

Displays the gear command by output state control.

**GEAR_RAT**
**Range:** ______ **actual**

Displays the gear ratio.

**GEN_BRK_CMD**
**Range:** ______ **ON/OFF**

Displays the generator brake command.

**GEN_CTRL**
**Range:** ______ **actual**

Displays the generator control mode.

**GEN_COILTEMP (°C)/(°F)**
**Range:** ______ **actual**

Displays the generator coil temperature.

**GEN_INV_V**
**Range:** ______ **actual**

Displays the voltage of the generator inverter.

**GEN_SPEED**
**Range:** ______ **actual**

Displays the generator speed.

**GEN_TEMPHI (°C)/(°F)**
**Range:** ______ **actual**

Displays the generator inverter phase temperature.

**GEN_TORQ_CMD**
**Range:** ______ **actual**

Displays the generator torque command.

**GR_RATIO**
**Range: ____ actual**

Displays the transmission gear ratio.

**GTQ_OUT**
**Range: ____ actual**

Displays the generator torque from AC Source.

**I_SDN_1**
**Range: ____ actual**

Displays the rapid discharge signal 1.

**I_SDN_2**
**Range: ____ actual**

Displays the rapid discharge signal 2.

**IAT_TCM (°C)/(°F)**
**Range: ____ actual**

Displays the intake air temperature.

**IMAN_DN_TCM**
**Range: ____ OPEN/CLOSED**

Displays the gear lever position—Tip Minus.

**IMIN_UP_TCM**
**Range: ____ OPEN/CLOSED**

Displays the gear lever position—Tip Plus.

**IMS_SRC**
**Range: ____ actual**

Displays the intermediate shaft speed.

**ISS**
**Range: ____ actual**

Displays the input shaft speed.

**ISS_DIR**
**Range: ____ FORWARD/REVERSE**

Displays the intermediate shaft direction.

**ISS_F**
**Range: ____ YES FAULT/NO FAULT**

Displays the input shaft speed sensor signal reliability.

**LF_WSPD_TCM**
**Range: ____ actual**

Displays the left front wheel speed sensor speed.

**LOAD_TCM**
**Range: ____ 0 to 100%**

Displays the calculated engine load as a percentage.

**LCP_AMP**
**Range: ____ 0 to 1.2A**

Displays the line pressure control amperage.

**M_SDN_A**
**Range: ________________ YES/NO**

Indicates whether there is a motor shutdown command from the E-quizzer.

**M_SDN_B**
**Range: ________________ YES/NO**

Indicates whether there is a motor shutdown command from the vehicle system control.

**M_SDN_C**
**Range: ________________ YES/NO**

Indicates whether there is a motor shutdown command from the powertrain control module.

**MANSW_TCM**
**Range: ________________ OPEN/CLOSED**

Indicates whether the gear selector lever is in Manual position.

**MECH_TCM (°C/°F)**
**Range: ________________ actual**

Displays the motor electronics coolant temperature.

**MIL_DIS_TCM**
**Range: ________________ actual**

Displays the distance traveled since the MIL was activated.

**MTQ_OUT**
**Range: ________________ actual**

Displays the motor torque from AC source.

**MTR_COILTEMP (°C)(°F)**
**Range: ________________ actual**

Displays the motor coil temperature.

**MTR_INV_V**
**Range: ________________ actual**

Displays the motor inverter voltage.

**MTR_SPEED**
**Range: ________________ actual**

Displays the motor speed in RPM.

**MTR_TEMPHI (°C)/(°F)**
**Range: ________________ actual**

Displays the motor inverse phase temperature.

**MTR_TORQ_CMD**
**Range: ________________ actual**

Displays the motor torque command.

**NEUTPOS_TCM**
**Range: ________________ YES/NO**

Indicates whether the gear selector lever position is neutral.

**ODOMETER_TCM**
**Range: ________________ actual**

Indicates the total distance traveled.

**OFMFLG**
**Range: ______ YES FAULT/NO FAULT**

Indicates the pressure control failure mode.

**OSS**
**Range: ______ actual**

Displays the output shaft speed.

**OSS_F**
**Range: ______ YES FAULT/NO FAULT**

Indicates the reliability of the output shaft speed signal.

**OSS_DIR**
**Range: ______ FORWARD/REVERSE**

Displays the output shaft direction.

**OSS_TCM**
**Range: ______ actual**

Displays the output shaft speed in RPM.

**OTEMP_FMFLG**
**Range: ______ YES FAULT/NO FAULT**

Indicates whether a transmission over temperature condition exists.

**OverdriveCancel**
**Range: ______ NOT DEPRESSED/DEPRESSED**

Displays the state of the overdrive cancel switch/hold switch.

**PCA**
**Range: ______ actual**

Displays the measured pressure of pressure control solenoid A.

**PCA_FLT**
**Range: ______ NO FAULT/FAULT**

Displays the pressure control solenoid A status.

**PCA_MES**
**Range: ______ actual**

Displays the measured pressure of the transmission PCA.

**PCAA**
**Range: ______ 0 to 1.2A**

Displays the pressure control solenoid A amperage.

**PCAAMP_MES**
**Range: ______ 0 to 1.2A**

Displays the measured current PCA.

**PCB**
**Range: ______ actual**

Displays the measured pressure of pressure control solenoid B.

**PCBA**
**Range: ______ 0 to 1.2A**

Displays the pressure control solenoid B amperage.

**PCBAMP_MES**
**Range: 0 to 1.2A**

Displays the measured current for the transmission PCB.

**PCCAMP_MES**
**Range: 0 to 1.2A**

Displays the measured current for the PCC.

**PCC**
**Range: actual**

Displays the measured pressure for pressure control solenoid C.

**PCC_MES**
**Range: 0 to 1.2A**

Displays the current pressure of the PCC.

**PCCA**
**Range: 0 to 1.2A**

Displays the pressure control solenoid C amperage.

**PCD**
**Range: actual**

Displays the measured pressure of shift solenoid pressure control D.

**PCD_FLT**
**Range: YES FAULT/NO FAULT**

Indicates the SSPCD status.

**PCD_AMP**
**Range: 0 to 1.2A**

Displays the shift solenoid pressure control D amperage.

**PCE_AMP**
**Range: 0 to 1.2A**

Displays the shift solenoid pressure control E amperage.

**PCF**
**Range: actual**

Displays the line pressure control.

**PCF_FLT**
**Range: YES FAULT/NO FAULT**

Displays the LPC status.

**PCG**
**Range: actual**

Displays the torque converter pressure control.

**PCG_FLT**
**Range: YES FAULT/NO FAULT**

Displays the torque converter clutch status.

**PCE**
**Range: actual**

Displays the shift solenoid pressure control E.

**RCL_F**
**Range: ____ YES FAULT/NO FAULT**

Displays the reverse control lamp fault status.

**PCM_MSG_TCM**
**Range: ____ PRESENT/NOT PRESENT**

Indicates whether a CAN message is missing from the PCM.

**RESPOS_TCM**
**Range: ____ YES/NO**

Indicates whether the gear selector lever in Reverse position.

**RF_WSPD_TCM**
**Range: ____ actual**

Displays the right front wheel speed sensor signal.

**RPM_DSD_TCM**
**Range: ____ actual**

Displays the desired idle speed (RPM).

**RPM_TCM**
**RPM_TCM_HEV**
**Range: ____ actual**

Displays the engine Speed (RPM).

**SHIFT_POS**
**Range: ____ actual**

Displays the transmission control indicator light status.

**SLIP_DES_SCP**
**Range: ____ 0 to 1200 RPM**

Displays the desired torque converter slip.

**SSA_AMP**
**Range: ____ 0 to 1.2A**

Displays the shift solenoid pressure control A amperage.

**SSAFM**
**Range: ____ YES/NO**

Displays the shift solenoid 1 status.

**SSB_AMP**
**Range: ____ 0 to 1.2A**

Displays the shift solenoid pressure control B amperage.

**SSB_SS1**
**Range: ____ ON/OFF**

Displays the shift solenoid 1 status.

**SSB_SS2**
**Range: ____ ON/OFF**

Displays the shift solenoid 2 status.

**SSBFM**
**Range: ____ YES/NO**

Displays the shift solenoid 2 status.

**SSC_AMP**
**Range: ______ 0 to 1.2A**

Displays the shift solenoid pressure control C amperage.

**SSE**
**Range: ______ 0 to 100%**

Displays the shift solenoid pressure control E status.

**SSPCA**
**Range: ______ actual**

Displays the shift solenoid pressure control A status.

**SSPCA_FLT**
**Range: ______ NO FAULT/FAULT**

Displays the shift solenoid pressure control A status.

**SSPCB**
**Range: ______ actual**

Displays the shift solenoid pressure control B status.

**SSPCB_FLT**
**Range: ______ NO FAULT/FAULT**

Displays the shift solenoid pressure control B status.

**SSPCC**
**Range: ______ actual**

Displays the shift solenoid pressure control C status.

**SSPCC_FLT**
**Range: ______ NO FAULT/FAULT**

Displays the shift solenoid pressure control C status.

**TC_SLIP**
**Range: ______ 0 to 1200 RPM**

Displays the actual torque converter slippage speed.

**TCC**
**Range: ______ 0 to 100%**

Displays the torque converter clutch solenoid signal (modulated).

**TCCAMP_MES**
**Range: ______ 0 to 1.2A**

Displays the measured current for the TCC pressure control.

**TCC_FLT**
**Range: ______ YES FAULT/NO FAULT**

Displays the status of the torque converter clutch fault.

**TCC_OSC**
**Range: ______ actual**

Displays the output state control of the torque converter.

**TCC_SLIP_DSD**
**Range: ______ 0 to 1200 RPM**

Displays the desired torque converter slip speed.

**TCIL**
**Range: ______ ON/OFF**

Displays the status of the transmission control indicator light.

**TCIL_FLT**
**Range: ______ YES FAULT/NO FAULT**

Displays the transmission control indicator light fault status.

**TCM_CAUTION**
**Range: ______ ON/OFF**

Displays the status of the transmission control module caution.

**TCM_HAZ**
**Range: ______ ON/OFF**

Displays the transmission control module hazard warning lamp status.

**TCS**
**Range: ______ NOT DEPRESSED/DEPRESSED**

Displays the status of the overdrive cancel switch/hold switch.

**TFT (°C/°F)**
**TOT_ENG (°C/°F)**
**TRAN_TEMP (°C/°F)**
**Range: ______ actual**

Displays the transmission fluid temperature.

**TIP_MIN_TCM**
**Range: ______ OPEN/CLOSED**

Displays the gear lever position —Tip Minus.

**TIP_PL_TCM**
**Range: ______ OPEN/CLOSED**

Displays the gear lever position—Tip Plus.

**TORQUE**
**TORQUE_TCM**
**Range: ______ actual**

Displays the net engine torque.

**TORQUE_DSD**
**TORQ_DSD**
**Range: ______ actual**

Displays the desired total engine torque.

**TOTF**
**Range: ______ YES FAULT/NO FAULT**

Displays the transmission fluid temperature fault status.

**TOWHAUL**
**Range: ______ ON/OFF**

Displays the tow haul switch status.

**TP_PER**
**Range: ______ 0 to 100%**

Displays the throttle position in percentage.

**TP_REL_TCM**
**Range:** ______ **0 to 100%**

Displays the relative throttle position as a percentage.

**TR**
**TR_FREQ(Hz)**
**TTR_DC**
**TR_V**
**Range:** ______ **not available**

Indicates the transmission range.

**TRFM**
**Range:** ______ **YES FAULT/NO FAULT**

Indicates the transmission range status.

**TRO_N_F**
**TRO_N_FAULT**
**Range:** ______ **YES FAULT/NO FAULT or YES/NO**

Displays the neutral output status. Reads YES when a neutral circuit fault is detected.

**TRO_P_F**
**Range:** ______ **YES FAULT/NO FAULT or YES/NO**

Displays the park output status. Reads YES when a park circuit fault is detected.

**TSES_TCM**
**Range:** ______ **CLOCKTIME**

Displays the time since start in seconds.

**TSLIPRAT**
**Range:** ______ **0 to 1200 RPM**

Displays the transmission slip ratio.

**TSFMFLG_TCM**
**TSFMFLG**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the status of the turbine speed sensor failure mode.

**TSS**
**TSS_TCM**
**Range:** ______ **actual**

Displays the turbine shaft speed.

**TSS_F**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the turbine shaft speed signal reliability.

**TQ_CNTL**
**Range:** ______ **actual**

Displays the torque fuel/spark limiting status.

**VAR_CMD**
**Range:** ______ **actual**

Displays the commanded variator ratio (input speed/output speed).

**VAR_MES**
**Range:** ______ **actual**

Displays the measured variator ratio (input speed/output speed).

**VEH_CTRL**
**Range:** ______ **not available**

Displays the vehicle control mode.

**VOLT_SENSR**
**Range:** ______ **5V**

Displays the sensor supply voltage.

**VPWR_TCM**
**VPWR**
**Range:** ______ **B+**

Displays the module supply voltage.

**VS_SRC**
**Range:** ______ **actual**

Displays the transfer case sensor signal.

**VSFMFLG**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the vehicle speed sensor signal status.

**VSS_F**
**Range:** ______ **YES FAULT/NO FAULT**

Displays the vehicle speed sensor reliability.

**VSS_TCM**
**VSS_TCM_HEV**
**Range:** ______ **actual**

Displays the vehicle speed.

**VSS_TCM_HR**
**Range:** ______ **actual**

Displays the vehicle speed—high resolution.

**WARMUPDTC_TCM**
**Range:** ______ **actual**

Displays the number of warm-ups since the DTCs were cleared.

# Tire Pressure Monitor (TPM) Parameters

**CCNT_TPMS**
**Range:** ____ **actual**

Indicates continuous codes.

**HORN_TPM**
**Range:** ____ **ACTIVE/INACTIVE**

Indicates horn output.

**LAST_ID**
**Range:** ____ **actual**

Indicates the last received tire transmitter ID code value.

**LF_ID**
**Range:** ____ **actual**

Indicates the left front tire transmitter identifier.

**LF_LRN**
**Range:** ____ **ACTIVE/INACTIVE**

Indicates the left front learn status.

**LF_MES**
**Range:** ____ **ACTIVE/INACTIVE**

Indicates the left front re-measure status.

**LF_NORM**
**Range:** ____ **ACTIVE/INACTIVE**

Indicates the left front normal status.

**LF_PSI**
**Range:** ____ **actual**

Indicates the left front tire pressure.

**LF_REC**
**Range:** ____ **YES/NO**

Indicates the left front transmit has been received after learn.

**LFAWAKE**
**Range:** ____ **YES/NO**

Indicates the left front awake status.

**LFIDPRG**
**Range:** ____ **YES/NO**

Indicates the left front sensor programmed.

**LFLOBAT**
**Range:** ____ **LOW/OK**

Indicates the left front battery status.

**LR_ID**
**Range:** ____ **YES/NO**

Indicates the left rear tire transmitter identifier.

**LR_LRN**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the left rear learn status.

**LR_MES**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the left rear re-measure status.

**LR_NORM**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the left rear normal status.

**LR_REC**
**Range:** ______ **YES/NO**

Indicates the left rear transmit has been received after learn.

**LRAWAKE**
**Range:** ______ **actual**

Indicates the left rear awake status.

**LRIDPRG**
**Range:** ______ **YES/NO**

Indicates the left rear sensor programmed.

**LRLOBAT**
**Range:** ______ **LOW/OK**

Indicates the left rear battery status.

**LRO_PSI**
**Range:** ______ **actual**

Indicates the left rear outer tire pressure.

**RESET**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the parameter reset command.

**RF_ID**
**Range:** ______ **actual**

Indicates the right front tire transmitter identifier.

**RF_REC**
**Range:** ______ **YES/NO**

Indicates the right front transmit bas been received after learn.

**RF_LRN**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the right front learn status.

**RF_MES**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the right front re-measure status.

**RF_NORM**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the right front normal status.

**RF_PSI**
**Range:** ________ **actual**

Indicates the right front tire pressure.

**RFAWAKE**
**Range:** ________ **YES/NO**

Indicates the right front awake status.

**RFIDPRG**
**Range:** ________ **YES/NO**

Indicates the right front sensor programmed.

**RFLOBAT**
**Range:** ________ **LOW/OK**

Indicates the right front battery status.

**RR_ID**
**Range:** ________ **actual**

Indicates the right rear tire transmitter identifier.

**RR_LRN**
**Range:** ________ **ACTIVE/INACTIVE**

Indicates the right rear learn status.

**RR_MES**
**Range:** ________ **ACTIVE/INACTIVE**

Indicates the right rear re-measure status.

**RR_NORM**
**Range:** ________ **ACTIVE/INACTIVE**

Indicates the right rear normal status.

**RR_REC**
**Range:** ________ **YES/NO**

Indicates the right rear transmit has been received after learn.

**RRAWAKE**
**Range:** ________ **YES/NO**

Indicates the right rear awake status.

**RRIDPRG**
**Range:** ________ **YES/NO**

Indicates the right rear sensor programmed.

**RRLOBAT**
**Range:** ________ **LOW/OK**

Indicates the right rear battery status

**RRO_PSI**
**Range:** ________ **actual**

Indicates the right rear outer tire pressure.

**SP_LRN**
**Range:** ________ **ACTIVE/INACTIVE**

Indicates the spare learn status.

**SP_MES**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the spare re-measure status.

**SP_NORM**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the spare normal status.

**SP_REC**
**Range:** ______ **YES/NO**

Indicates the spare transmit has been received after learn.

**SPAWAKE**
**Range:** ______ **YES/NO**

Indicates the spare awake status.

**SPIDPRG**
**Range:** ______ **YES/NO**

Indicates the spare sensor programmed.

**SPLOBAT**
**Range:** ______ **ACTIVE/INACTIVE**

Indicates the spare low battery.

**SPR_ID**
**Range:** ______ **actual**

Indicates the spare tire transmitter identifier.

**SPR_PSI**
**Range:** ______ **actual**

Indicates the spare tire pressure.

**VSS_TPM**
**Range:** ______ **actual**

Displays the vehicle speed.

**WARN_1**
**Range:** ______ **actual**

Displays the transmitter identifier with warning value 1.

**WARN_2**
**Range:** ______ **actual**

Displays the transmitter identifier with warning value 2.

**WARN_3**
**Range:** ______ **actual**

Displays the transmitter identifier with warning value 3.

**WARN_4**
**Range:** ______ **actual**

Displays the transmitter identifier with warning value 4.

**WARN_5**
**Range:** ______ **actual**

Displays the transmitter identifier with warning value 5.

Chapter 14

# GM Data Parameters

This chapter contains information for interpreting data parameters on GM vehicles.

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


- “GM Operations” on page 155
- “GM Testing” on page 162
- “GM Communications Problems” on page 730


## Alphabetical Parameter List

### Numerics

## A

## B

## C

## D

## E

## F

## I

## K

## L

## M

## N



## O

## P

## Q

## R

## S

## T

## U



## V

## W



## Y

# Engine Parameters

This section defines data parameters that are available from the engine electronic control module (ECM) or the powertrain control module (PCM) on General Motors vehicles.

**1ST GEAR**
**2ND GEAR**
**3RD GEAR**
**4TH GEAR**
**Range: _______________ P1/P2**

Displays the various input signals to the PCM from switches on the transmission. A displayed value of P1 indicates the initial state of the switch position, while P2 indicates the switch position has changed.

On some vehicles, all of these switches may not be installed, or they may be installed but not be connected at the transmission. However, the circuits to the PCM may be present. A gear switch parameter reads P1 at all times for an unconnected circuit.

**1-2 ERROR(SEC)**
**Range: _______________ variable**

Displays the difference between the desired 1-2 shift time and the actual 1-2 shift time. A positive number indicates a firm or fast shift, where the actual shift time was shorter than the desired shift time. A negative number indicates a soft or slow shift, where the actual shift time was longer than the desired shift time. This value is only accurate if the shift was adaptable.

**1-2 SHIFT(SEC)**
**Range: _______________ variable**

Displays the actual time of the last adaptable 1-2 shift. The shift time is based on the gear ratio change after the commanded 1-2 shift.

**1-2 SOLENOID**
**2-3 SOLENOID**
**Range: _______________ ON/OFF**

Displays the PCM commanded valve state of the 1-2 and 2-3 solenoids. All the shift solenoids are normally closed. This means that no fluid passes through when the solenoid is commanded OFF. When commanded ON, the solenoid opens and allows fluid to flow.

As shown in Table 14-1, the solenoid ON and OFF states match certain gear positions. Check the factory manual for a chart for the specific transmission being serviced.

**Table 14-1** *1-2/2-3 SOLENOID parameter readings*

| 1-2 Solenoid | 2-3 Solenoid | Gear |
|---|---|---|
| ON | ON | 1st |
| OFF | ON | 2nd |
| OFF | OFF | 3rd |
| ON | OFF | 4th |

**1-4 SHIFT LAMP**
**Range: _______________ ON/OFF**

Displays the 1-4 shift lamp status. Reads as follows:

- OFF under normal conditions
- ON when the 1-4 shift solenoid is enabled by the PCM and the 1-4 shift lamp lights

**1-4 SOL ENABLED**

**Range: ____________________ YES/NO**

Displays the PCM command status of the 1-4 shift lamp and reads as follows:

- NO under normal operating conditions
- YES when the 1-4 shift solenoid is enabled by the PCM

**18X ACTIVITY(RPM)**

**Range: ____________________ variable**

Displays the engine speed as calculated from the 18X reference signal.

**1X REF PULSES**

**Range: ____________________ YES/NO**

On some models, the powertrain control module (PCM) receives alternating ignition reference signals, called 1X and 2X pulses. The PCM uses this information to synchronize fuel injection with ignition and to control timing when the engine is running.

A counter in the PCM records 2X pulses and resets to zero when a 1X pulse occurs. If the PCM receives eight 2X pulses without a 1X pulse, the counter resets to zero and counts 1X pulses until it receives four of them. It then resets to zero and resumes counting 2X pulses.

1X REF PULSES reads as follows:

- YES as long as the PCM continues to receive normal, alternating 1X and 2X pulses
- NO if there may be a problem with an ignition reference signal or a crankshaft sensor

**2-3 ERROR(SEC)**

**Range: ____________________ variable**

Displays the difference between the desired 2-3 shift time and the actual 2-3 shift time. A positive number indicates a firm or fast shift, where the actual shift time was shorter than the desired shift time. A negative number indicates a soft or slow shift, where the actual shift time was longer than the desired shift time. This value is only accurate if the shift was adaptable.

**2-3 SHIFT(SEC)**

**Range: ____________________ variable**

Displays the actual time of the last adaptable 2-3 shift. The shift time is based on the gear ratio change after the commanded 2-3 shift.

**24X SNSR RPM**

**Range: ____________________ 0 to 1750 rpm**

Displays the engine RPM calculated from CKP sensor data. Due to the resolution of the signal, this data is limited to the idle RPM range.

**2ND AIR SYS RDY**

**Range: ____________________ YES/NO**

Indicates whether the OBD-II Secondary Air System Monitor has performed at least one test and reads as follows:

- YES when the PCM is ready to display secondary air system diagnostic trouble codes (DTCs) set by the Monitor during the last test.
- NO if the vehicle needs to be run through an OBD-II Monitor Readiness Drive Cycle before displaying secondary air system DTCs

**2ND FUEL PUMP**

**Range: ____________________ ON/OFF**

Displays the PCM command to the relay for the second fuel pump on the ZR1 Corvette with a LT5 engine.

**2ND START LMP**
**Range: ____ YES/NO**

Displays the status of the 2nd gear start selector switch. The 2nd gear start switch enables the 2-3 shift solenoid and disables the 1-2 shift solenoid, which allows the vehicle to start motion in second gear for better traction. Wide open throttle overrides the 2nd gear start switch, allowing a first gear start.

2ND START LMP reads as follows:

- YES when the 2nd gear start selector switch is on
- NO at all other times

**3-4 ERROR(SEC)**
**Range: ____ variable**

Displays the difference between the desired 3-4 shift time and the actual 3-4 shift time. A positive number indicates a firm or fast shift, where the actual shift time was shorter than the desired shift time. A negative number indicates a soft or slow shift, where the actual shift time was longer than the desired shift time. This value is only accurate if the shift was adaptable.

**3-4 SHIFT(SEC)**
**Range: ____ variable**

Displays the actual time of the last adaptable 3-4 shift. The shift time is based on the gear ratio change after the commanded 3-4 shift.

**3X ENG SPEED**
**Range: ____1600 to 10,000 rpm)**

Displays the signal calculated from the 7X pulses and is fed to the powertrain control module (PCM) by the ignition control module. This is used by the PCM in order to calculate RPM at engine speeds above 1600 RPM and to initiate injector pulses.

**4-5 ERROR(SEC)**
**Range: ____ variable**

Displays the difference between the desired 4-5 shift time and the actual 4-5 shift time. A positive number indicates a firm or fast shift, where the actual shift time was shorter than the desired shift time. A negative number indicates a soft or slow shift, where the actual shift time was longer than the desired shift time. This value is only accurate if the shift was adaptable.

**4-5 SHIFT(SEC)**
**Range: ____ variable**

Displays the actual time of the last adaptable 4-5 shift. The shift time is based on the gear ratio change after the commanded 4-5 shift.

**4-5 SOLENOID**
**Range: ____ ON/OFF**

Displays the current commanded state of the shift solenoids. All of the shift solenoids are normally closed. This means that no fluid passes through when the solenoid is commanded OFF. When commanded ON, the solenoid opens and allows fluids to flow through.

**4WD LOW ENBL**
**Range: ____ YES/NO**

Displays the current state of the four wheel drive (4WD) low gear.

**4X CAM REF**
**Range: ____0 to 255**

Displays the number of 4X reference pulses between camshaft pulses in a range of 0 to 255. The normal count is 8 with the engine running.

**5V REF (V)**
**Range: 0 to 5.12**

Displays the 5 V reference signal on which system sensors operate. The PCM monitors this voltage and provides the parameter on the data stream. Nominal reference voltage is 5.0 V, but it may vary by a few tenths of a volt, depending on system calibration and charging system output.

**5V REF A**
**5V REF B**
**Range: PASS/FAIL**

Displays the state of 5 V reference circuits A and B.

**12V REF**
**Range: PASS/FAIL**

Displays the state of the 12 V reference circuit input to the PCM.

**A/C CLUTCH**
**Range: ON/OFF**

Displays the PCM commanded state of the A/C clutch control relay. Reads ON when the A/C clutch is engaged.

**A/C CLUTCH FBK**
**Range: ON/OFF**

Displays the current state of the A/C clutch relay.

**A/C COMP SW**
**Range: LO/NORM**

Displays the state of the A/C compressor cycling switch and reads as follows:

- LO when pressure is low
- NORM when pressure is normal

The A/C compressor cycling switch is normally closed.

**A/C ENABLED**
**Range: YES/NO**

Displays the position of the A/C switch on the instrument panel or the setting of the A/C request on the automatic climate control panel.

A/C ENABLED reads YES if the A/C switch has been turned on or the BCM has commanded the A/C system to turn on.

In some cases, the A/C compressor may not turn on even though the switch is closed. Several other switch or sensor signals may prevent the PCM from engaging the A/C compressor clutch. The request parameter means the switch is closed or the PCM has been commanded to turn on the A/C when all other conditions permit. Refer to the A/C Clutch parameter description for information on the feedback signal from the A/C compressor clutch.

**A/C EVAP TMP (°)**
**A/C EVAP**
**Range: –18° to +53°C or 0° to 128°F**

Displays the A/C evaporator temperature. The PCM uses the information for cycling the compressor clutch and preventing evaporator freezing.

**A/C FAN REQUEST**
**FAN REQUEST**
**Range:** ____________ **YES/NO**

Indicates whether the PCM is commanding the electric engine cooling fan to turn on.

**A/C HI PRESS(V)**
**Range:** ____________ **0.00 to 5.00 V**

Displays the pressure value of the A/C refrigerant pressure sensor as voltage. The A/C refrigerant pressure helps diagnose DTC P0530.

**AC HI PRESS OPN**
**Range:** ____________ **HI/NORM**

Displays the state of the A/C secondary high pressure switch. The A/C secondary high pressure switch is normally open.

**A/C HI-SIDE (psi)**
**Range:** ____________ **15 to 452 psi**
**A/C HI-SIDE(KPA)**
**Range:** ____________ **0 to 3000 kPa**
**AC HI-SIDE (V)**
**Range:** ____________ **0.00 to 5.00 V**

Displays the refrigerant pressure, which indicates the load placed on the engine by the A/C compressor. The voltage value is signal from the pressure sensor, the pressure readings are calculated by the PCM based on the voltage signal. The PCM uses it to adjust idle and control the cooling fans.

**A/C HIGH PRESS SW**
**Range:** ____________ **OPEN/CLSD**
**AC HI PRESS SW**
**Range:** ____________ **HIGH/LOW or HIGH/NORM**

Displays the current state of the A/C secondary high pressure switch.

**A/C IDLE UP**
**Range:** ____________ **YES/NO**

Indicates when the engine idle speed is being increased because of increased engine load from A/C compressor operation.

**A/C LOAD (ft./lb.)**
**Range:** ____________ **see description**

Displays the calculated load that the A/C is placing on the engine as foot-pounds of torque.

**A/C PRESS**
**Range:** ____________ **NORM/HIGH**
**A/C LOAD SIGNAL**
**Range:** ____________ **YES/NO**

Displays the status of a pressure switch in the high-pressure side of the air conditioning system on some models.

Readings indicate if system pressure is normal or too high.

- If A/C PRESS reads HIGH, the PCM disables air conditioning operation.
- If A/C LOAD SIGNAL reads YES, the PCM increases idle speed by 50 RPM.

**A/C PRESS (psi)**
**Range: ________________________________________________ 25 to 460 psi**
**A/C PRESS (KPA)**
**Range: ______________________________________________ 170 to 3170 kPa**
**AC HI PRES(psi)**
**Range: ________________________________________________ 25 to 460 psi**
**AC HI PRES(KPA)**
**Range: ______________________________________________ 170 to 3170 kPa**

Displays the signal of a pressure sensor in the high-pressure side of the air conditioning system on some models in pounds per square inch or kilopascal.

The sensor values are accurate to approximately ±20 psi (138 kPa). The readings are slightly low when pressure is decreasing and slightly high when pressure is increasing.

**A/C PRESS(V)**
**Range: __________________________________________________ 0 to 5.12 V**

Displays the signal of a pressure sensor in the high-pressure side of the A/C system on some models as voltage. High voltage equals high pressure; low voltage equals low pressure. Refer to A/C Press (psi) or (kPa) parameter for information on the calculated measurements.

**A/C RLY OPEN/SHORT**
**Range: ____________________________________________________ YES/NO**

Indicates whether a short exists in the A/C relay circuit. Reads YES if the A/C relay control circuit feedback voltage at the PCM is too low when the A/C relay is commanded off.

**A/C RELAY**
**Range: ____________________________________________________ ON/OFF**

Displays the feedback signal the PCM receives from the A/C clutch, which indicates whether the A/C clutch relay is ON or OFF.

**A/C RELAY COM**
**A/C RELAY CMD**
**Range: ____________________________________________________ ON/OFF**

Displays the PCM commanded state of the A/C clutch control relay. They read ON when the A/C clutch is engaged and OFF at all other times.

**A/C REQUEST**
**A/C REQUESTED**
**Range: ________________________________________ YES/NO or ON/OFF**

Displays the state of the A/C request input circuit from the heating, ventilation, and air conditioning (HVAC) controls. The PCM uses the A/C request signal in order to determine whether the A/C compressor operation is being requested.

**A/C RLY**
**Range: ____________________________________ open/short/overcurrent**

Displays the status of the A/C relay. The PCM monitors output driver (ODM) B #3 for an open or shorted condition if one of the conditions exists the fault line will go low. The screen displays the condition that is present.

**A/C SLUGGING**
**Range: ____________________________________________________ YES/NO**

Displays the PCM command status to the A/C compressor at startup. Often the A/C compressor vibrates when first engaged after engine startup. To help prevent this condition, the PCM engages the A/C compressor when the engine first starts.

A/C SLUGGING reads YES if the PCM is commanding the compressor to run at startup.

**A/C SOLENOID**
**Range: ______ ON/OFF**

Displays the status of the A/C solenoid on some carbureted engines. The PCM can override the A/C instrument panel switch and turn the A/C compressor off through a solenoid.

A/C SOLENOID reads as follows:

- ON if the PCM is leaving the solenoid on and letting the A/C switch control the air conditioning
- OFF if the PCM actuated the solenoid to turn off the A/C

**A/C STATUS**
**Range: ______ YES/NO**

Displays the status of the A/C system communication to the VCM.

**A/F LEARNED**
**Range: ______ YES/NO**

Indicates whether the block learn multiplier (BLM) is responding to the fuel integrator corrections on some fuel-injected vehicles. Use this reading to check block learn response.

This parameter reads as follows:

- YES when block learn is responding to the integrator corrections
- NO if block learn is not responding to the integrator

In most cases, it should read YES when the engine is in closed loop, and NO when in open loop. This may vary with a few engine calibrations.

If the fuel integrator reaches its limit and block learn is not enabled, reads NO, the vehicle may have a driveability problem or it may return to open loop. Refer to the Integrator and BLM parameter descriptions for more information.

**A/F RATIO**
**A/F RATIO(:1)**
**Range: ______ 0 to 99.9**

Displays the calculated desired air-fuel ratio the PCM expects during closed-loop operation on some fuel-injected vehicles. This is not a measured value, but the calculated value of the ratio that the PCM wants to be delivered based on sensor input signals.

Although the range is from 0 to 99.9, the actual value should be near 14.7 in most cases. Lower numbers indicate a rich ratio commanded for startup. Higher numbers indicate a leaner ratio.

**ABUSE MGMNT**
**Range: ______ YES/NO**

Indicates whether excessive stress is being applied to the powertrain. Reads YES if the PCM determines there is excessive stress. The PCM reduces engine torque when YES displays.

**AC PRES DISABLE**
**Range: ______ YES/NO**

Displays the status of the A/C pressure cutout. Reads YES if the PCM has disabled the A/C compressor due to excessive refrigerant pressure

**AC PRESS TOO HI**
**Range: ______ YES/NO**

Displays the status of the A/C pressure switch and reads as follows:

- NO when the switch is closed, which is the normal position
- YES when the switch opens, which indicates A/C pressure is too high

Opening the A/C pressure switch interrupts voltage to the PCM to de-energize the A/C compressor control relay to turn the compressor off.

**AC RLY BAT SHRT**
**Range: ____ YES/NO**

Indicates whether a short to battery voltage is detected on the A/C clutch relay control circuit.

**ACCEL ENRICH**
**Range: ____ YES/NO**

Displays the status of acceleration enrichment on some fuel-injected engines. On these models, the PCM provides a richer mixture during acceleration by momentarily increasing the injector pulse width.

ACCEL ENRICH reads as follows:

- YES when the PCM enriches the mixture during acceleration. Injector pulse width should increase at the same time
- NO under all other conditions

**ACT EGR(%)**
**Range: ____ 0 to 100%**

Displays the feedback signal from the EGR valve indicating actual EGR valve pintle position on 4.3L truck engines with central point injection (CPI).

**ACT EGR(KPA)**
**Range: ____0 to 128**
**ACT EGR("Hg)**
**Range: ____ 0 to 37.9**
**DES EGR(KPA)**
**Range: ____0 to 128**
**DES EGR("Hg)**
**Range: ____ 0 to 37.9**

Displays the actual and desired amount of control vacuum applied to the EGR valve on C and K series trucks with a 6.2L diesel engine. The readings do not indicate EGR pressure. A MAP sensor in the vacuum line provides the feedback signal that indicates actual control vacuum.

Compare the two parameters to determine the ability of the PCM and the vacuum pump to control EGR and the response of the system to PCM commands.

**ACT EXH CMP B1**
**ACT EXH CMP B2**
**Range: ____ 0 to 40°**

Displays the degrees of advance for the bank1 (B1) or bank 2 (B2) exhaust camshaft. The angle shown is related to crankshaft position as determined by the control module based on input from the exhaust CMP sensors. The scan tool displays a higher value for a more advanced exhaust camshaft position. A lower value displays when the exhaust camshaft is not being advanced, such as when running at idle.

**ACT FRP(MPa)**
**Range: ____ 0.00 to 175.00 MPa**

Displays the current fuel rail pressure, as measured by the fuel rail pressure (FRP) sensor.

**ACT INT CMP B1**
**ACT INT CMP B2**
**Range:** ____ **0 to 40°**

Displays the desired intake camshaft position for bank1 (B1) or bank 2 (B2), as determined by the control module. The scan tool will display a higher value for advanced intake valve timing, such as at high load or speed conditions. The scan tool will display a lower value for a less advanced intake valve timing such as at idle.

**ACT MAF IDLE(g/s)**
**Range:** ____ **0 to 35.4**

Displays the actual mass airflow (MAF) sensor signal in grams-per-second (gm/Sec). Most port fuel injection engines use a MAF sensor to determine the mass, or weight, of air entering the engine. The PCM uses the MAF signal along with other sensor signals to determine the air-fuel ratio needed by the engine and adjust fuel injection pulse width accordingly.

This grams per second (gm/Sec) measurement ranges from 0 to 255 and reads as follows:

- The reading should be low at idle and increase as the throttle opens.
- During WOT, the reading may rise above 100 gm/Sec.
- A maximum reading near 255 is unlikely.
- Some MAF sensors produce a low reading of about 2 to 8 gm/Sec with the engine off.
- The actual (ACT) measurement ranges from 0 to 35.4.

This parameter displays the amount of mass airflow while the engine idles.

The MAF sensor on some 1987–88 2.8L V6 engines may have been disconnected as part of a service modification campaign. Readings on such an engine may be either fixed at one end of the range or jumbled. Modified systems use the manifold absolute pressure (MAP) sensor.

**ACT PUMP(°)**
**DES PUMP(°)**
**Range:** ____ **0 to 25.5°**

Displays the actual (ACT) fuel injection timing and the desired (DES) fuel injection timing.

**ACT TIMING**
**Range:** ____ **0 to 25°**

Displays the current actual injection timing on 6.5L diesel engines.

**ACTUAL CKP**
**Range:** ____ **0 to 255**

Indicates whether the 7X synchronization pulses from the ignition module are being received by the PCM.

**ACTUAL CMP**
**Range:** ____ **0 to 255**

Displays a count of the signal pulses being sent to the PCM by the camshaft position (CMP) sensor. The count changes continually as the engine runs.

**ADP KNCK RET(°)**
**Range:** ____ **variable**

Displays the spark advance adjustment factor. The PCM calculates this value based on input from the knock sensor and applies it to the ignition control (IC). This allows the PCM to make long-term adjustments to the spark advance.

**AIR ACTIVE INH**
**Range: ______ YES/NO**

Indicates whether the air injection active test is inhibited from running at this time and reads YES when the test is being prevented.

**AIR ACTIVE INJ**
**Range: ______ YES/NO**

Indicates whether the air injection active test is being performed by the PCM for diagnostic purposes and reads YES when a test is in progress.

**AIR CONTROL SOL**
**AIR DIVERT SOL**
**Range: ______ NORM/DIV or PORT/DIV**

Displays the PCM output command to the air injection control or diverter valve solenoid.

These parameters read as follows:

- NORM or PORT when the solenoid has been commanded to move the valve and direct air downstream to the exhaust ports or to the air switching solenoid
- DIV when the solenoid valve is diverting air to the atmosphere

**AIR DIAG DONE**
**Range: ______ YES/NO**

Indicates whether the OBD-II Secondary Air System Monitor has performed a diagnostic monitor test and reads YES if the monitor has completed

**AIR INTAKE SOL**
**Range: ______ ON/OFF**

Indicates whether the PCM has commanded the secondary air intake valve to open on some Isuzu 1.6L engines.

AIR INTAKE SOL reads as follows:

- OFF if the PCM has not energized the solenoid to open the secondary valve, and the engine is operating on the primary intake runners
- ON if the PCM has commanded the solenoid to open the secondary valve

**NOTE:**
The engine must be warmed up, in closed loop, and operating with certain combinations of speed, throttle opening, and load before this parameter reads ON.

This parameter is an output signal from the PCM only. It does not indicate whether the solenoid is responding or the air valve is opened.

**AIR PASSIVE INH**
**Range: ______ YES/NO**

Indicates whether the air injection Passive Test is inhibited from running at this time and reads YES when the test is being prevented.

**AIR PASSIVE ON**
**Range: ______ YES/NO**

Indicates whether air injection Passive Tests are in progress and reads YES if a test is running.

**AIR PASSIVE PASS**
**Range: ____ YES/NO**

Indicates whether air injection Passive Tests 1 and 2 have completed. Reads YES if both test successfully completed, no further action is needed.

**AIR PASSVE1 PASS**
**Range: ____ YES/NO**

Indicates passed or failed air injection Passive Test 1 and reads as follows:

- YES if the test was completed
- NO if not

The second AIR Passive test runs after test 1 completes.

**AIR PASSVE2 FAIL**
**Range: ____ YES/NO**

Indicates whether Passive air injection Test 1 or Passive Test 2 failed or is inconclusive.

AIR PASSVE2 FAIL reads YES if the test failed, which causes the AIR Active Test to run.

**AIR PUMP**
**AIR INJ PUMP**
**SEC. AIR PUMP**
**Range: ____ ON/OFF**

Displays the status of the AIR pump relay control circuit and read as follows:

- ON when the PCM grounds the AIR pump relay control circuit
- OFF when the PCM disables the ground circuit

**AIR SOLENOID**
**AIR INJ SOL**
**Range: ____ ON/OFF**

Displays the condition of the air solenoid Control circuit. They read ON when the solenoid is on and OFF at all other times.

**AIR SWITCH SOL**
**Range: ____PORT/CONV**

Displays the PCM command to the air injection switching solenoid on some vehicles:

- PORT = the solenoid moves the valve to direct air to the exhaust ports or manifold
- CONV = the solenoid moves the valve to direct air downstream to the catalytic converter

**AIRFLOW(gm/Sec)**
**Range: ____0 to 255**

Displays the intake airflow in grams-per-second (gm-Sec). Some engines have both a MAF and an AIRFLOW parameter. When the MAF sensor is working correctly, both should read the same.

If the MAF sensor fails, it should set a code 33 or 34. In this case, the PCM substitutes a calculated, or default, value for mass airflow based on the signals from several other sensors. The MAF reading is the default value, so the faulty MAF sensor value displays.

**APP(%)**
**Range: ____ 0 to 100%**

Displays the accelerator Pedal Position (APP) as a percentage and reads as follows:

- 0% at idle
- 100% at wide open throttle (WOT)

**APP #1 ERROR**
**APP #2 ERROR**
**APP #3 ERROR**
**Range: ____ YES/NO**

Indicates whether an accelerator pedal position (APP) sensor signal error occurred, and reads:

- YES only when the APP signal is out of specifications
- NO when the voltage is normal

**APP 1(V)**
**APP 2(V)**
**APP 3(V)**
**Range: ____ 0 to 5.0 V**

Displays the voltage signal from accelerator pedal position (APP) sensors. The ECM uses APP sensors to control fuel delivery as requested by the driver. Three APP sensors are located in a module at the base of the accelerator pedal. The ECM only requires information from one sensor, the other two serve as a fail safe.

APP 1 should read as follows:

- About 0.35 to 0.95 V at idle
- Above 4.0 V at wide open throttle

**APP 1&2 AGREE**
**APP1/APP2 AGREE**
**APP1/APP3 AGREE**
**APP2/APP3 AGREE**
**Range: ____ YES/NO**

Displays the results of a control module test that compares signals from one specific accelerator pedal position (APP) sensor to another specific APP sensor.

These parameters read as follows:

- YES if the sensor signals agree and correspond to the same accelerator pedal position
- NO if the sensor signals disagree and correspond to different accelerator pedal positions

**APP1(V)**
**Range: ____ 0 to 5.0 V**
**APP2(V)**
**APP3(V)**
**Range: ____ 5.0 to 0 V**

Displays the voltage signal from accelerator pedal position (APP) sensors, see Table 14-12.

**Table 14-2** *Typical accelerator pedal readings*

| Parameter | Accelerator Pedal At 0% (Pedal At Rest) | Accelerator Pedal At 100% (Pedal Fully Pressed) |
|---|---|---|
| APP1(V) | Less than 1.1 V | More than 2.0 V |
| APP2(V) | More than 3.9 V | Less than 3.0 V |
| APP3(V) | More than 3.2 V | Less than 3.5 V |

**APP1(%)**
**APP2(%)**
**APP3(%)**
**Range: ____ 0 to 100%**

Accelerator pedal position (APP) sensor inputs are used by the PCM to control fuel delivery as requested by the driver. An APP sensor module is located at the base of the accelerator pedal. During normal operation, the PCM only uses the APP1 sensor input, the other two serve as fail safe sensors.

These parameters read as follows:

- 0% for a fully released accelerator
- 100% at wide open throttle (WOT)

The displayed value should increase as smoothly as the accelerator is moved from closed to WOT.

**APP-1 MIN(%)**
**Range: ____ 0 to 100%**

Displays the absolute minimum voltage from APP Sensor 1, which the ECM learned during a key up ignition cycle learn procedure.

The ECM scales this voltage to 0% as long as it falls within a certain range.

**APP1/APP3 PROB**
**APP1/APP2 PROB**
**APP2/APP3 PROB**
**Range: ____ YES/NO**

Indicates whether the signal voltage from one APP sensor is in the proper relationship to the signal of another APP sensor.

These parameters read as follows:

- NO under normal conditions
- YES when a fault exists

**APP ANGLE(%)**
**Range: ____ 0 to 100%**

Displays the accelerator pedal position (APP) sensor angle, which the ECM computes from the APP sensor voltage input. The ECM sends the APP angle information to the TCM via the high speed GMLAN serial data line.

APP ANGLE reads as follows:

- 0% at idle when APP voltage is below 0.90 V
- 100% at wide open throttle when APP voltage is near 5.0 V

**APP AVE**
**Range: ____ 0 to 125 counts**

Displays the accelerator pedal position (APP) as step counts. The TAC Module takes the voltages from the 3 APP Sensors, averages the readings and converts the readings into counts. The reading is the average counts. The average is different on every vehicle.

**APP AVG**
**Range: ____ 0 to 255**

Displays the accelerator pedal position (APP) as step counts. The Throttle Actuator Control (TAC) module calculates an average after sampling signals from the three APP sensors. The TAC converts this average into the step count displayed.

**ASYNCH PULSE**
**Range: ________ YES/NO**

Displays the status of the asynchronous pulse to the fuel injectors, which provides extra fuel when engine load and speed require it. These pulses are not synchronized with the regular injector pulses, so they are called asynchronous. The asynchronous pulse function is similar to a carburetor accelerator pump.

ASYNCH PULSE reads as follows:

- YES when the asynchronous pulse function is active
- NO when it is not

**ASYNCH PW(mS)**
**Range: ________ 0 to 99.9**

Displays the duration of the asynchronous injector pulses in milliseconds (mS).

When ASYNCH PULSE reads YES, ASYNCH PW(mS) shows the time of the pulse. The range is 0 to 99.9 mS, but typical values are usually quite short.

**ATC SLIP(RPM)**
**Range: ________ variable**

Displays the difference in rotational speed between the front and rear propshafts on an automatic transfer case.

**AUTO LRN TIMER**
**Range: ________ ON/OFF**

Indicates whether the vehicle theft deterrent (VTD) is still in learn mode or whether it has timed out. It reads ON when learn mode is active.

**AUTO RECIRC MODE**
**Range: ________ ON/OFF**

Displays the VCM command for auto recirculation. If the secondary high pressure switch closes, indicating high refrigerant pressure, auto recirculation is commanded ON by the VCM to prevent warm outside air from entering the vehicle, which might further raise the A/C pressures.

**AUX FAN REQUEST**
**Range: ________ ON/OFF**

Displays the PCM command to the auxiliary fan relay control circuit and reads as follows:

- ON when the PCM grounds the relay control circuit
- OFF when the PCM opens the ground circuit

**AUX INTAKE SOL**
**Range: ________ ON/OFF**

Indicates whether the auxiliary intake air control solenoid is ON or OFF.

**AWD LAMP OPEN**
**Range: ________ YES/NO**

Indicates the state of the instrument cluster AWD lamp circuit and reads as follows:

- YES when the lamp circuit is open
- NO if the circuit is complete and the lamp is on

**AWD LAMP SHRTED**
**Range: ________ YES/NO**

Displays the status of the instrument cluster AWD lamp circuit and reads YES if the lamp circuit is shorted to ground.

**B-1 LOOP STAT**
**B-2 LOOP STAT**
**Range: ______ OPEN/CLSD/???**

Displays the condition of the heated oxygen sensor (HO2S) for Bank 1 Sensor 1 and Bank 2 Sensor 1 respectively. They read as follows:

- OPEN when the HO2S has not met all of the conditions necessary for closed loop operation
- CLSD when the powertrain control module (PCM) is using HO2S feedback for fuel control
- ??? when the PCM has invalid data related to the HO2S

**B1S1 HTR AMPS**
**B2S1 HTR AMPS**
**Range: ______ 0 to 1.5 A**

Displays the heated oxygen sensor (HO2S) B1S1 and B2S1 heater element current. The heater current is low when heater circuit resistance is high, and high when circuit resistance is low.

**B1-S1 L-R(SEC)**
**B2-S1 L-R(SEC)**
**Range: ______ 0 to 5.10**

Displays the average time that it takes for heated oxygen sensor (HO2S) on B1S1 (bank 1) and B2S1 (bank 2) to switch from lean to rich.

**B1S1 LOOP STATUS**
**Range: ______ OPEN/CLSD**

Displays the state of the Bank 1 fuel control system as commanded by the control module. Closed Loop operation indicates that the control module is controlling the fuel delivery based off the oxygen sensors input signal. In Open Loop operation, the control module ignores the oxygen sensor input signal and bases the amount of the fuel to be delivered on other sensor inputs.

**B1S2 LOOP STATUS**
**Range: ______ OPEN/CLSD**

Displays the state of the Bank 1 Sensor 2 (rear) heated oxygen sensors as commanded by the control module. The rear sensors will not go into Closed Loop until the ECM determines that the HO2S is ready for operation.

**B2S1 LOOP STATUS**
**Range: ______ OPEN/CLSD**

Displays the state of the Bank 2 fuel control system as commanded by the control module. Closed Loop operation indicates that the control module is controlling the fuel delivery based off the oxygen sensors input signal. In Open Loop operation, the control module ignores the oxygen sensor input signal and bases the amount of the fuel to be delivered on other sensor inputs.

**B2S2 LOOP STATUS**
**Range: ______ OPEN/CLSD**

Displays the state of the Bank 2 Sensor 2 (rear) heated oxygen sensors as commanded by the control module. The rear sensors will not go into Closed Loop until the ECM determines that the HO2S is ready for operation.

**BAL RATE 1(mm3)**
**BAL RATE 2(mm3)**
**BAL RATE 3(mm3)**
**BAL RATE 4(mm3)**
**BAL RATE 5(mm3)**
**BAL RATE 6(mm3)**
**BAL RATE 7(mm3**
**BAL RATE 8(mm3)**
**Range: ______ see description**

Displays the adjustment of fuel volume to the individual cylinders as cubic millimeters (mm3) and reads as follows:

- A negative value indicates that fuel volume is lowered.
- A Positive value indicates that volume is raised.
- Between -4 mm3 and +4 mm3 does not cause a driveability concern.
- Less than -4 mm3, or between 4 mm3 and 14 mm3 may cause a driveability concern without any DTCs.
- More than 15 mm3 sets a DTC.

**BARO**
**Range: ______ 10 to 105 kPa**

Displays barometric pressure. The BARO reading is determined from the boost sensor at ignition on, engine off. The BARO reading display represents barometric pressure and is used to compensate for altitude differences.

**BARO(“Hg)**
**Range: ______ 0 to 37.0 “Hg**
**BARO(KPA)**
**Range: ______ 0 to 125 kPa**

Displays the PCM calculated barometric pressure based on the BARO sensor voltage signal as inches of mercury.

The BARO parameter typically reads as follows:

- 100 kPa (29.6 inHg) at sea level
- 60 kPa (17.8 inHg) at 14,000 feet

Compare the BARO voltage and pressure parameter readings. Voltage should be high when pressure is high, low when pressure is low.

**BARO(V)**
**Range: ______ 0 to 5.12 V**

Displays the signal voltage of the barometric pressure (BARO) sensor, which varies directly with atmospheric (barometric) pressure.

BARO(V) ranges from 0 to 5.12 V and reads as follows:

- It should read high when barometric pressure is near atmospheric pressure at sea level.
- It should drop as barometric pressure drops.

The PCM uses BARO sensor voltage along with the manifold absolute pressure (MAP) sensor voltage to calculate manifold vacuum and to determine true absolute pressure.

Some systems do not have a BARO sensor, but the PCM provides a BARO reading by sampling the MAP sensor reading with the key on and engine off, just before cranking. At this point, manifold pressure should equal, or be very close to, atmospheric pressure.

The PCM also updates these BARO estimates when the engine is running by sampling MAP voltage when the engine is at wide open throttle.

**BASE PW(mS)**
**LEFT BPW(mS)**
**RIGHT BPW(mS)**
**Range: ________________________________ 0 to 99.9 mS**

Displays the base pulse width (PW) that the PCM is applying to turn on the fuel injectors in milliseconds (mS) on throttle body and port injection systems.

A high pulse width indicates more on-time and a richer mixture. A low pulse width indicates less on-time and a leaner mixture. There are no definite specifications for injector pulse width, but the reading should change as engine speed and load change.

These parameters read as follows:

- 1 to 4 mS at idle
- 12 mS at wide open throttle or a little higher for some engines

Some V-type engines, such as the Cadillac Allante V8, have separate pulse width parameters for the left and right banks. These values are shown as left and right, rather than base.

**BATT(V)**
**Range: ________________________________ 0 to 25.5 V**

Displays the vehicle battery voltage. The engine control system has no specific sensor to measure battery voltage, but some PCMs calculate this analog parameter using a sensing circuit across the supply voltage circuit.

Although the range is 0 to 25.5 V, the reading should be close to normal charging system regulated voltage with the engine running. Typically 13.5 to 14.5 V at idle. Check the reading against actual voltage measured at the battery or alternator.

Some Cadillac models read battery voltage at the fuel pump relay. The display should read 00.0 for these models when the engine is not running.

The PCM uses the battery parameter principally for self-diagnostics. Some PCM functions are modified if voltage falls too low or rises too high. For example, if voltage drops below a minimum value, the PCM tries to recharge the battery by increasing the idle speed. This may affect the idle speed control, fuel metering, and ignition timing parameters.

**BATTERY (V)**
**Range: ________________________________ 11.5 to 14.5 V**

Displays the system voltage measured by the ECM at the battery voltage feed circuit.

**BLM**
**BLOCK LEARN**
**LT TRIM**
**LEFT BLM**
**RIGHT BLM**
**Range: ________________________________ 0 to 255**

Displays the block learn multiplier (BLM) numbers, which indicate the operation and long-term correction of the fuel metering of a fuel-injected engine. Block learn indicates if the PCM is commanding a rich or lean mixture.

The BLM number ranges from 0 to 255 with a midpoint of 128. A BLM number higher than 128 indicates a PCM command for a long-term rich mixture correction. A BLM number lower than 128 indicates that the PCM is commanding a lean mixture (Figure 14-1).

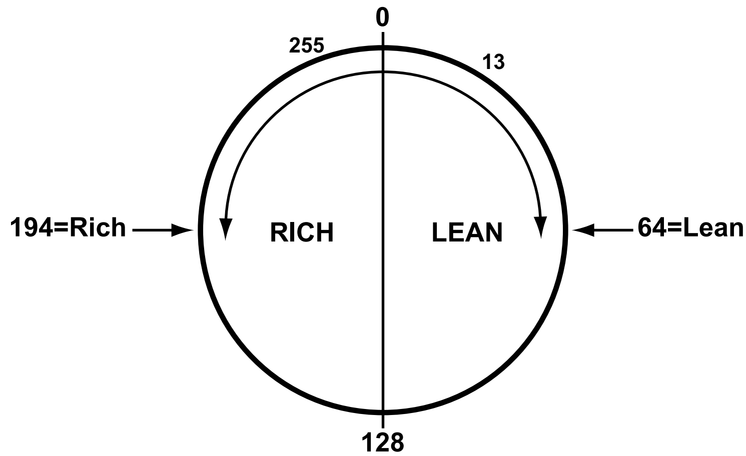


**Figure 14-1**

Rich/lean correction from base midpoint (0)

The BLM number follows the integrator number and makes long-term corrections to fuel metering in response to short-term integrator changes. For example, integrator and block learn may both start at 128. The integrator number may move up toward or above 130. At that point, the BLM number may move up to 129. The integrator then returns to 128 to indicate that it is controlling fuel metering at the midpoint of an overall richer operating condition. A similar action occurs when the PCM commands a leaner mixture and the numbers move down. Refer to the Integrator parameter for more information.

Compare BLM values to injector on-time. A BLM above 128 indicates increased on-time. A value below 128 indicates decreased on-time. The BLM corrections operate only in closed loop. In open loop, the number goes to a fixed value, usually 128.

Some V-type engines have separate BLM factors for the left and right banks. Values are shown as left and right BLM for these engines.

Block learn may be stored in volatile or nonvolatile PCM memory. If in volatile memory, values erase when the engine is turned off and return to 128 when the engine starts. If in nonvolatile memory, values are retained and restored when the engine is started. Disconnecting the battery or removing the PCM fuse erases nonvolatile memory.

**BLM CELL**
**FUEL TRIM**
**Range: ______________________________ 0 to 15 or 0 to 24**

Displays the current BLM or fuel trim cell. For all vehicles except Cadillac, block learn multiplier (BLM) is divided into 16 cells, numbered from 0 to 15. The Cadillac BLM is divided into 25 cells, numbered from 0 to 24.

Cells are arranged in a theoretical grid, four or five high and four or five wide. Height represents engine load from low to high, and width represents engine speed from low to high. Any combination of engine load and speed fits into one of the 16 or 25 cells in the grid.

These parameters indicate which cell the engine is operating in at the moment.

**BLM CELL 1-CRZ**
**BLM CELL 2-DECL**
**BLM CELL 3-ACC**
**Range:** ______ **108 to 148 counts**

This parameter counts acceleration fuel adjustments, which indicates learned changes to fuel control. Ideal is 128 counts

**BLM CELL O-IDLE**
**Range:** ______ **108 to 148**

This parameter counts idle fuel adjustments, which indicates learned changes to fuel control. Ideal is 128 with an operating range from 108 to 148. Long term fuel trim cells compensate for variation due to changes in the engine, driving conditions. High block learn counts indicate the PCM is adding fuel to compensate for a lean exhaust. Low long term fuel trim indicates the PCM is reducing fuel to compensate for a rich condition.

**BOOST(%)**
**Range:** ______ **0 to 100%**

Displays the percentage of the supercharger boost control duty cycle, or the wastegate solenoid, on 3800 supercharged engines only.

- 0% = no boost
- 100% = full boost

**BOOST(KPA)**
**Range:** ______ **10 to 200 kPa**

Displays the amount of turbo boost pressure in the intake manifold. True boost pressure is determined by subtracting barometric pressure (BARO) from the actual reading.

**BOOST(“Hg)**
**Range:** ______ **0 to 60.7 “Hg**
**BOOST PRESS(V)**
**Range:** ______ **0 to 5.00 V**
**DES BOOST(KPA)**
**Range:** ______ **0 to 205 kPa**
**DES BOOST(“Hg)**
**Range:** ______ **0 to 60.7 “Hg**

Displays the boost pressure on a turbocharged or supercharged engine.

- BOOST PRESS(V) is a signal from the pressure sensor indicating boost pressure
- BOOST is a feedback signal to the PCM indicating the actual boost pressure
- DES BOOST is the desired boost pressure that the PCM is trying to maintain

To determine true boost pressure, subtract BARO from the actual boost reading.

At idle, boost pressure should be about the same as barometric pressure. At a full load with WOT, boost pressure should be high, while at decel with a closed throttle, boost pressure should be low. Boost pressure readings are opposite of what you would read with a vacuum gauge. When manifold pressure is high, vacuum is low.

**BOOST DUTY(%)**
**Range:** ______ **0 to 100%**

Displays the percentage of the supercharger boost control duty cycle and reads as follows:

- 0% = no boost
- 100% = full boost

**BOOST ENRICH**
**Range:** ______ **YES/NO**

Indicates whether the PCM is providing a richer mixture when the turbocharger is applying boost on some turbocharged engines. It does this by momentarily decreasing mixture control (MC) solenoid dwell or increasing injector pulse width. BOOST ENRICH reads as follows:

- YES when boost is applied
- NO under all other conditions

**BRAKE BOOSTER PRESS SENSOR**
**Range:** ______ **54-81 kPa**

Displays the brake booster engine vacuum pressure.

**BRAKE LAMP SW**
**Range:** ______ **ON/OFF**

Displays the status of the pedal-mounted brake lamp switch and reads ON when the switch is in the ON position.

**BRAKE SW**
**Range:** ______ **OPEN/CLSD**

Displays the state of the brake switch circuit input and reads as follows:

- OPEN when the brakes are applied
- CLSD when the brake pedal is released

**BRAKE VAC(V)**
**Range:** ______ **0.00 to 5.00 V**

Displays the signal from the brake booster vacuum sensor as voltage.

**CAL ID**
**Range:** ______ **1111111 To 9999999**

Displays the calibration ID number for service identification.

**CALC B1 TWC(°)**
**CALC B2 TWC(°)**
**Range:** ______ **300-1065**

Displays the temperature of the bank 1 (B1) and bank 2 (B2) catalytic converters as calculated by the control module based on various system inputs. A higher value displays at higher catalytic converter temperatures. Lower values display at lower catalytic converter temperatures.

**CALC CMPRS OUT**
**Range:** ______ **0 to 255**

Displays the binary number that represents the cam output from the EI module to the ECM.

**CALC VACUUM**
**Range:** ______ **variable**

Displays the PCM-calculated intake manifold vacuum, which is directly related to engine load. The lower the displayed value, the greater the engine load.

**CAM HI TO LO**
**CAM LO TO HI**
**Range:** ______ **0 to 65535**

Displays a count of the number of camshaft position (CMP) sensor signal changes as voltage goes from low to high.

**CAM PHASE ACT(°)**
**Range: ______ 0 to 25°**

Displays the actual PCM commanded camshaft retard in degrees.

**CAM PHASE DES(°)**
**Range: ______ 0 to 25°**

Displays the PCM desired camshaft phase angle.

**CAM PHASE DUTY(%)**
**Range: ______ 0 to 100%**

Displays the duty cycle the PCM is applying to the camshaft phase solenoid to achieve desired cam retard or advance.

**CAM PHASE VARI**
**Range: ______ 0 to 25%**

Displays the difference in degrees between the desired and actual camshaft angle.

**CAM REF MISSED**
**Range: ______ 0 to 8**

Displays the number of camshaft pulses not counted by the PCM. Reads 0 under normal conditions. This number only increases due to an intermittent condition. If the signal is missing for a longer period, this parameter remains 0.

**CAM RETARD(°)**
**Range: ______ 0 to 360**

Displays the difference between the camshaft position (CMP) sensor and crankshaft position (CKP) sensor in degrees.

**CAM SIG PRESENT**
**Range: ______ 0 to 255**

Displays the number of camshaft signal inputs to the PCM. It resets to zero after reaching 255.

**CAT CONV(°C)**
**Range: ______ 0° to 1000°C**
**CAT CONV(°F)**
**Range: ______ 0° to 1832°F**

Displays the PCM calculated catalytic converter temperature on some vehicles. The calculations are based on sensor inputs for exhaust oxygen content, engine coolant temperature, load, speed, and other values.

**CAT CONV HITEMP**
**Range: ______ YES/NO**

Indicates whether the catalytic converter is overheating on 1992 and later 5.7L high output (HO) Corvette only.

Catalytic converter temperature is calculated internally by the PCM based on sensor inputs for exhaust oxygen content, engine coolant temperature, load, speed, and other values.

**CAT MON TST B1**
**CAT MON TST B2**
**Range: ______ YES/NO**

Indicates whether the diagnostic tests for the catalytic converters have completed for bank one (B1) and bank two (B2).

**CAT TESTS DONE**
**Range: ________________________________________ 0 to 255**

Displays a count of the total number of catalyst monitor samples taken during the current ignition cycle. The counter should never be greater than 1 unless DTCs have been cleared or the battery has been disconnected.

**CATALYST MONITOR**
**Range: ________________________________________ YES/NO**

Indicates whether the diagnostic tests for the catalyst system have completed.

**CC ACTIVE**
**C/C ACTIVE**
**Range: ________________________________________ ON/OFF**

Indicates whether the cruise control operation is inhibited.

**CC BRAKE SW**
**CRUISE BRAKE SW**
**Range: ________________________________________ OPEN/CLSD**

Displays the status of the cruise control (CC) brake switch contacts, which are normally closed. The CC brake switch provides a PCM input signal. When the brake pedal is pressed the contacts open to deliver a high voltage signal to the PCM, and the PCM disengages the cruise control.

These parameters are not active and read CLSD unless the cruise control is turned on. With the cruise control on, the reading is as follows:

- OPEN when the brake is pressed
- CLSD at all other times

**CC CLUTCH**
**C/C CLT/TCC SW**
**Range: ________________________________________ ON/OFF**

Displays the current command from PCM to the cruise control module. They read ON when cruise is being commanded on and OFF at all other times.

**CC CURRENT HI**
**Range: ________________________________________ YES/NO**

Indicates whether there is excessive current at output number 4 of QDM B.

**CC DIRECTN CMD**
**Range: ________________________________________ ON/OFF**

Indicates whether the PCM is commanding a cruise control direction.

**CC DISENG HIST1**
**CC DISENG HIST2**
**CC DISENG HIST3**
**CC DISENG HIST4**
**CC DISENG HIST5**
**CC DISENG HIST6**
**CC DISENG HIST7**
**CC DISENG HIST8**
**Range: ________________________________________ see description**

Displays the last eight cruise control disengagements in order from 1 to 8.

**CC ENABLED**
**Range: ____ YES/NO**

Indicates whether the PCM has enabled cruise control (CC) system operation on Cadillacs and reads YES only when the cruise control ON/OFF switch is ON and the brake pedal is released.

**CC ENGAGED**
**CRUISE ENGAGED**
**Range: ____ YES/NO**

Displays the status of the cruise control switch and read as follows:

- YES when the cruise control switch is on and the set/coast switch is activated
- NO when the cruise control switch is on and the set/coast switch is released

**CC INH SIG CMD**
**Range: ____ YES/NO**

Indicates whether the PCM is commanding the SMCC module to inhibit cruise control operation, such as when park, neutral, reverse or low gear is selected.

**CC INH STAT**
**Range: ____ ON/OFF**

Indicates whether the PCM is inhibiting cruise control.

**CC INHIBITED**
**Range: ____ YES/NO**

Indicates whether the PCM is inhibiting cruise control.

**CC MOVE**
**Range: ____ ON/OFF**

Displays the current command from the PCM to the cruise module.

**CC RES/ACC**
**CRUISE RES/ACC**
**CC ON/OFF SW**
**Range: ____ ON/OFF**
**CC RES/ACC SW**
**C/C RES/ACC SW**
**CC SET/CST SW**
**C/C SET/CST SW**
**CRUISE SET/CST**
**Range: ____ YES/NO**

Displays the positions of the cruise control switches and read as follows:

- ON or YES when the circuits are closed
- OFF or NO when the circuits are open

The resume (RES) accelerate (ACC) and the set coast (CST) switches are in parallel to each other and in series with the On/Off switch.

- If the ON/OFF parameters read ON, the YES/NO parameters should read YES.
- If the ON/OFF parameters read OFF, the YES/NO parameters should read NO.

**CC OPEN/SHRT**
**Range: ____ YES/NO**

Indicates whether an open or short exists at cruise control output number 4 of QDM B.

**CCP DUTY CYCLE**

**Range: ______ 0 to 100%**

Displays the canister purge solenoid duty cycle on some systems. Pulse width modulated solenoids in these systems turn on to activate purge and turn off to block purge.

The solenoid duty cycle displayed indicates the percentage of actual purge flow:

- 0% indicates the solenoid is completely de-energized to prevent purge
- 100% indicates the solenoid is fully energized to allow maximum purge

On vehicles that display both CCP DUTY CYCLE and CCP SOLENOID or CCP COMMAND, the solenoid reading may be OFF, purge on, or the command reading may be ON, purge on, while the duty cycle reading is at 0 (zero). This means the PCM is commanding purge to be turned on, but purging starts slowly. Purging normally increases gradually from 0% to avoid dumping vapors into the intake charge and creating a momentary overly rich mixture.

**CCP SOLENOID**
**CCP COMMAND**

**Range: ______ ON/OFF**

Displays the status of the charcoal canister purge (CCP) valve. The CCP valve is controlled by a solenoid that blocks vacuum to cut off purge when energized, such as with a cold engine or when running at idle. The solenoid opens the vacuum line to allow purge on a warm engine running above idle when de-energized. Solenoid operation is controlled by the PCM.

Either one of the two parameters display, depending on the information on the PCM data stream. The CCP solenoid parameter indicates the state of the solenoid, while the CCP command indicates the command for the actual purge flow.

CCP SOLENOID reads as follows:

- ON when the solenoid is energized to block purging (at idle)
- OFF when the solenoid is de-energized to allow purging (at closed-loop cruising speed)

CCP COMMAND reads as follows:

- ON when the PCM de-energizes the solenoid to allow purge
- OFF when the PCM has energized the solenoid to prevent purge

In codes and data mode, the CCP solenoid is usually ON or the CCP command is usually OFF because the PCM prevents purge in this diagnostic mode on most vehicles. On some vehicles, purging may not be affected in this way. In road test mode, the PCM allows normal purge operation, and either reading may be ON or OFF depending on operating conditions.

Either parameter indicates the PCM command has been issued. They are not feedback signals and do not indicate whether the solenoid has responded to the command.

**CC RELEASE**

**Range: ______ YES/NO**

Indicates whether the PCM is commanding cruise to disengage.

**CC REQUESTED**

**Range: ______ YES/NO**

Displays the state of the cruise control request input from the stepper motor cruise control (SMCC) module.

**CC SERVO(%)**
**Range: ______ 0 to 100%**

Displays the feedback signal from the servo on computer-controlled cruise control systems, which indicates the relative position of the servo diaphragm connected to the throttle.

CC SERVO(%) reads as follows:

- 0% when the servo is fully retracted
- 100% when it is fully extended

This parameter is sent to the PCM by the servo position sensor. The PCM calculates the percentage of movement from the sensor signal.

**CC SPEED**
**Range: ______ 0 to vehicle max**

Displays the selected speed that the cruise control system is trying to maintain. Readings increase whenever the resume/accelerate switch is pressed, and decrease if the set/coast switch is pressed.

**CC VACUUM SOL**
**CC VENT SOL**
**Range: ______ ON/OFF**

Displays the PCM outputs commands to the cruise control vacuum and vent solenoids, which regulate the cruise control servo on some vehicles.

These parameters read ON when the solenoids are energized to apply or to vent vacuum.

The two readings should have the following relationships with throttle position control:

**Table 14-3** *CC VACUUM SOL and CC VENT SOL readings*

| Vacuum Solenoid | Vent Solenoid | Throttle Position |
|---|---|---|
| ON | OFF | Accelerate |
| ON or OFF | ON | Decelerate |
| OFF | OFF | Steady |

**CHANGE OIL LAMP**
**Range: ______ ON/OFF**

Indicates whether the PCM is commanding the change oil lamp on.

**CHASSIS PITCH**
**Range: ______ YES/NO**

Indicates whether conditions that would cause the vehicles chassis to pitch exist.

**CKP A/B SIG ERR**
**Range: ______ 0 to 255**

Displays the number of times the PCM recognized a correlation error between crankshaft position (CKP) sensors A and B.

**CKP ACTV CNTR**
**Range: ______ 0 to 255**

Displays the number of 7X pulses the PCM has received from the EI (ignition) module. The EI module produces the 7X pulses based on the AC voltage from the CKP sensor. One count equals one notch passed on the crankshaft.

The reading increments from 0 to 255, and then resets to 0 when a CKP signal is being received.

**CKP RESYNCS**
**Range: ________________________________________________0 to 255**

Displays a count of the number of times the PCM had to synchronize the crankshaft position (CKP) sensor.

**CKP-A CNTR**
**CKP-B CNTR**
**Range: ________________________________________________0 to 3**

Displays a rolling count when the PCM is calculating crankshaft position using the signal from CKP sensor A or B respectively.

Normal engine operation is for the PCM to use the sensor A signal for crankshaft position and ignore the sensor B input. The scan tool displays only the signal the PCM is using to determine crankshaft position. Therefore, sensor A counts will be changing and sensor B counts will be fixed at zero.

However, if the sensor A signal is missing or irregular, the PCM will use the sensor B signal and display a rolling count on the sensor B parameter.

**CLEAR CODE**
**Range: ________________________________________________0 to 9999**

Displays the accumulated distance in miles or kilometers since an emission diagnostic trouble code cleared. The PCM stores this mileage in the Freeze Frame and Failure Records buffers.

**CLEAR FLOOD**
**Range: ________________________________________________ YES/NO**

Indicates whether the PCM is commanding a clear flood mode on many fuel-injected engines. The PCM responds to engine cranking with a wide open throttle by commanding a clear flood mode. Clear flood provides a very lean air-fuel mixture to help clear a flooded engine.

Reads YES only under these conditions. If it does not, the PCM may not be getting an accurate TPS signal, or there may be a problem with the clear flood program in the PCM.

**CLNT FAN/RLY 1**
**Range: ________________________________________________ ON/OFF**

Displays the state of the driver circuit for the coolant fan circuit and should read ON when the fan is operating.

**CLNT FAN/RLY 2&3**
**Range: ________________________________________________ OK/FAULT**

Displays the state of the driver circuit for coolant fan control circuit and reads as follows:

- OK under normal conditions
- FAULT if a circuit failure was detected

**CLUTCH DEPRESSED**
**Range: ________________________________________________ YES/NO**

Indicates whether the clutch pedal is pressed. The cruise control disengages when the clutch pedal is pressed.

Reads as follows:

- YES when the clutch pedal is pressed
- NO when the pedal is released

**CLUTCH SW**
**Range: ____________________ OPEN/CLSD**

Displays the current state of the clutch pedal switch on models with a manual transmission.

**CMP ACTV CNTR**
**Range: ____________________ 0 to 255**

Displays a count of compression sense (camshaft) pulses the PCM received from the EI module. The reading increments from 0 to 255, and resets to 0 when a valid CMP signal is received.

**CMP PRESENT**
**Range: ____________________ YES/NO**

Indicates whether a valid CMP signal was received. Should read YES with the engine running.

**CMP SENSOR(RPM)**
**Range: ____________________ variable**

Displays the engine speed based on the signal from the camshaft position (CMP) sensor.

**CMP RESYNCS**
**Range: ____________________ 0 to 255**

Shows how many times the PCM had to synchronize the camshaft position (CMP) sensor.

**CMP RETARD(°)**
**Range: ____________________ ±0 to 100°**

Displays the camshaft retard in degrees. The typical amount displayed is –3°. The normal value should be as close to 0 as possible. The engine must be above 1000 RPM for a valid reading.

**CMMNDED MODE**
**Range: ____________________ see description**

Displays the current operating mode of the automatic transfer case. Possible readings are: INVALID, NEUT, 2WD, 4WD LO, 4WD HI, AUTO 4WD, and 2WD LO.

**COLD START**
**Range: ____________________ YES/NO**

Indicates whether the engine is operating in cold-start mode. A cold start-up is when the engine coolant temperature (ECT) rises above a predetermined temperature during an ignition cycle. The next ignition cycle the ECT should be below a predetermined temperature.

Also, the ECT and the intake air temperature (IAT) are less than 122°F (50°C) and are within 5°F (3°C) of each other at start-up. When the above is true, the displays reads YES.

**COMMAND GEAR**
**Range: ____________________ see description**

Displays the PCM-desired gear on models with an 4T60E transmission. On the 4T60E, two shift solenoids change forward gear ranges when the selector is in D-4 (overdrive).

On all models except Saturn, the readings are: NONE, 1ST, 2ND, 3RD, and 4TH. For Saturn, this parameter shows the gear the module is controlling. The readings are: LOW, 2ND, 3RD, 4TH, NEUT, and REV.

The display shows “????” between gears or if the signal is invalid.

**COMP GRAD(“H20)**
**Range: ____________________ 0 to 9.18**

Displays the rise in fuel tank pressure when both the EVAP Purge valve and the EVAP Vent valve are closed.

**CONVERTER(°)**
**Range: 0 to 765°C or 32 to 1409°F**

Displays the temperature of the 3-way catalyst as calculated by the PCM.

**COOLANT(V)**
**CLNT(V)**
**Range: 0 to 5.00 V**

Displays the voltage signal supplied to the vehicle control module (VCM) by the engine coolant temperature (ECT) sensor. The ECT is a thermistor in the intake manifold that transmits a variable voltage signal to the VCM. The VCM converts ECT voltage to temperature readings. On a cold engine, ECT resistance is high and voltage is high. As the engine warms ECT resistance drops and the voltage decreases.

**COOLANT**
**Range: -39 to +140°C or -38 to +284°F**

Displays the temperature calculated by the PCM based on engine coolant temperature (ECT) sensor voltage. The PCM applies 5.0 V to the ECT sensor circuit. The sensor is a thermistor which changes internal resistance as the engine temperature changes.

When the sensor is cold, internal resistance high, the PCM senses a high signal voltage and interprets the voltage as a cold engine. As the sensor warms, internal resistance decreases, the voltage signal decreases and the PCM interprets the lower voltage as a warm engine.

**COOLANT TEMP**
**Range: WARM/COOL**

Displays the status of the temperature switch on minimum-function, carbureted T-cars (Chevette, T-1000, and Acadian) and some Isuzu models. These systems do not have a thermistor-type temperature sensor.

- WARM = the PCM turns on the engine cooling fan
- COOL = the PCM turns the fan off

**COOLING FAN 1**
**COOLING FAN 2**
**Range: ON/OFF**

Displays the PCM output commands to the cooling fan relays on some Cadillac models with two electric engine cooling fans. The PCM command goes to a quad driver module that energizes the relays.

- Fan 1 reads ON when the PCM energizes the low-speed relay to operate both fans.
- Fan 2 reads ON when the high-speed relay is energized, which also operates both fans.

**CLNT LIGHT**
**Range: ON/OFF**

Displays the PCM output command to the coolant temperature lamp on the instrument panel of a late-model Cadillac. The reading corresponds to lamp condition.

**CRANK**
**Range: YES/NO**

Indicates whether the ignition switch cranking circuit is closed through the starter solenoid and reads as follows:

- YES when the cranking circuit is closed and the engine is cranking
- NO when the circuit is open

This parameter signals the PCM to shut down temporarily as the engine cranks because power cannot be ensured with the high current draw of the starter.

**CRANK LEARNED**
**Range: ____ YES/NO**

Indicates whether the PCM has learned the spacing between the notches of the crankshaft position (CKP) sensor. In order to perform accurate misfire diagnostics using the CKP sensor, the exact space between each reluctor notch must be learned.

**CRANK REQUEST**
**CRANK REQ**
**Range: ____ YES/NO**

Displays the PCM request to engage the cranking relay and power the starter. Reads YES when the ignition switch is in the crank position.

**CRANKING A/F**
**Range: ____ 0 to 99.9**

Displays the PCM calculated desired cranking air-fuel ratio on some fuel-injected engines. The calculated value is based on various sensor inputs.

Although the measurement range is from 0 to 99.9, the actual value should be below 14.7, indicating a rich ratio for startup.

**CRANKING RPM**
**Range: ____0 to 800**

Displays the engine speed during cranking on some fuel-injected engines. The PCM uses cranking RPM to calculate fuel metering for the best air-fuel ratio at starting. Use this parameter for checking cranking performance or troubleshooting starting problems.

**CRANK PULSES**
**CRANK REF PULSE**
**Range: ____ YES/NO**

Indicates whether the PCM is receiving crankshaft rotation and position signals from the ignition system or a CKP sensor. The PCM uses this information to synchronize fuel injection during engine cranking.

- YES = the engine is cranking
- NO = a problem may exist with an ignition reference signal or CKP sensor.

**CRANK REF MISSED**
**Range: ____ 0 to 8 counts**

Displays the number of crankshaft reference pulses not recorded by the PCM. The PCM uses the crank signal parameter to determine crankshaft position.

CRANK REF MISSED should read 0 at idle.

If a fault occurs in this circuit, the vehicle goes into a backup fuel mode, and the fuel system runs on a calculated injection rate based on the last fuel injection pulse. The engine starts and continues to run, but in the backup fuel mode, with either of these faults present.

Also, since the PCM calculates RPM based on crank pulses, the RPM parameter reads zero (0) if a fault is detected in the crankshaft circuit.

**CRUISE MODE**
**Range: ____ ON/OFF**

Displays the operating condition of the cruise control system on some models.

**CRUISE RES/ACC SW**
**Range: ON/OFF**

Displays the current state of the cruise Resume/Accel switch.

**CRUISE SET/CST SW**
**Range: ON/OFF**

Displays the current state of the cruise set coast switch.

**CRUISE SW**
**Range: ON/OFF**

Displays the cruise control switch state, which sends a signal voltage to the Throttle Actuator Control (TAC) Module that allows all other cruise control functions.

**CRUISE SWITCH**
**Range: ON/OFF**

Indicates the current state of the cruise ON/OFF switch.

**CURRENT GEAR**
**Range: 0 to 4**

Indicates which forward gear the transmission is in on some vehicles. An illegal transmission position displays as 9. For other vehicles, readings are: PARK/NEUTRAL, REVERSE, DRIVE 4, DRIVE 3, DRIVE 2, or LOW.

**CUR SLIP ADAPTS**
**Range: 0 to 65,025**

No information is currently available for this parameter.

**CUR THROT ANT**
**Range: 0 to 65,025**

No information is currently available for this parameter.

**CYL AIR(g/cyl)**
**Range: 0.25 to 1.25**

Displays the actual amount of air going through the mass airflow sensor (MAF) in grams per cylinder (g/cyl) on 6.5L diesel engines. The g/cyl reading is PCM calculated.

**CYL DEACT SYSTEM COMMAND**
**Range: V4/V8**

Displays the current status of the total number of cylinders being commanded to be active.

**CYL 1 DEACT SOL COMMAND**
**CYL 4 DEACT SOL COMMAND**
**CYL 6 DEACT SOL COMMAND**
**CYL 7 DEACT SOL COMMAND**
**Range: ON/OFF**

Indicates whether the identified cylinder is being commanded to deactivate. Reads ON if deactivated. By default the cylinder is normally activated and the reading should be OFF.

**CYL MDE MIS ID**
**Range: variable**
**CYL MIS INDEX**
**Range: -32,257 to 33,023**

Displays the number of crankshaft decelerations, which are used to detect misfire.

- Less than 1000 = an engine without misfire
- More than 1000 = a misfiring engine

**DECEL ENLEAN**
**Range: ______ YES/NO**

Indicates whether the PCM is reducing the injector pulse width to create a lean air-fuel mixture during deceleration on fuel-injected engines. Readings are based on sensor inputs and PCM calculations of throttle position (TP), manifold absolute pressure (MAP), RPM, and engine coolant temperature (ECT).

DECEL ENLEAN reads as follows:

- YES during deceleration to indicate the PCM is reducing injector pulse width
- NO at all other times

**DECEL FUEL C/OFF**
**Range: ______ YES/NO**

Indicates whether the extreme limit of PCM deceleration enleanment has been reached. When throttle position (TP), MAP, and RPM reach the minimum values recorded in PCM memory, the PCM shuts off fuel completely during deceleration.

Reads YES only when the PCM issues the cutoff command, that is during certain closed throttle deceleration conditions. It should read NO at all other times.

A lean mixture, or fuel cutoff, on deceleration helps prevent high HC emissions and allows the engine to return to a 14.7:1 idle air-fuel ratio more quickly. Reduced fuel flow also helps to prevent stalling.

**DECEL FUEL MODE**
**Range: ______ YES/NO**

Indicates whether the BCM is in deceleration (decel) fuel mode. Reads YES when operating in decel fuel mode.

**DEL TORQUE(%)**
**Range: ______ 0 to 100%**

Displays the duty cycle of the Delivered Torque PWM signal, which is used to determine how much torque the engine is delivering. Normal values range from 10% to 90%. The signal is low (about 10%) at idle and at higher under driving conditions.

**DELIVRD TORQ(%)**
**Range: ______ 0 to 100%)**

Displays the engine torque as calculated by the PCM as a percentage. The signal is low (about 10%) at idle and at higher under driving conditions.

**DES B1S1(Lambda)**
**DES B1S2(Lambda)**
**Range: ______ 0 to 2**

Displays the Lambda output from the bank 1 sensor 1 (B1S1) or bank 1 sensor 2 (B1S2) heated oxygen sensor (HO2S) to the control module. A lambda below 1.0 indicates a rich exhaust, while a lambda above 1.0 indicates a lean exhaust. The scan tool value fluctuates constantly while operating in Closed Loop.

**DES CC SERVO(%)**
**ACT CC SERVO(%)**
**Range: ______ 0 to 100%**

Displays the PCM desired (DES) and actual (ACT) status of the cruise control servo on some 3800 tune port injected (TPI) engines as a duty cycle. The desired parameter is the PCM command to the cruise control servo diaphragm. The actual parameter is a feedback signal from the variable inductance sensor coil.

**DES CYL AIR(g/c)**
**Range: ______ variable**

Indicates how much air each cylinder needs based on a certain engine load and speed. The PCM internally calculates this value, and expresses it in terms of average grams per cylinder.

**DES EGR(%)**
**Range: ______ 0 to 100**

Displays the desired EGR duty cycle, which is an internal PCM calculation displayed on some vehicles. Based on several sensor inputs, the PCM determines the percent of EGR needed for certain operating conditions.

When the engine control system is operating correctly, the desired EGR and the EGR Duty Cycle parameter readings should be close to equal. See the EGR Duty Cycle parameter for more information.

**DES EGR(V)**
**Range: ______ 0 to 5.0 V**

Displays the desired EGR signal voltage, which determines EGR valve pintle position, commanded by the PCM.

**DES EXH CMP B1**
**DES EXH CMP B2**
**Range: ______ 0 to 40°**

Displays the desired exhaust camshaft position for bank 1 (B1) or bank 2 (B2), as determined by the control module. The scan tool will display a higher value for more advanced exhaust valve timing, such as at high load or speed conditions. The scan tool will display a lower value for a less advanced exhaust valve timing, such as idle.

**DES FRP REG(mA)**
**Range: ______ 1,200 to 1,400 mA**

Displays the desired current draw of the fuel rail pressure regulator in milliamps. This reading is used by the ECM in Circuit diagnostics.

**DES FRP(MPa)**
**Range: ______ 37 to 40 MPa)**

Displays the fuel rail pressure desired by the ECM based on current sensor inputs. Compare this reading to actual fuel rail pressure to check sensor accuracy or troubleshoot problems.

**DES INJ TIM(°)**
**INJ TIMING(°)**
**Range: ______ 0 to 25.5°**

Displays the injection timing in degrees before top dead center. The desired (DES) reading shows the PCM requested timing, and injector (INJ) timing shows actual injection timing.

The PCM monitors and controls these parameters based on the crankshaft and camshaft sensor signals, as well as TDC offset.

**DES INT CMP B1**
**DES INT CMP B2**
**Range: ______ 0 to 40°**

Displays the desired intake camshaft position for bank 1 (B1) or bank 2 (B2), as determined by the control module. The scan tool will display a higher value for more advanced intake valve timing, such as at high load or speed conditions. The scan tool will display a lower value for a less advanced intake valve timing, such as at idle.

**DES MAF IDLE(g/s)**

**Range: 0.0 to 35.4 g/s**

Displays the PCM calculated quantity of the air flowing into the engine during idling conditions in grams per second (g/s). The calculated quantity of air flowing into the engine is based on the engine load and the engine speed (RPM).

**DES TIMING**

**Range: 0 to 25.5°**

Displays the injection timing requested by the PCM on 6.5L diesel engines.

**DES TORQUE**

**Range: 0 to 100%**

Displays the level of desired torque requested from the EBTCM to the PCM when reduced torque is desired to prevent wheel slip during acceleration.

**DESIRED FAN RPM**

**Range: variable**

Displays the desired fan speed as calculated by the PCM. The PCM compensates for various engine loads based on engine coolant temperature in order to keep the fan at the desired speed by turning on the fan clutch and monitoring the fan speed sensor.

**DESIRED IAC**

**Range: 0 to 255**

Displays the PCM desired position for the idle air control (IAC) motor. This is an internal PCM parameter that indicates what IAC motor position should be. The IAC or Idle Air Control parameter shows what the actual IAC motor position.

Compare the actual and desired IAC readings. They should be equal, or very close to each other. If the PCM detects a sudden change in engine conditions, such as A/C engagement or cooling fan operation, it may command a new desired IAC position.

**DESIRED IDLE**

**Range: 0 to 3187 rpm**

Displays the desired idle speed the ECM is attempting to maintain. The ECM compensates for engine loads based on engine coolant temperature to keep the engine at the desired speed.

**DESIRED TP(%)**

**Range: 0 to 100%**

Displays the desired throttle angle that the PCM is trying to maintain. Compare the actual and desired throttle position readings. They should be equal, or very close to each other.

**DRIVE**
**REVERSE**

**Range: YES/NO**

Displays the gear switch input signals on 1981–85 Cadillac models with cruise control and reads as follows:

- YES when the vehicle is in the indicated gear
- NO at all other times

**DRV CYCLE DONE**

**Range: YES/NO**

Indicates whether a drive cycle has completed, which allows diagnostic tests to run and reads YES if a drive cycle has been completed.

**DRV1 OPEN/SHRT**
**DRV2 OPEN/SHRT**
**Range:** ________ **YES/NO**

Indicates whether an open or short exists in the output driver module (ODM) 1 or 2 circuits.

**DRV1 OVER AMPS**
**DRV2 OVER AMPS**
**Range:** ________ **YES/NO**

Indicates whether an overcurrent condition exists in the ODM 1 or 2 circuits.

**DTC STORED**
**Range:** ________ **XXX**

Indicates the total number of current DTCs set this ignition cycle.

**DTC THIS IGN**
**Range:** ________ **YES/NO**

Indicates whether a DTC has set during this ignition cycle.

**E-CELL EXPIRED**
**Range:** ________ **YES/NO**

Displays the internal state of the PCM and reads as follows:

- YES after a few thousand miles, though exact mileage varies by vehicle and engine
- NO on a new vehicle

The E-cell is used in many system programs to modify the fuel metering and spark timing calculations for a new, or “green,” engine during break in. It is an electrolytic cell that contains a silver cathode and a gold anode. The silver gradually depletes as current is applied to the cell. After a specified time, the anode is completely depleted and the E-cell becomes an open circuit. The PCM then adjusts its fuel and spark calculations for a broken-in engine.

**EC IGN RLY CMD**
**Range:** ________ **OFF/ON**

Displays the commanded state of the EC ignition relay control circuit. The scan tool will display ON or OFF. ON indicates the EC ignition relay control circuit is being grounded by the control module, allowing voltage to the ignition system. OFF indicates the EC ignition relay is not being commanded on by the control module.

**EC IGN RLY FDBK(V)**
**Range:** ________ **variable**

Displays the voltage signal sent to the control module from the engine control ignition relay. The scan tool will display battery voltage when the engine is running. The scan tool will display no voltage when the relay is OFF.

**ECM RESET**
**Range:** ________ **YES/NO**

Displays the status of the control module on the current ignition cycle. Reads YES when an internal module reset occurred on the current ignition cycle. Reads NO at all other times.

**EFE COMMAND**
**Range:** ________ **ON/OFF**

Indicates whether PCM is commanding the early fuel evaporation (EFE) system to turn on:

- ON displays when the engine is cold and the PCM is commanding the EFE system to energize and heat the air-fuel mixture
- OFF displays at all other times

This is an output signal from the PCM only, it does not indicate whether the EFE system has responded.

The EFE system is used on carbureted engines to preheat the incoming air-fuel mixture for a cold engine. Either a vacuum-operated manifold heat control valve or an electric grid heater under the carburetor is used to preheat the air.

**EGR ADAPT CELLS**
**Range: ______ range 0 to 15**

Displays the adaptive learn matrix (ALM). The ALM has sixteen cells each of which covers a range of engine speed (RPM) and load. This is an internal PCM value based on Mass Air Flow (MAF) that is used to adjust the EGR control vacuum. As backpressure or other system variations occur over the life of the vehicle, the ALM trims EGR control vacuum to compensate.

**EGR ADPT LRN CL**
**Range: ______ variable**

Displays the EGR adaptive learn value. Variables, such as exhaust backpressure changes due to wear, age, and damage, affect EGR operation. To accommodate for these changes, the EGR adaptive strategy trims the EGR control vacuum as necessary. The higher the displayed value, the greater the EGR control vacuum.

**EGR CLSD(CNT)**
**Range: ______0 to 255**
**EGR CLSD(V)**
**Range: ______ 0 to 5.00 V**

Displays the PCM-learned value for the EGR valve pintle sensor when the valve is fully closed.

**EGR CMD**
**EGR COMMAND**
**EGR SOLENOID**
**Range: ______ ON/OFF**

Displays the PCM command to the EGR vacuum solenoid and read as follows:

- ON whenever the PCM energizes the solenoid to open the EGR valve, usually during closed-loop cruise
- OFF when EGR is not requested, usually at idle

This is an output signal from the PCM only. It does not indicate if the solenoid responded or if the EGR valve actually opened.

The EGR CMD parameter displays only on C and K series trucks with a 6.2L diesel engine. It appears in the top line of the display, and is usually ON at idle and OFF at cruising speed in closed loop.

**EGR DCEL TEST**
**Range: ______0 to 255**

Displays a count of MAP sensor changes during an EGR test that opens the EGR valve on deceleration. To pass, counts must be higher than the EGR decel threshold of the same test.

**EGR DIAG SWITCH**
**Range: ______ ON/OFF**
**VACUUM AT EGR**
**Range: ______ YES/NO**

Displays the feedback signal from the EGR vacuum control solenoid.

- ON or YES = EGR system is receiving vacuum
- OFF or NO = EGR vacuum is cut off

Most systems have a vacuum switch on the EGR vacuum control solenoid that closes as the vacuum valve opens. A few systems use a separate in-line vacuum switch.

**EGR DUTY(%)**
**Range: ________ 0 to 100%**

Displays the PCM commanded duty cycle of the EGR solenoid, which opens the EGR valve.

Pulse width modulated (PWM) solenoids control EGR vacuum in two different ways. Some solenoids open a vacuum line to the EGR valve when energized. Others close off, or bleed off, vacuum when energized. Check service manuals to determine the EGR solenoid operation on a specific vehicle. This parameter indicates one or the other of the following solenoid operations.

On some vehicles, the PCM cycles the EGR vacuum solenoid on and off to regulate the amount of vacuum applied to the EGR valve. On these systems, the solenoid duty cycle is directly proportional to the EGR flow:

- 10% or less = no EGR
- 50% duty cycle = 50% EGR
- 90% or greater = maximum EGR

On other vehicles, the PCM cycles the EGR solenoid on and off to regulate vacuum applied to the EGR valve or to open a vacuum bleed in the line to the EGR valve. When the solenoid is ON, vacuum is bled off. When the solenoid is OFF, full vacuum is applied. On these systems, the duty cycle is inversely proportional to EGR flow:

- 90% or more = no EGR
- 10% or less = maximum EGR

**EGR DUTY CYCLE**
**Range: ________ 0 to 100%**

Displays the duty cycle of the EGR valve, which controls the current applied to the valve motor. As duty cycle increases, so does current which forces the valve to open further and allow more exhaust gas recirculation.

- 0% = a closed valve
- 100% = a fully opened EGR valve

**EGR ERROR(%)**
**Range: ________ 0 to 100%**

Displays the difference between desired and actual EGR position currently monitored by the PCM. If the EGR position error reaches an unacceptable level, DTC P1406 sets.

**EGR FBK(V)**
**Range: ________ 0 to 5.12 V**

Displays a feedback voltage that indicates the operation of the EGR valve. A potentiometer on the EGR valve sends a variable voltage signal to the PCM based on valve position.

- 0 V = the valve is closed (no EGR)
- 5.10 V = the valve is fully open (maximum EGR)

This parameter should be above 0 V when the EGR Command parameter is ON. Actual voltage varies between vehicles and as engine conditions change. When EGR Command reads OFF, the feedback voltage should be 0 or close to 0.

On vehicles that display EGR duty cycle, the feedback voltage should be proportional to duty cycle. For example, if the duty cycle is 50%, feedback should be about 2.50 V. If the duty cycle is 25%, feedback should be about 1.25 V.

**EGR FUEL COMP(%)**
**Range:** ________ **0 to 99.6%**

Displays the percentage of extra fuel the PCM is adding to compensate for EGR flow on some fuel-injected engines.

**EGR LOOP STATUS**
**Range:** ________ **OPEN/CLOSED**

Indicates whether the ECM is in control of EGR function.

**EGR POS(%)**
**Range:** ________ **0 to 100%**

Indicates actual EGR position based on the EGR pintle position signal.

- 0% = a closed EGR valve
- 100% = a fully open EGR valve

**EGR POS(V)**
**Range:** ________ **0 to 5.00 V**
**EGR VLV POS(V)**
**Range:** ________ **0 to 5.10 V**

Displays the EGR valve position as voltage. Voltage increases as the EGR opening increases.

**EGR SOLENOID 1**
**EGR SOLENOID 2**
**EGR SOLENOID 3**
**EGR SOL 1**
**EGR SOL 2**
**EGR SOL 3**
**Range:** ________ **ON/OFF**

Displays the status of a combination vacuum valve with three separate solenoids that modulate vacuum to the EGR valve. This system is only used on V6 fuel-injected engines with “digital” EGR control. The three parameters read ON or OFF in various combinations to indicate the level of vacuum applied to the EGR valve.

**EGR TEMP(V)**
**Range:** ________ **0 to 5.12 V**

Displays the feedback signal from a thermistor in the EGR passage on Isuzu 1.6L engines that indicates EGR flow. High voltage is a high flow rate and low voltage is low or no flow.

**EGR TRIPS**
**Range:** ________ **0 to 255**

Displays the total number of deceleration tests that the EGR Monitor performed during the current ignition cycle.

**EGR TTL SOL CMD**
**Range:** ________ **OPEN/CLSD**

Displays the PCM commanded state of the EGR throttle valve solenoid.

**EGR VENT SOL**
**Range:** ________ **ON/OFF**

Displays the status of the EGR vent solenoid and reads ON when the EGR vent solenoid purges vacuum to the atmosphere when there is a desire to quickly turn off EGR flow.

**EGR VNT SOL CMD**
**Range:** ________ **YES/NO**

Displays the PCM commanded state of the EGR vent solenoid.

**EGR ZEROED**
**Range: ______________________________ YES/NO**

Indicates if the EGR valve auto-zero sequence completed on 1992 and later CPI truck engines.

**EMISSION FAULT**
**Range: ______________________________ 0 to 255**

Displays the number of warm-up cycles that occurred without an emission fault. It counts from 0 to 255, then resets to 0.

**ENCODER GEAR**
**Range: ______________________________ variable**

Displays the actual transfer case sector shaft position, which is determined by the transfer case control module.

**ENG HOT LAMP**
**Range: ______________________________ ON/OFF**

Indicates whether the PCM is enriching the air-fuel mixture to lower the internal engine temperature.

**ENG OIL TEMP**
**Range: ______________________________ -40 to +327°**

Displays the engine oil temperature in degrees, which the PCM uses to control the cooling fans.

**ENG TORQ(lb/ft)**
**Range: ______________________________ 0 to 9999 lb./ft.**
**ENG TORQ(N-M)**
**Range: ______________________________ 0 to 65025 Nm**
**TORQ DELIV(Nm)**
**Range: ______________________________ 0 to 65025 Nm**

Displays the engine torque, which is PCM calculated value based on engine load, throttle position, mass airflow, and other engine and transmission inputs. This parameter is accurate to within 15 ft-lb of actual measured engine torque.

**Engine LOAD(%)**
**Range: ______________________________ 0 to 100%**

Displays the PCM calculated engine load based on speed and mass air flow (MAF) sensor readings. The engine load increases with an increase in RPM or airflow.

**Engine RUNNING**
**Range: ______________________________ hh:mm:ss**

Displays the elapsed since engine startup. The timer resets to zero each time the engine starts.

**Engine SYNC**
**Range: ______________________________ YES/NO**

Indicates whether the PCM is receiving the 7X engine synchronization pulse.

**Engine WARM**
**Engine HOT**
**Range: ______________________________ YES/NO**

Displays the PCM internal operating conditions in relation to engine temperature on 1985–86 Oldsmobile-built carbureted engines.

- On a cold engine operating in open loop, both parameters should read NO.
- At operating temperature, Engine WARM reads YES while Engine HOT reads NO.
- If the engine overheats, both parameters read YES.

**ESC COUNTER**
**Range: ______________________________________________0 to 255**

Displays a signal count from the detonation sensor on engines with electronic spark control (ESC). The count indicates the relative duration and magnitude of spark knock.

The range does not indicate actual time. Numbers greater than 0 indicate knock occurred. A lower number means short duration; a higher number indicates longer duration and magnitude.

**ESC FAILURE**
**Range: ______________________________________________ YES/NO**

Indicates whether a fault exists in the electronic spark control (ESC) or detonation sensor circuits. If either of the ESC components fails, the display reads YES. This is usually accompanied by trouble code 43. The display reads NO if the system is operating properly.

**ESC LEARNED**
**Range: ______________________________________________0 to 255**

Displays the normal level of engine noise detected by the knock sensor (KS) at certain speeds and loads. The PCM “learns” this minimum level, and uses it as a cutoff point. If engine noise repeatedly exceeds this value, a misfire diagnostic trouble code (DTC) sets. If the PCM senses noise below this level, it assumes there is a fault in the KS circuit, and sets a DTC.

**ESO SOL**
**Range: ______________________________________________ ON/OFF**

Displays the status of the electronic shutoff solenoid (ESO) solenoid. The solenoid, located on the fuel injection pump, prevents fuel from entering the pump when the ignition is off.

**ESO SOL TST**
**Range: ____________________ SHORT TO B+/PASS/OPEN/GROUNDED PASS**

Displays the status of the ESO, which prevents fuel from entering the fuel injection pump on 6.5L diesel engine when the ignition is switched off. The solenoid is located on the fuel injection pump.

**EST BYPASS LINE**
**Range: ______________________________________________ HI/LO**
**IGNITION BYPASS**
**Range: ______________________________________________ YES/NO**

Indicates whether ignition timing is being controlled by the PCM. When the engine is cranking, electronic spark timing (EST) is controlled by the ignition control module (ICM).

- HI or YES = the PCM is controlling ignition timing
- LO or NO = the ICM is controlling timing

When the engine starts the PCM applies 5 V to the bypass circuit. This commands the ICM to switch timing control to the PCM. If the ICM does not receive a 5 V bypass command signal, the ICM continues to control spark timing.

**EST ENABLED**
**Range: ______________________________________________ YES/NO**

Indicates whether the PCM is controlling spark advance and reads as follows:

- YES after the engine starts and the PCM controls timing
- NO with the engine cranking, the ignition module controlling timing, and electronic spark timing disabled

If the bypass circuit from the ignition module to the PCM becomes open with the engine running, timing returns to the basic module control. In this case, the display reads NO to indicate a fault.

**EVAP CANISTER**
**Range: ______ VENT/NO VENT**

Displays the PCM command to the EVAP canister vent valve, which is normally open. The PCM commands the EVAP canister vent valve closed, during testing of the EVAP system.

**EVAP Duty(%)**
**Range: ______ 0 to 100%**

Displays the pulse-width modulated voltage the VCM is applying to the EVAP purge valve as a percentage, or duty cycle. A high percentage indicates near maximum canister purging.

**EVAP LK FACTOR**
**Range: ______ 0 to 3.98**

Displays the EVAP canister loading factor. The EVAP Monitor waits until this factor is within range before starting a test.

**EVAP OPEN/SHRT**
**Range: ______ YES/NO**

Indicates whether an open or short exists at output 5 of output driver module (ODM) A.

**EVAP OVER AMPS**
**Range: ______ YES/NO**

Indicates whether there is excessive current at output 5 of output driver module (ODM) A.

**EVAP PURGE(%)**
**Range: ______ 0 to 100%**

Displays the pulse-width modulated duty cycle applied to the EVAP purge valve by the PCM.

When EVAP PURGE(%) reads 100%, the valve should be fully open to purge the system.

**EVAP PURGE SOL**
**Range: ______ ON/OFF**

Displays the status of the EVAP canister purge control solenoid and reads ON when the solenoid is on and canister purge is applying a small vacuum to the EVAP system.

**EVAP TEST INHIB**
**Range: ______ YES/NO**

Indicates whether certain parameters prohibit the EVAP diagnostic from running and reads:

- YES when the PCM prohibits an EVAP test
- NO when the test is allowed to run

**EVAP TST**
**Range: ______ PASS/FAIL**

Indicates whether the EVAP diagnostic has successfully completed.

**EVAP VAC SW**
**Range: ______ ON/OFF**

Displays the status of the EVAP vacuum switch. The normally-closed switch is in the purge line between the canister and the EVAP purge solenoid.

EVAP VAC SW reads ON when the switch opens and vacuum increases to greater than 5 inches of water in the line.

**EVAP VENT SOL**
**Range: ______ ON/OFF**

Displays the status of the EVAP vent solenoid and reads as follows:

- ON when EVAP vent solenoid is closed to create a vacuum in the fuel tank
- OFF if the solenoid is open to allow purge

**EVO DUTY(%)**
**Range: ______ 0 to 100%**

Displays the duty cycle (0–100%) of the electronic variable orifice (EVO) commanded by the PCM. At idle, full assist is commanded which is indicated as 0% and as vehicle speed increases the duty cycle will go up thus reducing assist.

**EVO FBK**
**Range: ______ 0 to 100%**

Displays the EVO duty cycle feedback to the PCM. Current is used to monitor and control EVO. The PCM converts the current reading to a duty cycle (0% at idle).

**EVO SOL CMD**
**Range: ______ ON/OFF**

No information is currently available for this parameter.

**EVO STATUS**
**Range: ______ ON/OFF**

Displays the status of the EVO solenoid valve on Saturn vehicles only.

**EWMA DECEL AVG**
**Range: ______ -10 to 10 kPa**

Displays the exponentially weighted moving average (EWMA), which indicates the operating efficiency of the EGR system after the EGR Monitor has run a test. It is the average pressure (kPa) difference between two values while the EGR Monitor performs a test: the change in pressure the PCM expects to see as detected by the MAP sensor, and the actual change in pressure as recorded by the MAP sensor.

The EWMA DECEL AVG reading should always be near -3 kPa. The greater this value, the more restricted the EGR system.

**EXCESS VAC PASS**
**Range: ______ YES/NO**

Displays the status of the evaporative emission (EVAP) system diagnostic test.

**EXHAUST OXYGEN**
**LEFT EXH O2**
**RIGHT EXH O2**
**Range: ______ RICH/LEAN**

Displays the general rich or lean condition of the exhaust as measured by the oxygen sensor (O2S). Exhaust oxygen content is related to oxygen content in the intake air-fuel mixture and thus indicates intake air-fuel ratio. The O2S is the primary sensor that indicates whether the engine is running rich or lean. The O2S must be hot (above 500°F), and the PCM must be in closed loop before the PCM responds to the O2S signal.

These parameters indicate the general condition of the exhaust. The O2S voltage parameters indicate the exact sensor signal. Refer to the “O2(mV)” on page 569 for more information.

Some V-type engines have separate oxygen sensors for the left and right cylinder banks. Two data parameters display for these engines, one for the left bank and one for the right.

**EXH PRESS(KPA)**
**Range: ____ 0 to 93 kPa**
**EXH PRESS(“Hg)**
**Range: ____ 0 to 27.5 “Hg**

Displays the PCM calculated exhaust pressure value. On some vehicles, the PCM calculates theoretical backpressure based on input signals from various sensors.

**EXH PRESS REG**
**Range: ____ OPEN/CLSD**

Displays the PCM command to the vacuum solenoid for the exhaust pressure regulator (EPR) on C and K series trucks with a 6.2L diesel engine.

- OPEN = the command is to close the vacuum line and open EPR
- CLSD = the PCM energized the solenoid, which opens the vacuum line to close the EPR and increases backpressure for more EGR

**EXT BRAKE TRVL**
**Range: ____ ON/OFF**

Displays the extended brake travel switch contact states of the torque management brake switch and reads as follows:

- ON when the pedal is 40% applied
- OFF when the brake pedal is released

**F AXLE REQ**
**Range: ____ ON/OFF**

Displays the front axle switch request from the transfer case shift control module.

**F AXLE SW LCKED**
**Range: ____ YES/NO**

Displays the current state of the front axle switch.

**F PROPSHAFT FLT**
**Range: ____ YES/NO**

No information is currently available for this parameter.

**F PROPSHFT(RPM)**
**Range: ____ variable**

Displays the rotational speed of the front propshaft on an automatic transfer case.

**FAN 1 ENABLED**
**FAN 2 ENABLED**
**FAN 1 REQUESTED**
**FAN 2 REQUESTED**
**Range: ____ YES/NO**

Displays the status of the fan control circuits. The Requested parameters are PCM inputs from pressure switches in the high-pressure side of the A/C. The Enabled parameters are PCM output commands to the fan relays. They should both read YES when the fans are on, and NO at all other times.

**FAN CTRL 1 CMD**
**FAN CTRL 2 CMD**
**Range: ____ LO/HI**

Displays the PCM output command to the cooling fan control module. They are used to determine what speed—low (LO) or high (HI)—to run the fans at.

**FAN DUTY CYCLE**
**Range: ______ 0 to 100%**

Displays the duty cycle on engines that control the engine fan by pulse-width modulation. The duty cycle indicates fan speed:

- A low reading indicates a low fan speed.
- A high reading a high fan speed.
- 0% indicates the fan is off.

**FAN RELAY**
**FAN RELAY 1**
**FC RELAY 1**
**FC RELAY 2&3**
**Range: ______ ON/OFF**

Indicates whether the fan control relay is being commanded on by the PCM. On vehicles with three relays, both fans run at low speed when relay 1 is commanded.

**FAN SPEED(RPM)**
**Range: ______ variable**

Displays the fan speed in RPM. The PCM controls the fan by modulating the fan clutch and monitoring the fan speed sensor.

**FC 1 BATT SHRT**
**FC 2 BATT SHRT**
**Range: ______ YES/NO**

Indicates whether a short to battery voltage is detected on the cooling fan control circuit.

**FC 1 OPEN/SHORT**
**FC 2 OPEN/SHORT**
**Range: ______ YES/NO**

Indicates whether an open or a short to ground is detected on the cooling fan control circuit.

**FRONT AXLE REQ**
**Range: ______ YES/NO**

Indicates weather or not the front axle state is being detected by the PCM.

**FRP REG CMD**
**Range: ______ 0 to 100%**

Indicates the current commanded duty cycle of the fuel rail pressure regulator.

**FRP REG CMD(mA)**
**Range: ______ not available**

Displays the current (mA) supply to the fuel rail pressure regulator.

**FRP REG RELAY**
**Range: ______ ON/OFF**

Displays the commanded state of the FRP regulator relay.

**FT CELL**
**Range: ______ 0 to 23**

Displays the fuel cell that the PCM is currently operating in, which is determined by manifold absolute pressure (MAP) and RPM inputs.

**FT CELL B1**
**Range: ________________________________0 to 22**

Displays which of the fuel trim cells is currently active for bank 1 of a V-type engine. A plot of engine speed and MAP sensor readings is broken into 22 cells.

**FT CELL B2**
**Range: ________________________________0 to 22**

Displays which of the fuel trim cells is currently active for bank 2 of a V-type engine. A plot of engine speed and MAP sensor readings is broken into 22 cells.

**FT DIAG INHIBIT**
**Range: ________________________________ YES/NO**

Displays the state of the fuel trim that the PCM is commanding. Fuel trim is inhibited when the vehicle is not in Closed Loop. DTC(s) related to fuel trim are set and diagnostics that temporarily effect fuel trim operation are active.

**FT ENABLE**
**Range: ________________________________ YES/NO**

Indicates whether the VCM is using fuel trim values to adjust fuel delivery to the engine. Fuel trim is disabled when the vehicle is not in Closed Loop, malfunction codes related to fuel trim are set, large amounts of purge vapor are ingested by the engine, or additional diagnostics that temporarily affect fuel trim operation are active.

**FT LEARN**
**Range: ________________________________ ENABLED/DISABLED**

Indicates whether conditions are appropriate for enabling long term fuel trim corrections and reads as follows:

- ENABLED when long term fuel trim is responding to the short term fuel trim
- DISABLED when long term fuel trim is not responding to in short term fuel trim

**FT PRES(“H2O)**
**Range: ________________________________ -60.0 to 61.5**

Indicates the pressure in the fuel tank expressed with respect to the barometric pressure and displays 0 mmHg when the fuel tank pressure is equal to the barometric pressure.

**FUEL CUTOFF-MPH**
**Range: ________________________________ YES/NO**

Indicates whether the PCM is turning off the fuel injectors due to excessive vehicle speed and reads as follows:

- YES if speed exceeds tire design limitations
- NO during normal operation

**FUEL CUTOFF-P/N**
**FUEL CUTOFF-DR**
**FUEL CUTOFF-REV**
**Range: ________________________________ YES/NO**

Indicates whether the PCM is turning off the fuel injectors on Saturn vehicles only. Depending on PRNDL and throttle position, the PCM may limit engine RPM by temporarily disabling fuel injection. When the vehicle is in park or neutral, this occurs at engine speeds above 4,000 RPM; in drive or reverse, above 6,750 RPM. When a fuel cutoff mode is activated, the associated parameter reads YES.

**FUEL CUTOFF SOL**
**Range: ______ ON/OFF**

Displays the status of the fuel cutoff solenoid on most Isuzu-built carbureted engines and reads as follows:

- ON when the PCM energizes the solenoid to open the fuel line for normal delivery
- OFF when the solenoid closes the fuel line during deceleration

This value indicates the state of the PCM output command. It is not a feedback signal to indicate solenoid operation.

**FUEL LEVEL(%)**
**Range: ______ 0 to 100%**

Displays the amount of fuel remaining in the tank as a percentage.

**FUEL LEVEL(L)**
**Range: ______ 0 to 19 gallons**

Displays the amount of fuel in the tank in gallons.

**FUEL LEVEL(ltr)**
**Range: ______ variable**

Displays the amount of fuel remaining in the fuel tank as liters or gallons. The control module calculates the amount of fuel remaining in the tank by using information from the fuel level sensors. Several enhanced EVAP diagnostics are dependent upon the correct fuel level.

**FUEL LEVEL(V)**
**Range: ______ 0.0 to 5.0 V**

Displays the amount of fuel remaining in the tank as voltage.

- Below 1 V = empty tank
- About 2.5 V + full tank

**FUEL LVL L/TANK(V)**
**Range: ______ 0 to 5 V**

Displays the voltage from the sensor used to monitor the fuel level inside the left fuel tank. The scan tool will display a low voltage reading the fuel tank is low or near empty. The scan tool will display a high voltage reading when the fuel level in the tank is high or near full.

**FUEL LVL R/TANK(V)**
**Range: ______ 0 to 5 V**

Displays the voltage from the sensor used to monitor the fuel level inside the right fuel tank. The scan tool will display a low voltage reading the fuel tank is low or near empty. The scan tool will display a high voltage reading when the fuel level in the tank is high or near full.

**FUEL PMP FBK(V)**
**FUEL PUMP FBK(V)**
**Range: ______ 0 to 25.5 V**

Displays the status of the fuel pump power supply to the PCM. When the ignition switch is on, the reading should show battery voltage.

**FUEL PUMP(V)**
**Range: ______ 0 to 25.5 V**

Displays the electrical system voltage present at the fuel pump relay on some fuel-injected engines. The PCM monitors fuel pump voltage through a voltage-sensing circuit. This reading indicates system voltage and the overall electrical load.

The display should be close to the battery voltage with the engine running. When the ignition switches on, it should indicate battery voltage for about 2 seconds. If the engine does not crank during this time, the reading returns to 0. When the engine is not cranking or running, the display reads 0 because the relay is open.

**FUEL PUMP CMD**
**Range:** ______ **ON/OFF**

Displays the PCM command of the fuel pump relay driver circuit.

**FUEL PUMP RELAY**
**Range:** ______ **ON/OFF**

Displays the current state of the fuel pump relay.

**FUEL PUMP SPD**
**Range:** ______ **0 to 100%**

Displays the duty cycle of the pulse-width modulated output signal the PCM is applying to the fuel pump control module to run the pump.

When the value is 100%, the fuel pump is running at high speed. Typically, the PCM commands the fuel pump to run at high speed when the MAP sensor senses high vacuum (high load) or when the system voltage is less than 10 V.

**FUEL RATE(mm3)**
**Range:** ______ **0 to 80 $mm^3$**

Displays the amount of fuel the ECM is requesting in cubic millimeters.

**FUEL SYS1**
**Range:** ______ **see description**

Displays the operating status of fuel bank 1. Readings are: CL (closed-loop), OL (open loop), OL DRIVE, OL FAULT, and CL FAULT.

**FUEL TANK CAP(L)**
**Range:** ______ **0 to 98L/25.9G or 0 to 128L/34G**

Displays the capacity of the fuel tank in gallons.

**FUEL TANK PRESS**
**TANK PRESS(V)**
**Range:** ______ **0.0 to 5.0 V**

Displays the voltage signal output by the fuel tank pressure sensor. When tank pressure equals atmospheric pressure, reading is about 1.3 to 1.7 V. The voltage increases with pressure.

**FUEL TEMP**
**Range:** ______ **–18° to +285°F**

Displays fuel temperature in degrees as determined by a thermistor located in the optical sensor.

- When the sensor is cold (internal resistance high) the ECM monitors a high signal voltage which it interprets as low fuel temperature.
- As the sensor warms (internal resistance low) the voltage signal decreases and the ECM will interpret the low voltage as warm fuel.

**FUEL TEMP(°C)**
**Range:** ______ **-40° to 151°C**
**FUEL TEMP(°F)**
**Range:** ______ **-40° to 304°F**

Displays the fuel temperature on diesel engines. The PCM converts voltage signals from a thermistor-type sensor to temperature.

**FUEL TRIM ID**
**Range: ____________________________________________0 to 255**

Displays the average long-term fuel trim for cells used in determining DTC P0101 and P0172.

**FUEL TRIM IDX(%)**
**LT TRIM IDX(%)**
**Range: ____________________________________________-100% to +100%**

The fuel trim index (IDX) percentage value represents the operation and short-term correction of the fuel-metering for a fuel-injected engine. The long-term (LT) fuel trim value represents the operation and long-term correction. Both numbers indicate whether the PCM is commanding a rich or a lean mixture.

Both parameters range from -100% to +100% with 000% as the midpoint:

- A number above zero indicates the PCM has commanded a rich mixture correction.
- A number below zero indicates the PCM is commanding a lean mixture.

The fuel trim, or short-term correction, number leads the long-term fuel number. When a pattern or trend of short-term corrections occur, long-term fuel responds with a similar correction.

Compare long-term and short-term fuel numbers to injector on-time. Numbers above zero indicate increased on-time, and numbers below zero indicate decreased on-time. Fuel trim corrections operate only in closed loop. In open loop, the numbers go to a fixed value.

**FUEL TRIM**
**INTEGRATR**
**LEFT INT**
**RIGHT INT**
**Range: ____________________________________________0 to 255**

Displays the operation and a short-term correction to the fuel metering of a fuel-injected engine. It indicates whether the PCM is commanding a rich or a lean mixture.

The integrator number ranges from 0 to 255 with a midpoint of 128:

- Numbers higher than 128 indicate a PCM command for a short-term rich mixture.
- Numbers lower than 128 indicate a lean command.

Compare integrator values to injector on-time. Values above 128 indicate increased on-time, while those below 128 indicate decreased on-time. Integrator corrections operate only in closed loop. In open loop, the integrator goes to a fixed value, usually 128.

The block learn multiplier (BLM) is a long-term fuel metering correction factor derived from the integrator correction. Block learn and integrator indicate the same directions of fuel metering correction. High numbers indicate rich mixtures; low numbers indicate lean mixtures. Refer to the BLM description for more information.

Some V-type engines, such as the Cadillac Allante and ZR1 Corvette LT5, have separate integrator factors for the left and right banks. Two parameter values are shown as left and right in the top line of the display for these engines.

**FUEL VOLATI**
**Range: ____________________________________________ LO/HI**

Displays the rate at which fuel can be vaporized in the cylinder as calculated by the control module. Reads HI when the fuel volatility is high. Reads LO when the fuel volatility is low.

**FULL POS SW**
**Range: ______ ON/OFF**

Indicates whether the PCM is using the maximum values found on the lookup tables. This parameter does not refer to a component on the vehicle. These values usually include fuel enrichment and spark advance.

**GEN COMMAND**
**GEN L TERMINAL**
**GEN L TERM**
**GEN L-TERM**
**Range: ______ ON/OFF**

Displays the state of the generator “L” terminal and read as follows:

- ON under normal operating conditions
- OFF if the PCM detects incorrect voltage in the L terminal circuit

**GEN F TERMINAL(%)**
**GEN F-TERM(%)**
**Range: ______ 0 to 100%**

Displays the PCM commanded state of generator “F” terminal.

- A high value indicates a high charging command.
- A low value indicates a low charging command.

**GEN LAMP**
**Range: ______ ON/OFF**

Indicates whether the PCM is commanding the generator lamp on the instrument panel on.

**GEN REG DUTY(%)**
**Range: ______ 0 to 100%**

Displays the duty cycle of the generator, or alternator, output based on the field input from the generator F terminal. As engine speed increases, the reading decreases.

**GENERATOR(%)**
**Range: ______ 0 to 100%**

Displays the level of charge that the PCM is requesting.

**GLOW PLUG RLY(V)**
**GLOW PLUG(V)**
**Range: ______ 0 to 25.5 V**

The relay (RLY) parameter displays the voltage requested by the PCM to the glow plug relay. The PCM cycles this voltage on and off. Cycling time is longest on a cold engine, and decreases as the engine warms up.

The voltage parameter is the amount of voltage the glow plug system is drawing. The scan tool can be used to determine if the glow plugs actually turned ON by monitoring the voltage drop. Also, a good functional check of the glow plug relay.

**GLOW PLUG SYS**
**Range: ______ ON/OFF**

Indicates whether the ECM has requested the glow plugs to be turned ON.

**GLOW PLUG TYPE**
**Range: ______ FED/CAL**

Indicates whether the glow plug system is Federal or California, which changes some diagnostic procedures.

**GM P/N**
**Range:** ____________________ **variable**

Displays the GM software number of the transfer case shift control module.

**HANDWHL SNSR(V)**
**Range:** ____________________ **0 to 5.1 V**

Displays the steering wheel position as voltage. A sensor located in the steering column sends a voltage signal to the EVO, and the displayed value is the sensor voltage.

This signal typically ranges from zero to about 5.1 V with each 90° rotation of the steering wheel.

**HEATED WINDSHLD**
**Range:** ____________________ **ON/OFF**

Displays the state of the heated windshield command from the PCM on some vehicles. The PCM receives the signal from the instrument panel switch and a temperature sensor signal from the heated windshield power module:

- ON displays if passenger compartment temperature is below 65°F (18°C) and the instrument panel switch is turned on
- OFF displays if interior temperature is above 65°F (18°C)

**HIGH ALTITUDE**
**Range:** ____________________ **YES/NO**

Indicates whether the vehicle is operating at high altitude.

On some fuel-injected vehicles, the PCM compares the throttle position, mass airflow, and RPM readings to determine engine load. If the throttle is open more than expected for a given load, the PCM assumes it is at high altitude and adjusts fuel metering accordingly. The display should then read YES.

On some minimum-function T-cars (Chevette, Acadian, and T-1000) and carbureted Isuzu engines, the PCM uses a separate barometric pressure switch signal to determine if the vehicle is at high altitude. On these models, YES indicates that the PCM is controlling the engine for high altitude operation with low barometric pressure.

**HIGH BATTERY**
**LOW BATTERY**
**Range:** ____________________ **YES/NO**

Displays battery state based on a sensing circuit across the supply voltage circuit on some models. Reads NO during normal operation and YES when battery voltage is high or low.

On most vehicles, he PCM disables the output solenoids to protect the PCM from high current if battery voltage is too high.

**HIGH ELEC. LOAD**
**Range:** ____________________ **YES/NO**

Indicates whether the PCM senses an excessive electrical load and reads YES under heavy electrical accessories loads.

**HIGH RES SIGNAL**
**Range:** ____________________ **ON/OFF**

Indicates if the PCM detects the ignition control module generating a high resolution signal.

**HI PS PRESSURE**
**Range:** ____________________ **YES/NO**

Displays the status of a pressure switch in the power steering system that closes under high pressure on some Cadillac and other vehicles and reads as follows:

- YES when the steering wheel is turned right or left to full lock
- NO at all other times

**HI SPARK COMP**
**LO SPARK COMP**
**MID SPARK COMP**
**Range: ____ 0 to 255 counts**

Displays the adaptive spark retard values the PCM uses to control engine knock. Spark compensation values for low, mid, and high RPM driving are stored by the PCM in “cells” similar to those used for block learn. Values up to 20 are considered normal.

If sufficient knock is present to fill the low, mid, and high spark cells, a loss of power may occur due to excessive retard. Spark compensation values eventually return to zero when the knock condition is corrected, this is a slow process. If desired, reset by disconnecting PCM power.

On 1993 and later vehicles, these values are internally adjusted by the PCM based on engine coolant temperature (ECT) at engine start:

- If ECT is below 46°F (8°C), the values set to zero.
- If ECT is below 133°F (56°C), the values are adjusted to 75%.
- If ECT is above 219°F (104°C), 100% of the values are used.

Temperatures in between are adjusted accordingly.

**HO2 SNSR-1(mV)**
**HO2 SNSR-2(mV)**
**Range: ____ 0 to 1000 mV**

Displays the output voltage for heated oxygen sensor (HO2S) 1 (upstream) and HO2S 2 (downstream).

- Sensor 1 voltage should fluctuate constantly from about 50 mV (lean exhaust) to 800 mV (rich exhaust) during closed loop operation.
- Sensor 2 voltage fluctuates slowly over a longer period of time due to the oxygen storage capability of an efficiently operating catalyst.

If the voltage fluctuates rapidly on a hot catalyst, low catalyst efficiency may be the cause.

**HO2S 1 HEATER**
**HO2S 2 HEATER**
**Range: ____ ON/OFF**

Displays the PCM command status to the HO2S 1 and HO2S 2 heater circuit.

**HO2S B1-S2(mV)**
**HO2S B2-S2(mV)**
**Range: ____ range 0 to 1275 mV**

Displays the signals from the rear heated oxygen sensors on banks 1 and 2 repsectively.

The reading represents the exhaust oxygen output voltage beyond the catalytic converter. This voltage will remain inactive or appear lazy within a range 100 mV (lean exhaust) and 900 mV (rich exhaust) when the system is operating in closed loop.

**HO2S-1(mV)**
**Range: ____ 0 to 1132 mV**

Displays the front heated oxygen sensor (HO2S-1) output voltage. Voltage should fluctuate constantly between 100 mV (lean exhaust) to 900 mV (rich exhaust) when in closed-loop.

**HO2S-2(mV)**
**Range: 0 to 1132 mV**

Displays the rear heated oxygen sensor (HO2S-2) output voltage. Voltage should remain inactive or appear lazy within a range of 100 mV to 900 mV when the catalytic converter is functioning properly and the system is operating in a closed-loop.

**HO2S HTR B1-S1**
**HO2S HTR B1-S2**
**HO2S HTR B2-S1**
**HO2S HTR B2-S2**
**Range: HIGH/LOW**

Displays the commanded state of the HO2S heater control circuits and read as follows:

- HIGH when the heater is commanded on
- LOW when the heater is off

**HO2S HTR CMD**
**Range: ON/OFF**

No information is currently available for this parameter.

**HOT LIGHT**
**Range: ON/OFF**

Displays the state of the temperature telltale lamp on Saturn vehicles only. HOT LIGHT reads ON when the lamp is on and the engine or transaxle reaches an overheat condition.

**HOT MODE**
**Range: ON/OFF**

Indicates whether the transmission entered “hot mode” operation and reads ON only when transmission fluid temperature exceeds 275°F (135°C).

During hot mode, the TCC engages in 4th gear until the temperature drops below 275°F (135°C), the brakes are applied, or the TP sensor signal is low.

- If temperature reaches 302–307.5°F (150–153°C) for 15 minutes, a DTC sets.
- If fluid temperature exceeds 309°F (154°C) for 1 second, hot mode operation continues until the next ignition cycle.

**HOT OPEN LOOP**
**Range: YES/NO**

Indicates whether the PCM has commanded open loop operation due to high engine temperature and reads YES only when in open loop.

**IAC COIL ENABLE**
**Range: YES/NO**

Indicates the state of PCM control for the idle air control (IAC) motor coil on some full-size trucks with V6 and V8 engines.

IAC COIL ENABLE reads as follows:

- YES when the PCM is controlling IAC valve movement
- NO if the PCM is not controlling the IAC motor

**IAC COIL A**
**IAC COIL B**
**Range: ON/OFF**

Indicate whether the PCM is controlling either or both motor coils for the idle air control (IAC) valve on 1991 and later 2.5L truck engines.

These parameters read as follows:

- ON when the PCM is controlling the coil to operate the IAC motor
- OFF when PCM control is off

**IAC DIRECTION**
**Range: ____ FWD/REV**

Displays which direction the PCM is commanding the idle air control (IAC) motor to move and reads as follows:

- FWD when the PCM is commanding the IAC motor outward to reduce idle airflow
- REV when the PCM is moving the IAC motor inward to increase airflow

**IAC LEARNED**
**Range: ____ YES/NO**

Indicates whether the idle air control (IAC) motor has learned the number of counts needed to produce a desired idle speed on many models with a Buick-built V6 engine.

IAC LEARNED reads as follows:

- NO when the ignition is first turned on.
- YES once the engine accelerates and returns to idle, the IAC system should learn the required idle counts

**IAC LT TRIM(%)**
**Range: ____ -100 to 100**

Displays the long term adaptive value for IAC as a percentage.

Ideal values are around 0%.

- A positive value indicates that the ECM is adding air (via the IAC valve) to compensate for a low idle speed condition.
- A negative value indicates that the ECM is reducing the amount of air to compensate for a high idle speed.

The ECM maintains the idle speed as close to the Desired Idle Speed as possible. The ECM makes adjustments to compensate for the changes in the idle speed, these changes are indicated by the Long Term and Short Term air Trim values.

- Short term trim values change rapidly in response to any minor fluctuations in the idle speed. These changes fine tune the idle RPM.
- Long term trim values change in response to short term trends. The long term air trim makes coarse adjustments to the idle speed to re-center and restore control to the short term air trim.

**IAC MOTOR CMD**
**Range: ____ ON/OFF**

No information is currently available for this parameter.

**IAC POSITION**
**Range: ____ 0 to 255 counts**

Displays the commanded position of the idle air control pintle in counts. A larger number of counts means that more air is being commanded through the idle air passage. IAC position should respond fairly quickly to changes in engine load to maintain desired idle RPM.

**IAC PULSE(%)**
**Range:** ________ **0 to 65%**

Displays the duty cycle of the ECM command signal to the IAC valve. The IAC valve has two control circuits, one opens the valve and the other closes the valve. The ECM control both circuits simultaneously. The ratio of the frequency between the two PWM signals determines the direction and the amount that the drive unit rotates the shutter within the valve.

**IAT-1**
**IAT-2**
**Range:** ________ **–40 to 419°F or –40 to 152°C**

Displays the PCM calculated intake air temperature (IAT) sensor in degrees. The PCM uses the IAT to adjust fuel delivery and spark timing according to intake air density.

**IC CYL 1 & 4 CMD**
**IC CYL 2 & 3 CMD**
**Range:** ________ **ON/OFF**

Displays the status of the ignition coil for cylinders 1 & 4 or 2 & 3 as commanded by the ignition control module.

**IC FAULT CYL 1**
**IC FAULT CYL 2**
**IC FAULT CYL 3**
**IC FAULT CYL 4**
**IC FAULT CYL 5**
**IC FAULT CYL 6**
**IC FAULT CYL 7**
**IC FAULT CYL 8**
**Range:** ________ **YES/NO**

Indicates whether there is a fault in the ignition control (IC) circuit for a particular cylinder and read YES if a fault is detected.

This parameter is restricted to the number of cylinders for a particular engine. Thus, a 4-cylinder engine does not display IC Fault Cyl 5, 6, 7 or 8.

**ICM CTRL IGN**
**Range:** ________ **YES/NO**

Indicates whether the PCM is controlling ignition timing and reads as follows:

- YES when the PCM is controlling the ignition timing and the PCM calculates the desired ignition timing based on information from the input sensors
- NO when the ignition system operates independently from the PCM

The Ignition Control Module (ICM) maintains a base ignition timing of 10 degrees btdc and is able to change this ignition timing slightly with increased engine speed. Ignition control mode is in affect whenever an ignition control fault is detected while the engine is running and it will have a noticeable effect on driveability.

**IDLE AIR CONTRL**
**Range:** ________ **0 to 255**

Indicates the position of the idle air control (IAC) valve in the throttle body of a fuel-injected engine as a step count. The IAC valve controls how much air bypasses the throttle at idle, and thus idle speed.

The motor that drives the IAC valve has 255 positions, and readings vary from 0 to 255. A reading of zero indicates the motor is at its outermost position, which closes the IAC valve to cut off air flow. A high number indicates that the motor moved inward to open the IAC valve and allow more idle air. Count changes should occur fairly rapidly as engine load changes.

**IDLE INJ PW(mS)**
**Range: ______________________________ 0 to 6.1**

Displays the fuel injector base pulse-width modulation (PWM), or the on-time in milliseconds with the engine at idle.

**IDLE RPM ERROR**
**Range: ______________________________ 0 to 12,800 RPM**

Displays the difference between the PCM commanded idle speed and actual engine speed.

**IDLE SW**
**Range: ______________________________ CLSD/OPEN**

Displays the position of the idle switch on some minimum-function engines and reads as follows:

- CLSD = the throttle is closed and the engine should be at idle
- OPEN = the engine is off idle

Idle speed on these engines is not PCM regulated.

**IDLE THROTTLE**
**Range: ______________________________ YES/NO**

Displays the idle throttle position (TP) and reads YES when the throttle is closed.

**IGN COIL 1 & 4**
**IGN COIL 2 & 5**
**IGN COIL 3 & 6**
**Range: ______________________________ ON/OFF**

Displays the state of the primary ignition coil circuits, which are ECM controlled. The value switches from ON to OFF with each control command issued by the ECM. Due to the rapid changes in the signal state and the refresh rate of the scan tool, readings may appear to freeze occasionally when the engine is running.

**IGN CYCLES**
**Range: ______________________________ 0 to 50**

Displays the number of on-off cycles of the ignition switch since the last trouble code change on some late-model vehicles. The counter resets to zero under any of the following conditions:

- A new trouble code occurs.
- Trouble codes are cleared.
- Battery power is disconnected.
- 50 ignition cycles occur with no other code changes.

After 50 ignition cycles with no change in trouble codes, the PCM erases all codes in memory and resets the counter to zero.

**IGN CYCLE DTC**
**Range: ______________________________ YES/NO**

Indicates whether a DTC set on the current ignition cycle.

**IGN FUEL VTD**
**Range: ______________________________ YES/NO**

Indicates whether a VTD code is stored in memory.

**IGN REF PULSES**
**Range: YES/NO**

Indicates whether ignition 2X reference pulses were detected during cranking on some vehicles. The PCM counts the 2X pulses during cranking to verify if ignition input signals are synchronized. The counter resets to zero once the engine starts.

IGN REF PULSES reads as follows:

- YES while cranking
- NO once the engine starts

**IGN SPARK EFFIC(%)**
**Range: 0-100**

Indicates how much of the ignition capacity is being required to operate the engine as calculated by the control module. The scan tool will display a high value when more spark is required, such as high load conditions. The scan tool will display low values when less spark is required, such as at idle.

**IGNITION 0**
**IGN 0**
**Range: ON/OFF**

Displays the status of the ignition 0 input circuit to the PCM.

**IGNITION (V)**
**Range: 0 to 25.5 V**

Displays the system voltage at the PCM ignition input with the ignition switch in the run position.

**IGNITION 1 (V)**
**Range: 0 to 25.5 V**

Displays the system voltage measured by the ECM at its ignition feed circuit. Ignition voltage is only present when the vehicle is running.

**IGNITION 1(V) LOW**
**Range: YES/NO**

Displays the condition of the ignition input to the VCM and reads YES if voltage is low.

**IGNITION 1(V) HIGH**
**Range: YES/NO**

Displays the condition of the ignition input to the VCM and reads YES if voltage is high.

**IGNITION 1 SW**
**Range: ON/OFF**

Displays the status of the ignition input to the body control module (BCM).

**IGNITION 3(V)**
**Range: variable**

Displays the ignition feed voltage at the transfer case shift control module.

**IGNITION 3 SW**
**Range: ON/OFF**

No information is currently available for this parameter.

**IGNITION MODE**
**Range: YES/NO**

Indicates whether the PCM is controlling ignition timing and reads as follows:

- YES is displayed under normal conditions, which indicates the PCM has requested control of the spark advance and will calculate ideal timing from sensor input. The ignition control module (ICM) determines the correct operating mode based on the level of voltage that the PCM applies to the ignition control module bypass circuit. The PCM provides 5 volts to the ignition control module bypass circuit when conditions are appropriate for PCM control of spark timing. This may also be referred to as "IC mode." The timing changes with changes in engine speed and load.
- NO indicates that the PCM is not controlling ignition timing and the ICM is maintaining a base ignition timing of 10° BTDC. If the PCM does not apply 5 volts to the bypass circuit, the ICM will control spark timing until the bypass signal is received. This may also be referred to as "Bypass mode." The base timing of 10° BTDC changes slightly with changes in engine speed.

**IGNITION SW**
**Range: ______ ON/OFF**

Indicates whether the ignition switch is on, or in the run position and reads as follows:

- ON when the ignition switch is on and the engine is running or not cranking
- OFF when the switch is in any position other than run

**ILC SOLENOID**
**Range: ______ YES/NO**

Displays the PCM output command to the idle load compensator (ILC) solenoid on some carbureted engines and reads as follows:

- YES when the engine is idling with an increased load, such as the A/C compressor on (idle speed may increase slightly)
- NO under normal idle conditions

**IMRC SOL CMD**
**Range: ______ ON/OFF**

Displays the commanded state of the IMRC (Intake Manifold Runner Control) solenoid.

**INITL BRK APLY**
**Range: ______ ON/OFF**
**INITL BRK APLY**
**Range: ______ YES/NO**

Displays the status of the initial brake applied switch as determined by the control module. Reads YES/ON when the brake pedal is depressed, and NO/OFF when the brake pedal is not depressed.

**INJ 1**
**INJ 2**
**Range: ______ 0 to 999 mS**

Displays the ECM command to the applicable fuel injector in milliseconds (mS).

**INJ CLOSE(mS)**
**Range: ______ 0 to 4.00 mS**

Displays the amount of time it takes the fuel solenoid to close. When the engine load increases, closure time fluctuates.

**INJ 1 CMD**
**INJ 2 CMD**
**INJ 3 CMD**
**INJ 4 CMD**
**Range: ______ ON/OFF**

Indicates whether the applicable injector is being commanded on by the control module.

**INJ PW(mS)**
**INJ PW #1(mS)**
**INJ PW #2(mS)**
**INJ PW #3(mS)**
**INJ PW #4(mS)**
**INJ PW #5(mS)**
**INJ PW #6(mS)**
**INJ PW #7(mS)**
**INJ PW #8(mS)**
**Range: ______ 0 to 999 mS**

Displays the commanded state of the fuel injectors in milliseconds.

**INJ PW B1(mS)**
**INJ PW B2(mS)**
**Range: ______ 0 to 1000 mS**

Displays the amount of time the PCM commands each injector ON during an engine cycle in milliseconds. A longer injector pulse width causes more fuel to be delivered. The injector pulse width increases as engine load increases.

- B1 represents cylinder bank 1 (cylinders 1, 3, 5, and 7)
- B2 represents cylinder bank 2 (cylinders 2, 4, 6, and 8)

**INJ x FAULT**
**Range: ______ YES/NO**

Indicates whether a fault exists in the wiring of a fuel injector. The “x” in the name is a variable from 1 to 8, depending on the cylinder being monitored.

**INLET AIR TEMP**
**Range: ______ HOT/COOL**

Displays the status of an intake airflow temperature switch on some minimum-function Isuzu systems and reads as follows:

- HOT when air temperature is above 60°F (15°C)
- COOL when temperature is below 40°F (4°C)

**INTAKE AIR**
**Range: ______ -39 to +140°C or -38 to +284°F**
**INTAKE AIR(°C)**
**Range: ______ -40 ° to 151 °C**
**INTAKE AIR(°F)**
**Range: ______ -40° to 304 °F**

Displays the intake air temperature (IAT) in degrees based on the IAT sensor signal. The PCM converts the voltage signal from a thermistor-type sensor to temperature values. The PCM uses IAT to adjust fuel delivery and spark timing according to the density of the incoming air.

**INTAKE HEAT FBK**
**Range: ______ ON/OFF**

Displays the current commanded state of the intake air heater relay.

**INTAKE HEAT RLY**
**Range: ______ ON/OFF**

Indicates whether the ECM is commanding the intake air heater on.

**INTAKE AIR(V)**
**Range: ______ 0 to 5.00 V**

Displays the intake air temperature (IAT) voltage, which is used by the vehicle control module (VCM) to determine intake air temperature. The information is used to adjust fuel delivery and spark timing.

**INTAKE HTR(V)**
**Range: ______ 0 to 12 V**

Displays the voltage supplied by the intake air heater relay. This can be used to determine if the relay is following the ECM command.

**INTAKE MAN. VLV**
**Range: ______ OPEN/CLOSED**

Displays the commanded position of the intake plenum switch over valve, which is part of the multi-ram induction system.

**INTERCOOLR PUMP**
**Range: ______ ON/OFF**

Displays the PCM output command to the intercooler pump motor relay on some supercharged or turbocharged engines and reads as follows:

- ON under normal conditions
- OFF when the PCM has not requested intercooler pump operation

**IPC FUEL ACTIVE**
**Range: ______ ON/OFF**

Indicates whether the vehicle theft deterrent (VTD) system has commanded the instrument panel cluster (IPC) control module to disable fuel delivery. The VTD disables fuel delivery when a key with an incorrect resistor is inserted into the ignition key cylinder.

**ISC DIRECTION**
**Range: ______ FWD/REV**

Indicates the direction the PCM is commanding the idle speed control (ISC) motor to move on some Cadillac models and reads as follows:

- FWD when the PCM is increasing idle speed
- REV when the PCM decreases idle speed

**ISC MOTOR**
**Range: ______ ON/OFF**

Indicates the state of the idle speed control (ISC) motor on some models and reads as follows:

- ON when the motor is controlling idle speed and ISC NOSE SWITCH reads CLSD.
- OFF when the ISC motor is not controlling idle speed and ISC NOSE SWITCH reads OPEN.

**ISC NOSE SWITCH**
**Range: ______ CLSD/OPEN**

Indicates idle speed control (ISC) nose switch position on some carbureted and fuel-injected engines and reads as follows:

- CLSD when the throttle is closed and the ISC motor is controlling idle speed
- OPEN when the engine is off idle and the driver is controlling the engine speed

**ISC REV PREVENT**
**Range: ____________________ YES/NO**

Indicates whether the PCM is preventing the idle speed control (ISC) motor from reversing on some Cadillac models. This parameter is principally active for a few seconds after a cold start.

ISC REV PREVENT reads as follows:

- NO under normal idle conditions
- YES when the PCM commands a specific idle speed control position, or throttle opening, and prevents the ISC motor from reversing regardless of any other sensor inputs

A brief YES reading may appear during deceleration and other closed-throttle conditions.

**KICKDOWN ENABLE**
**Range: ____________________ YES/NO**

Indicates whether operating conditions exist for a downshift during acceleration and reads YES when downshift conditions exist. The PCM looks at various sensors, such as throttle position, input shaft speed, and vehicle speed to enable a downshift.

**KNOCK**
**Range: ____________________ YES/NO**

Indicates whether detonation has been detected on vehicles with electronic spark control (ESC) and reads as follows:

- YES if detonation is detected
- NO if detonation is not detected

Compare this parameter to the ESC Counter or Knock Retard parameter. Some vehicles without knock sensors display this parameter, and it may read YES at all times. If so, confirm the vehicle has a knock sensor.

**KNOCK(V)**
**Range: ____________________ 0.0 to 5.0 V**

Indicates the presence of engine knock as a voltage signal. The higher the voltage, the greater the amount of knock.

**KNOCK COUNT**
**Range: ____________________ 0 to 255**

Indicates the amount of spark knock detected by the vehicle control module (VCM) as a count.

**KNOCK CTRL**
**Range: ____________________ ON/OFF**

Indicates when the control module is actively modifying ignition timing in response to knock sensor input.

**KNOCK PRESENT**
**Range: ____________________ YES/NO**

Indicates the presence of engine knock and reads as follows:

- YES when sensed knock exceeds a preset PCM value
- NO at all other times

**KNOCK RET 1(°)**
**KNOCK RET 2(°)**
**KNOCK RET 3(°)**
**KNOCK RET 4(°)**
**KNOCK RET 5(°)**
**KNOCK RET 6(°)**
**KNOCK RET 7(°)**
**KNOCK RET 8(°)**
**Range: ______ 0 to 90° or 0 to 191°**

Displays the amount of long-term spark advance the ECM removes from the ignition control for cylinders 1 through 8 to compensate for detonation. The value is based on ECM response to the knock sensor (KS) signal.

**KNOCK RETARD(°)**
**OCTANE MOD(°)**
**Range: ______ 0 to 90°**

Displays the amount of spark advance removed by the PCM when detonation is sensed in degrees. The PCM retards timing from the optimum advance for existing speed and load. The parameter does not indicate that timing is retarded after top dead center. It indicates the amount of advance that has been taken away.

Typically, the PCM retards timing at 4 degrees per second when the knock occurs. Advance is restored at a slower rate.

**KNOCK SNSR(V)**
**Range: ______ 0.0 to 3.9 V**

Displays the voltage input to the control module from the knock sensor (KS). The reading is more than 0.0 V only when knock is detected.

**KNOCK SNSR 1(V)**
**KNOCK SNSR 2(V)**
**Range: ______ 0.0 to 5.0 V**

Displays the voltage signal of the knock sensor (KS). The normal range is 0.8–1.0 V. Knock sensors are used by the PCM as microphones to listen for abnormal engine noise that may indicate pre-ignition/detonation.

There are 2 types of KS currently being used: broadband and flat response sensors. The broadband sensors have a single wire and the flat sensors have two wires. Broadband and flat sensor signals are processed differently by the PCM. Both systems will constantly monitor for a KS signal that is not present or falls within the noise channel range.

**KS COUNTER**
**Range: ______ 0 to 255**

Displays the number of instances of engine detonation detected by the knock sensor during a one-eighth second period.

**KS NOISE(V)**
**Range: ______ 0 to 4.98**

Displays the amount of normal engine mechanical noise in voltage. The PCM uses this feedback signal to diagnose the knock sensor (KS) module and the KS sensor. Also, the PCM detects knock by comparing this signal with the KS circuit signal. As engine speed and load increase, so does engine noise, which causes a higher voltage to display.

**LAST ADPT DC(%)**
**Range: ____ 0 to 100%**

Displays the highest commanded duty cycle applied to the automatic transfer case motor.

**LAST ADAPT (psi)**
**Range: ____ variable**

Displays the amount of transmission line pressure increase over baseline pressure that was required to adjust the apply effort of a clutch or band during the last adapting shift.

**LAST CLEAR CODE**
**Range: ____ see description**

Displays the distance (miles or kilometers) that the vehicle has been driven since the last DTC was cleared.

**LEARNED IAC**
**IAC MEMORY**
**Range: ____ 0 to 255**

Displays the minimum idle air control (IAC) motor position that the PCM has learned. The value represent the minimum IAC position stored in PCM memory.

**LIFT PUMP SYS**
**Range: ____ ON/OFF**

Displays the PCM control signal to the lift pump.

**LIFT PUMP(V)**
**Range: ____ 00.0 to 25.5 V**

Displays the voltage that the lift pump system is drawing. Use it as a check of the lift pump relay and oil pressure switch.

**L FUEL LEVEL (V)**
**Range: ____ 0 to 5.0 V**

Displays the fuel level in the left fuel tank as voltage. Interpret as follows:

- About 0.8 V = empty tank
- About 2.5 V = full tank

**LO RES SIG(mS)**
**Range: ____ 0 to 999.9 mS**

Displays the time between low resolution sensor pulses on some 5.7L high output (HO) Corvette engines. This parameter is only used for the angle base ignition timing system.

**LO SPARK MOD(°)**
**Range: ____ not available**

Displays the low spark modifier, which is an adaptive spark retard value used along with mid, and high spark modifiers to control engine spark knock. The low spark modifier is used for low engine speeds.

The value should be 0 degrees if no spark retard is needed. The adaptives are based on ECT and reset to 0 degrees during cold temperatures. If a hot restart occurs, a percentage of the learned adaptive is used. The ECM always works back to zero compensation or no spark retard.

**LOAD/LV8**
**Range: ____ 0 to 255**

Indicates the relative engine load. A high number indicates a heavy load, while a low number indicates a light load. The reading is also proportional to the weight of the air displaced by each cylinder in grams per second.

The load parameter is calculated by the PCM based on engine speed, the number of cylinders, and the manifold absolute pressure (MAP) or mass airflow (MAF).

**LOAD(%)**
**Range: ______ 0 to 100%**

Indicates the engine load based on manifold absolute pressure. The higher the percentage, the greater the engine load.

**LONG KNOCK**
**Range: ______ YES/NO**

Indicates whether the PCM is detecting an abnormally long engine knock condition. This parameter displays on Eng 1 data.

**LOOP STAT B1-S1**
**LOOP STAT B2-S1**
**Range: ______ OPEN/CLOSED**

Displays the loop status of the upstream oxygen sensors for bank 1 (B1-S1) and bank 2 (B2-S1):

- OPEN = open loop
- CLOSED = closed loop

During closed loop the PCM controls fuel delivery according to oxygen sensor voltage. In Open Loop, the PCM ignores the oxygen sensor voltage and bases the amount of fuel to be delivered based on TP sensor, engine coolant, and MAF sensor inputs.

**LOOP STAT B1-S2**
**LOOP STAT B1 S2**
**LOOP STAT B2-S2**
**LOOP STAT B2 S2**
**Range: ______ OPEN/CLOSED/CLSD/???**

Displays the loop status of the downstream oxygen sensors for bank 1 (B1-S2) and bank 2 (B2-S2):

- OPEN = open loop
- CLOSED or CLSD = closed loop
- ??? = the PCM received invalid data

In Closed Loop the PCM relies on the oxygen sensor voltage to monitor Bank 2 Catalytic Converter efficiency,

**LOOP STATUS**
**Range: ______ OPEN/CLSD**

Displays the loop status of the operating system:

- OPEN = open loop
- CLOSED = closed loop or the ECM is controlling fuel delivery according to the O2S 1 voltage

The ECM controls the air-fuel ratio as close to 14.7:1 as possible.

**LOW A/C FREON**
**Range: ______ YES/NO**

Indicates the amount of A/C refrigerant charge based on temperature on some S-series trucks and reads as follows:

- YES if the PCM disables the compressor clutch
- NO under normal conditions

**LOW A/C PRESS**
**Range:** ____ **YES/NO**

Displays the status of an A/C pressure switch on some vehicles. The switch opens if the refrigerant pressure drops below a minimum, and reads:

- YES if the PCM disables the compressor clutch to prevent damage
- NO under normal conditions

**LOW CLNT LEVEL**
**Range:** ____ **YES/NO**
**LOW COOLANT LEVEL**
**Range:** ____ **OK/LOW**

Indicates whether the low coolant switch has been activated.

**LOW ECL LAMP**
**Range:** ____ **ON/OFF**
**LOW COOLANT LEVEL**
**Range:** ____ **OK/LOW**

Displays the status of the engine coolant level (ECL) warning lamp on engines with a coolant level sensor and normally reads OFF. The lamp is controlled by the PCM over the Serial data line (SDL) 3 seconds ON, then OFF.

**LOW EOP**
**Range:** ____ **YES/NO**

Displays the status of the engine oil pressure (EOP) sensor and reads YES only when oil pressure is low.

If a low oil pressure condition is detected by the PCM, it sends a message on the class 2 data line to the Driver Information Center (DIC) requesting a warning message of the current condition to display.

**LOW FAN**
**HIGH FAN**
**Range:** ____ **ON/OFF**

Displays the PCM output commands to the fan relay. Some engines have two speeds for the electric cooling fan. The PCM controls the fan speeds through a relay and a resistor.

- When LOW FAN reads ON, the PCM energizes the relay through the resistor for the first-stage, or low-speed operation.
- When HIGH FAN reads ON, the PCM energizes the relay directly for second-stage, or high-speed operation.

In both cases, the PCM command is output to a quad driver module that energizes the relay.

**LOW OIL LAMP**
**Range:** ____ **ON/OFF**

Displays the status of the engine oil pressure lamp. The PCM relies on data from the engine oil pressure sensor to request the instrument panel cluster (IPC) to turn the lamp ON or OFF.

**LOW OIL LEVEL**
**Range:** ____ **YES/NO**

Indicates whether the PCM detects a low engine oil level.

**LOW OIL PRESS**
**Range:** ____ **YES/NO**

Displays the status of the engine oil pressure sensor and reads YES only when pressure is low.

**LOW OIL PRS SW**
**Range: ______ OPEN/CLSD**

Displays the status of the low engine oil pressure switch.

**L/R TRN B1S1(mS)**
**L/R TRN B2S1(mS)**
**Range: ______ 0.0 to 3187.5 mS**

Displays the time it takes the heated oxygen sensor (HO2S) voltage to change from the lean threshold to the rich threshold in milliseconds.

- B1S1 is the bank 1 upstream HO2S
- B2S1 is the bank 2 upstream HO2S

**LT ADD B1(mS)**
**LT ADD B2(mS)**
**Range: ______ 0.0 to 3187.5 mS**

Displays the time in milliseconds that the PCM had to adjust to correct for a lean condition detected by the upstream HO2S.

- B1 is the bank 1 HO2S
- B2 is the bank 2 HO2S

**LT FT HI-LD B1(%)**
**Range: ______ 0 to 100**

This parameter is calculated by the control module based on the short term FT value under high rpm/load conditions. The long term FT bank 1 is used for the long term correction of the fuel delivery in bank 1. The scan tool will display a high value for a large amount of long term fuel correction, and 0% for no long term fuel trim correction. The scan tool will display a negative value when the fuel system is running too rich and fuel is being removed from the combustion event. The scan tool will display a positive value if the fuel system is running lean and fuel is being added to the combustion event.

**LT FT HI-LD B2(%)**
**Range: ______ 0 to 100**

This parameter is calculated by the control module based on the short term FT value under high rpm/load conditions. The long term FT bank 2 is used for the long term correction of the fuel delivery in bank 2. The scan tool will display a high value for a large amount of long term fuel correction, and 0% for no long term fuel trim correction. The scan tool will display a negative value when the fuel system is running too rich and fuel is being removed from the combustion event. The scan tool will display a positive value if the fuel system is running lean and fuel is being added to the combustion event.

**LT TRIM-1**
**LT TRIM-2**
**Range: ______ 0 to 255 counts**
**LT TRIM-1(%)**
**LT TRIM-2(%)**
**Range: ______ –100 to 100%**

Displays the operation and long-term correction of the fuel-metering as counts or a percentage.

- A value below 128 counts or 0% indicates O2S feedback shows a rich condition and the vehicle control module (VCM) is commanding a lean mixture in response.
- A value above 128 counts or 0% indicates O2S feedback shows a lean condition and the VCM is commanding a rich mixture in response.
- Numbers 1 and 2 refer to the individual cylinder banks.

**LT TRIM AVG**
**Range: ________________________________________________0 to 255**

Displays an average of the long-term fuel trim from all cells. The value is PCM calculated.

- 0 = –100%
- 255 = 100%

**LT TRM AVG1 %**
**LT TRM AVG2 %**
**Range: ______________________________________________ –100 to 100%**

Displays an average of all long term fuel trim cells as percentage. The short term fuel trim cells are rated, for the amount of which they are used.

For example, an idle cell is rated higher than a wide open cell. If a fueling malfunction occurs in the idle cell and the wide open cell, the average would be more affected by the idle cell than the wide open cell.

- A negative value significantly below 0% indicates that the fuel system is rich and fuel delivery is being reduced.
- A positive value significantly more than 0% indicates that a lean condition exists and the PCM compensates by adding fuel.

When the average of the cells reach a predetermined high or low, a fuel trim DTC sets.

**LT TRIM AVG B1**
**LT TRIM AVG B2**
**Range: ____________________________________________ 0 to 255 counts**

Displays an average of all long-term fuel trim cells for each bank of a V-type engine as counts.

- A value below 128 indicates a lean condition, with injector pulse width being increased to compensate.
- A value above 128 indicates a rich condition, with the PCM decreasing injector pulse width to compensate.

A DTC sets if the average reaches a predetermined high or low value.

**LT TRIM ENABLED**
**Range: _________________________________________________ YES/NO**

Indicates whether the PCM is using fuel trim values to adjust fuel delivery to the engine and should read YES when in closed loop.

Fuel trim is disabled when the engine is not in closed loop, malfunction codes related to fuel trim are set, large amounts of purge vapor are ingested by the engine, or additional diagnostics that temporarily affect fuel trim operation are active.

**MAF(gm/Sec)**
**Range: ______________________________________________ 0 to 665 g/s**

Displays the amount of air entering the engine through the mass air flow (MAF) sensor.

**MAF(Hz)**
**Range: ____________________________________________ 0 to 31,999 Hz**

Displays the frequency of the mass airflow (MAF) signal in Hertz. The PCM converts current draw needed by the MAF to keep the hot wires at a constant temperature into a frequency signal.

**MAF(V)**
**Range: ______ variable**

Displays the signal of the mass airflow (MAF) as voltage. The MAF signal indicates the amount of air entering the engine.

**MAF BURNOFF**
**Range: ______ ON/OFF**

Displays the status of the mass airflow (MAF) sensor burnoff circuit. The hot-wire MAF sensors on some port fuel-injected engines build up a residue of contaminants from the intake air. To prevent buildup and maintain an accurate sensor reading, the PCM applies a burnoff voltage to the sensor element when the ignition switches off.

The engine must be warm and run in closed loop for a programmed length of time before burnoff voltage is applied. When this condition is present, MAF BURNOFF reads as follows:

- ON for a few seconds as soon as the ignition switches off
- OFF at all other times

**MAF#1(gm/Sec)**
**Range: ______ 0.0 to 6553.5 gm/Sec**

Displays the mass airflow (MAF) sensor input frequency converted to grams of air per second (gm/Sec). This indicates the amount of air entering the engine.

**MAF-EGR FLOW**
**Range: ______ 0.0 to 6553.5 gm/Sec**

Displays the mass airflow (MAF) sensor signal converted to grams per second (gm/Sec). This indicates the amount of air entering the engine. The PCM uses this information to monitor the EGR flow rates only.

**MAIN INJ(°)**
**Range: ______ XXX°**

Displays the current timing of the main injection pulse in degrees.

**MAIN INJ CMD(µS)**
**Range: ______ XXX µS**

Displays the commanded on time of the fuel injector for the main injection pulse in microseconds.

**MAIN FUEL(mm$^3$)**
**Range: ______ variable**

displays the PCM commanded amount of fuel in the main fuel-injection pulse as cubic millimeters (mm3).

**MAIN RELAY**
**Range: ______ ON/OFF**

Displays the commanded state of the engine controls power relay.

**MAP**
**Range: ______ 0 to 205 kPa**
**MAP(KPA)**
**Range: ______ 0 to 125 kPa**
**MAP(”Hg)**
**Range: ______ 0 to 60.7 “Hg**

Displays the PCM calculated manifold absolute pressure (MAP), which is based on the MAP sensor voltage signal.

When MAP displays in kPa (kilopascal), the reading should be about 100 to 102 kPa with the engine off and the intake manifold close to atmospheric pressure at sea level. When the engine is running with high manifold vacuum, the kPa reading drops. On a turbocharged engine, the kPa reading rises above 100 as boost is applied.

When MAP displays in “Hg (inches of mercury), the reading should be about 29.9 “Hg with the engine off and the manifold close to atmospheric pressure at sea level. When the engine is running with high manifold vacuum, the MAP reading in “Hg drops. On a turbocharged engine, the reading rises above 30 as boost is applied.

**Table 14-4** *Pressure/voltage conversion*

| Unit Of Measure | Voltage | | | | | | |
|---|---|---|---|---|---|---|---|
| | High | | | | | | Low |
| MAP (kPa) | 70 | 60 | 50 | 40 | 30 | 20 | 10 |
| MAP (inHg) | 21 | 18 | 15 | 12 | 9 | 6 | 3 |

Compare MAP voltage and MAP pressure parameter readings. Pressure should be high when voltage is high, and low when voltage is low. If readings appear abnormal for the apparent engine load, the sensor input signal may be inaccurate or the PCM calculations may be incorrect.

**MAP(V)**
**Range: 0 to 5.0 V**

Displays the manifold absolute pressure (MAP) sensor voltage signal.

The MAP sensor measures the change in the intake manifold pressure from engine load, and speed changes. As intake manifold pressure increases, the intake vacuum decreases resulting in a higher MAP sensor voltage. The PCM uses the MAP sensor signal for updating the BARO reading and as an enabling factor for several of the diagnostics.

**MAP CHANGE**
**Range: 0 to 68.6 V**

Displays the difference in MAP voltage readings taken during two operating conditions. The PCM uses this information to evaluate the operating condition of systems such as EGR.

For example, the PCM samples MAP sensor voltage, pulses the EGR value open, then takes a second MAP sample. The PCM compares the difference between the two samples to a value stored in memory. Too low a difference indicates a poorly functioning EGR system.

**MAT(°C)**
**Range: –40 to 199**
**MAT(°F)**
**Range: –40 to 389**
**MANIFOLD(°C)**
**Range: –40 to 199**
**MANIFOLD(°F)**
**Range: –40 to 389**

Displays the PCM estimated temperature of the intake manifold air on some fuel-injected engines. It is available only on a few engines. Measurements are provided in two ways:

- Most engines with mass airflow (MAF) sensors have a sensor in the intake air duct.
- Most engines with manifold absolute pressure (MAP) sensors have a sensor in the intake manifold.

The PCM converts sensor voltage to temperature readings. The MAT signal, along with MAF or MAP, are used by the PCM to calculate the amount of air entering the engine.

The MAT reading should be close to the ambient air temperature when the engine is cold, then rise steadily as it warms up. High-temperature MAT readings may differ greatly between vehicles due to underhood temperature variations and hot-soak conditions.

**MAX TP ANGLE(%)**
**MIN TP ANGLE(%)**
**Range: ______ 0 to 100**

No information is currently available for these parameters.

**MC DWL(°)**
**Range: ______ 0° to 60°**

Displays the duty cycle, or on-time, of the mixture control (MC) solenoid on carbureted engines.

This parameter is based on a 6-cylinder dwell scale of 0 to 60 degrees. A low reading indicates the PCM is commanding a rich mixture, and a high reading indicates a lean mixture.

- 30° = midpoint of the dwell range (50% duty cycle)
- 6° = fully rich condition
- 54° = fully lean condition

When the PCM is operating in open loop, the MC dwell value is fixed, usually near 30°. In closed loop, MC dwell values change as the O2S voltage changes.

For all 1981–82 vehicles with 5-pin in-line ALDL connectors, the MC dwell parameter is calculated from the MC solenoid signal at pin A of the ALDL connector.

- 0° = the circuit is open or grounded
- 60° = the circuit is shorted to battery voltage

Because MC dwell is not part of the serial data list for these vehicles, this parameter is not recorded on a data movie. The movie shows a dwell reading of N/A.

**MD-4CYL FDBACK**
**Range: ______ YES/NO**

This is a feedback signal from the Cadillac modulated-displacement V8/6/4 system and reads YES only when both pairs of cylinders are disabled and the engine is running on four cylinders.

This parameter and the MD-4Cyl Command and MD-6Cyl Command parameters should all read YES simultaneously.

**MD-4CYL COMMAND**
**MD-6CYL COMMAND**
**Range: ______ YES/NO**

Indicates which cylinders are disabled by the PCM on the Cadillac modulated-displacement V8/6/4 system. Table 14-5 shows the number of cylinders in operation and the PCM output.

**Table 14-5** *MD-6CYL and MD-4CYL COMMAND parameter readings*

| Engine | Parameter | Reading |
|---|---|---|
| 8 cylinders | MD-6CYL | NO |
| | MD-4CYL | NO |
| 6 cylinders | MD-6CYL | YES |
| | MD-4CYL | NO |
| 4 cylinders | MD-6CYL | YES |
| | MD-4CYL | YES |

**MED RES ENG SYNC**
**Range: YES/NO**

No information is currently available for this parameter.

**MED RES SIG**
**Range: 0 to 255**

Displays a count of crankshaft position (CKP) sensor reference pulses.

**MIL**
**Range: ON/OFF**

Displays the commanded state of the service engine soon/malfunction indicator lamp (MIL).

**MIL CURRENT HI**
**Range: YES/NO**

Displays the status of output driver (ODM) A output #1, which operates the MIL. Should be LOW with the MIL (ON) and HI with the MIL (OFF).

**MIL OPEN/SHRT**
**Range: YES/NO**

Indicates whether an open or short circuit exists in output driver (ODM) A output #1.

**MIL QDM**
**Range: PASS/FAIL**

Indicates whether an open or short circuit exists in output driver (ODM) A output #1.

**MIL REQUEST**
**Range: YES/NO**

Indicates whether the TCM has requested MIL illumination.

The TCM has no direct control of the engine MIL, but if a transmission fault occurs that is emissions related, the engine MIL must illuminate. If a transmission fault occurs that requires MIL illumination, the TCM will send a signal to the ECM over the CAN bus requesting illumination of the MIL.

**MILEAGE SINCE LAST**
**Range: 0 to 999**

Displays the distance traveled since an emission diagnostic trouble code cleared as miles or kilometers. The PCM stores this mileage in the Freeze Frame and Failure Records buffers.

**MILEAGE SINCE LAST CLEAR CODE**
**Range: see description**

Displays the distance traveled since on emission diagnostic trouble code cleared as miles or kilometers. The PCM stores this information in the Freeze Frame/Failure Records memory.

**MIN EGR COMMAND**
**MAX EGR COMMAND**
**Range: YES/NO**

Indicates whether the PCM is commanding the EGR vacuum solenoids to energize for C and K trucks with a 6.2L diesel engine. Maximum EGR is required at idle, while minimum EGR usually occurs under load.

**MIS PER CYCLE**
**Range: 0 to 200**

Displays a count of misfires detected. A current and a history misfire counter is maintained for each cylinder.

The misfire current counters, (Misfire Cur #1 - 8) indicate the number of firing events out of the last 200 cylinder firing events which were misfires. The misfire current counters displays real time data without a misfire DTC stored.

The misfire history counters (Misfire Hist #1 - 8) indicate the total number of cylinder firing events which were misfires. The misfire history counters displays 0 until the misfire diagnostic has failed and a DTC P0300 is set. Once the misfire DTC sets, the misfire history counters will be updated every 200 cylinder firing events.

**MISFIRE CYL**
**Range: ____________________ PRIM CYL 0-8, SEC CYL 0-8**

Displays the cylinder numbers of the primary (PRIM) and secondary (SEC) misfiring cylinders when a multiple misfire occurs. The most significant misfire displays in the primary parameter, the next most significant misfire is displayed by the secondary parameter.

**MISFIRE DATA**
**Range: ____________________ 0 to 255**

Displays the possible misfires being detected on each cylinder during the last 200 or 1000 revolutions of the crankshaft, depending on the vehicle selected. The counters may normally display some activity, but activity should be very low and equal for all cylinders.

**NOTE:**
This parameter range does not reflect the number of crankshaft revolutions.

**MISFIRE DELAY**
**Range: ____________________ 0 to 255**

Displays the number of engine cycles left before the misfire test is enabled. A value only displays if the misfire diagnostic is interrupted due to operation outside the conditions. DTC P0300 sets.

**MISFIRE ENABLED**
**Range: ____________________ YES/NO**

Indicates whether the misfire diagnostic monitor has been enabled, reads YES when enabled.

**MISFIRE HIST**
**Range: ____________________ 0 to 255**

Displays the total level of misfire detected on each cylinder. The misfire history counters do not update or show any activity until a misfire or DTC P0300 has become active. The misfire history counter updates every 200 cylinder firing events.

**MISFIRE HIST #1-4**
**Range: ____________________ 0 to 255 counts**

Displays the number of misfires that occurred after 195 current misfires have been counted.

The current misfire counter adds misfires to the history misfire counter after 195 total misfires have taken place.

- If 1 cylinder is misfiring, the misfiring current counter will have 195 misfires counted before adding to its history counter.
- If 2 cylinders are misfiring, the misfiring current counters adds to their history counters after 97 misfires. Count increments only after a misfire DTC has been set.

**MISFIRE INDEX**
**Range: ____________________ 0 to 100**

Displays the number of misfire tests performed by the PCM during 200 crankshaft revolutions.

**MISFIRE CYCLES**
**Range: ______________________________ 0 to 100**

Displays the number of engine cycles that were analyzed for misfire data. This parameter counts the misfire tests during 200 revolutions.

**MISFIRES/TEST**
**Range: ______________________________ 0 to 255**

Displays the total number of possible misfires during the last 200 crankshaft revolutions.

**MISS COOLANT(°)**
**Range: ______________________________ -40 to 151°C or -40 to 304°F**

Displays the engine coolant temperature (ECT) at the time a DTC P0300 set.

**MISFIRE CYL 1**
**MISFIRE CYL 2**
**MISFIRE CYL 3**
**MISFIRE CYL 4**
**MISFIRE CYL 5**
**MISFIRE CYL 6**
**MISFIRE CYL 7**
**MISFIRE CYL 8**
**Range: ______________________________ 0 to 255 counts**

Displays the number of possible misfires detected on each cylinder during the last 200 cylinder firing events. These readings normally display some activity, but the activity should be fairly equal for all cylinders.

**MISFIRE FAILS**
**MISFIRE PASSES**
**Range: ______________________________ 0 to 65535 counts**

Displays the number of crankshaft 200-revolution sample periods for which misfire diagnostics reported a failure or pass.

**MISS HISTORY 1**
**MISS HISTORY 2**
**MISS HISTORY 3**
**MISS HISTORY 4**
**MISS HISTORY 5**
**MISS HISTORY 6**
**MISS HISTORY 7**
**MISS HISTORY 8**
**Range: ______________________________ 0 to 65535 counts**

Displays the total level of misfires detected on each cylinder. These parameters do not update or show any activity until a misfire DTC (P0300) becomes active. These parameters update every 200 cylinder firing events.

**MISS LOAD(%)**
**Range: ______________________________ 0 to 100%**

Displays the engine load as a percentage at the time a diagnostic trouble code (DTC) P0300 set.

**MIS REV STAT**
**Range: ______________________________ variable**

Indicates whether all of the conditions have been met for the Misfire Diagnostic to begin.

**MODE SW SEL**
**Range: ______ see description**

Indicates the current status of the transfer case mode switch. Displayed values vary, possible readings are: Neutral/4WD HI/2WD/Auto 4WD/4WD Low/off.

**MODE SW SELECTD**
**Range: ______ ON/OFF**

Displays the position of the driver-operated automatic transfer case (ATC) mode switch.

**MODRT BRK APLY**
**Range: ______ ON/OFF**
**MODRT BRK APLY**
**Range: ______ YES/NO**

Displays the status of the moderate brake applied switch as determined by the control module. Reads YES/ON when the brake pedal is depressed, and NO/OFF when not depressed.

**MPG REQUEST KEY**
**MPG RESET KEY**
**Range: ______ YES/NO**

Displays the status of the fuel economy request and fuel economy reset switches on some Cadillac models. These switches may also be labeled Inst/Avg.

Read YES when the related switch is being pressed and NO at all other times.

**MPH GOVERNING**
**RPM GOVERNING**
**Range: ______ YES/NO**

Indicates whether the VCM is reducing fuel injection, and possibly retarding ignition timing and reducing spark advance on some 4.3L trucks with a VCM.

These parameters read as follows:

- YES only when active
- NO during normal operation

**MRE TWC TST DES**
**Range: ______ YES/NO**

Indicates whether another catalyst test is needed for a catalyst test decision.

MRE TWC TST DES reads YES if the PCM requires another test to determine if the catalyst is operating properly.

**MTR A/B BAT SHRT**
**Range: ______ YES/NO**

Indicates whether a fault was detected in the automatic transfer case shift motor control circuit.

**MTR A/B FLT**
**Range: ______ YES/NO**

No information is currently available for this parameter.

**MTR A/B GND SHRT**
**Range: ______ YES/NO**

Indicates whether the automatic transfer case shift motor control circuit is shorted to ground.

**MTR A/B OPEN**
**Range: ______ YES/NO**

Indicates whether an open was detected in the motor feed A or motor feed B circuits.

**MTR GND OPEN**
**Range: YES/NO**

No information is currently available for this parameter.

**MTR A/B OUTPUT**
**Range: ON/OFF**

No information is currently available for this parameter.

**N/V RATIO**
**Range: 0 to 255**

Displays the ratio of engine speed to vehicle speed. The variable should remain constant when operating in third and fourth gear with the torque converter clutch locked.

**ND WHL SPD**
**Range: 0 to 255 KPH or 0 to 158 MPH**

Displays the non-drive (ND) rear wheel speed as seen by the Electronic Brake Traction Control Module (EBTCM).

**NO. OF DRV CYCLES**
**Range: 0 to 50**

Displays the number of completed drive cycles. When a DTC sets, the counter is set to zero. If the DTC becomes history, the counter increments with each key cycle until another DTC is set, or until the key has been cycled at which time the DTC are erased.

**NO. OF FAIL MISF IN**
**Range: 0 to 255**

Displays the total number of cylinder firing events that the VCM determined as misfires during the last 200 crankshaft revolution sample.

**NO. OF MISFIRES**
**Range: 0 to 255**

Displays the total number of cylinder firing events detected as misfires during the last 200 crankshaft revolutions.

**NO. OF MISFIRES**
**Range: 0 to 65535**

Displays the number of failed misfire tests since a misfire DTC set.

**NO. OF NORMALS**
**Range: 0 to 65535**

Displays the total number of cylinder firing events that the VCM detected as being good since a misfire DTC set.

**NO. OF WARMUPS W/O**
**Range: 0 to 40**

Displays the number of warm-up cycles that occurred without an emission fault. The parameter counts to 40, then resets.

If an emission fault occurs, the counter resets to 0 and stays there until the fault is corrected. The counter also resets if information is cleared or if power to the PCM is interrupted.

**NO. OF WARMUPS W/O EMISSION FAULT**
**Range: 0 to 255**

Displays the number of warm up cycles without a detected emissions fault. The display increments to 255, then returns to 0 unless a fault occurs. If a fault occurs, 0 displays until the fault is corrected. Clearing codes or disconnecting PCM power resets the counter to 0.

**NO. OF WARMUPS W/O NON-EMISSION FAULT**
**Range: ______________________________ 0 to 255**

Displays the number of warm up cycles without a non-emission fault detected. The display increments to 255, then returns to 0 unless a fault occurs.

- 0 displays if a fault occurs and remains until the fault is corrected.
- Clearing codes or disconnecting PCM power resets the counter to 0.

**NON-EMISSION FLT**
**Range: ______________________________ 0 to 40**

Displays the number of warm up cycles without a non-emission fault. The display increments to 40, then resets to zero. It also resets if the PCM memory is cleared or power is interrupted. If a non-emission fault occurs, 0 displays until the fault is corrected.

**NON-VOLATILE MEM**
**Range: ______________________________ PASS/FAIL**

Indicates whether the PCM detects an error in its internal calibration program and reads as follows:

- PASS during normal operation
- FAIL only if the PCM detects a calibration error

**O2(mV)**
**O2S(mV)**
**O2S1(mV)**
**O2S2(mV)**
**LEFT O2(mV)**
**LEFT O2S(mV)**
**RIGHT O2(mV)**
**RIGHT O2S(mV)**
**Range: ______________________________ 0 to 1800**

Displays the oxygen sensor (O2S) signal in millivolts.

In compliance with SAE J1930, the exhaust gas oxygen sensor and related data parameters for 1993 models are referred to as O2S rather than O2. Data lists for 1992 and earlier models still use the term O2. For OBD-II equipped vehicles, O2S1 designates the pre-catalyst sensor, and O2S2 designates the post-catalyst sensor.

The O2S is the primary sensor that indicates whether the engine is running rich or lean. The O2S generates a signal that ranges from 0 V to 1 V or a little over 1 V (0 to 1000 mV).

- A high signal indicates a rich exhaust.
- A low signal indicates a lean exhaust.
- In normal operation, O2S voltage ranges from 100 to 1000 mV.

The O2S must be hot (above 500°F/260°C), and the PCM must be in closed loop before the PCM responds to the sensor signal.

The O2S voltage always displays in the center of the top line on the screen. Some V-type engines have separate oxygen sensors for the left and right cylinder banks. Voltage signals from these sensors display as the left and right O2S in the data list. A single O2S reading is not shown in the top line for these engines.

**O2 B1-S1(mV)**
**O2 B1-S2(mV)**
**O2 B1-S3(mV)**
**O2 B2-S1(mV)**
**O2 B2-S2(mV)**
**O2 B2-S3(mV)**
**Range: ____ 0 to 1106 mV**

Displays oxygen sensor (O2S) feedback signals to the VCM.

- B1 and B2 represent cylinder banks 1 and 2.
- S1, S2, and S3 represent sensors 1, 2, and 3.

The voltage fluctuates constantly between 10 mV and 1000 mV in closed loop.

**O2 B1&B2 READY**
**O2 B1-S1 READY**
**O2 B1-S2 READY**
**O2 B2-S1 READY**
**Range: ____ YES/NO**

Indicates whether the Heated Oxygen Sensor (HO2S) Monitor performed at least one test and reads as follows:

- YES if the vehicle is ready to display HO2S diagnostic trouble codes (DTCs) set by the Monitor during the last test.
- NO if another monitor needs to run.

**O2 B1-S1 STAT**
**O2 B1-S2 STAT**
**O2 B1-S3 STAT**
**O2 B2-S1 STAT**
**L/R SWITCH B1S1**
**L/R SWITCH B2S1**
**Range: ____ RICH/LEAN**

Displays the status of the oxygen sensors (O2S) in the catalyst monitor. Read as follows:

- RICH if O2S voltage is above bias voltage.
- LEAN if O2S voltage is below bias voltage.

There should be constant activity for the S1 and S2 (upstream) sensors, which indicates that the PCM is actively controlling the air-fuel mixture of the identified cylinder bank. Activity of the S3 sensors (downstream) should be much slower than that of the upstream sensors.

**O2 B2-S1 HTR(SEC)**
**Range: ____ 00:00 to 99:99**

Displays the time required to warm-up each HO2S. The HO2S warm up time is used for the HO2S heater test. The PCM runs the heater test only after a cold start (determined by engine coolant and intake air temperature at the time of startup) and only once during an ignition cycle.

When the engine is started the PCM monitors HO2S voltage. When the voltage indicates a sufficiently active sensor, the PCM looks at how much time has elapsed since startup. If the PCM determines that too much time was required for the HO2S to become active, a DTC sets. If the engine was warm when started, the value that was stored last time the test ran displays.

If PCM memory is cleared, 00:00 displays.

**O2 BIAS(V)**
**Range: ______________________________ range 0.420 to 0.480 mV**

Displays the bias voltage that the engine control module (ECM) applies to the heated oxygen sensor (HO2S) signal circuit.

**O2 CROSSCOUNTS**
**O2 CROSSCNTS-1**
**O2 CROSSCNTS-2**
**LEFT CROSSCNTS**
**RIGHT CROSSCNTS**
**LEAN/RICH TRANS**
**Range: ______________________________ 0 to 255**

Displays the number of times that the oxygen sensor (O2S) voltage signal crossed from the lean region, below 450 mV, to the rich region, above 450 mV. When the engine is warmed up and running in closed loop, the O2S voltage changes constantly. A counter in the PCM records the voltage changes from rich and lean as cross counts. The value displayed is the number of cross counts within the last second.

The reading indicates how well the O2S is responding to changes in fuel metering and exhaust oxygen content. These parameters do not indicate how well the O2s is performing. They show sensor voltage varies in response to exhaust oxygen content.

On some engines, the O2S may cool off at idle and the system may go to open loop. In this case, the O2S does not provide a variable voltage and the reading is zero. Run the engine at fast idle to warm the sensor, return to closed loop, and restore the display reading.

Some V-type engines use separate sensors in each of the cylinder banks. Two parameters, left and right or -1 and -2, display crosscounts for these engines.

This number resets to zero after it reaches its limit of 255.

**O2 HTR(AMP)**
**Range: ______________________________ 0 to 1300**

Displays the current draw of the H2OS 1 heater.

Typically, the heater current stabilizes at about 0.50 to 0.60 amp after operating temperature is reached. Initial current draw is higher.

**O2 READY**
**Range: ______________________________ YES/NO**

Displays the status of the oxygen sensor (O2S) on minimum-function (carbureted Chevette, Acadian, and T-1000) and some other vehicles. The O2S does not provide a constantly varying voltage on these systems.

O2 READY reads as follows:

- YES when the O2S is warm and the PCM can go into closed loop
- NO if the O2S is cold

When O2 READY reads NO, you should get the following other readings:

- OPEN/CLSD LOOP should be OPEN
- OPEN LOOP REGION should be 1, 2, 3, or 4

**O2 S1 READY**
**O2 S2 READY**
**Range: ______ YES/NO**

Displays oxygen sensor (O2S) status and reads NO (not ready) until the VCM has determined that the post HO2S is sufficiently warm for full operation.

**O2 SENSOR B1**
**O2 SENSOR B2**
**Range: ______ 0 to 1000 mV**

Displays the voltage activity of the heated oxygen sensor (HO2S) for banks 1 and 2.

**O2B1-S1(LAMBDA)**
**O2B2-21(LAMBDA)**
**Range: ______ 0.0 to 2.0 lambda**

Displays the Lambda output from the heated oxygen sensor (HO2S) to the control module.

A low reading indicates a rich exhaust; a high reading indicates a lean exhaust.

**O2B1-S1 HTR CMD**
**O2B1-S2 HTR CMD**
**O2B2-S1 HTR CMD**
**O2B2-S2 HTR CMD**
**Range: ______ YES/NO**

Displays the commanded state of the heater control circuits for oxygen sensors 1 and 2 on banks 1 and 2. They read as follows:

- YES when the sensor heater command is on
- NO when the sensor heater command is off

**O2S1 HTR(SEC)**
**O2S2 HTR(SEC)**
**O2S3 HTR(SEC)**
**Range: ______ 0:00 to 4:15**

Displays the time it takes before the heated oxygen sensor (HO2S) begins to transmit a variable voltage signal in seconds. An HO2S uses a heating element to reach operating temperature quickly. Once warm, the O2S signal voltage switches above and below bias voltage.

The time begins recording at startup, then stops once the PCM receives a reliable signal.

**O2S-1 HTR(AMP)**
**O2S-2 HTR(AMP)**
**Range: ______ 0 to 1.5 A**

Displays the current through the control module when the HO2S 1 and 2 heaters are commanded on. These parameters display a low current when the heater circuit resistance is high and a high current when the heater circuit resistance is low.

**ODM1 OVERTEMP**
**Range: ______ YES/NO**

Indicates whether the PCM is turning its output driver module off due to an overheat condition.

**ODOMETER(Mi)**
**Range: ______ 0 to 1677722**

Displays the actual vehicle mileage stored in the PCM.

**OIL LIFE(%)**
**Range: ____ 0 to 100%**

Displays the ECM calculated current oil life remaining as a percentage, which is based on mileage, driving conditions, temperature, and load conditions.

**OIL LIFE RESET**
**Range: ____ YES/NO**

The Fluid Life Indexes are calculated by the PCM. The PCM uses many engine parameters to determine the percentage of fluid life remaining for the engine oil and transaxle fluid. The fluid life indexes are stored in the non-volatile memory area of the PCM.

Reset life indexes using one of the following methods:

- KOEO, press the accelerator pedal to the floor three times within 5 seconds.
- Use the reset function on the Driver Information Center (DIC).
- Reset with the scan tool.

The DIC and accelerator methods only reset indexes to 100%. The scan tool resets engine life indexes in 10% increments.

**OIL PRESS(psi)**
**OIL PRESS(KPA)**
**Range: ____ 0 to 999**

Displays the PCM calculated engine oil pressure on some vehicles, such as Cadillac Allante and Corvette LT5. An oil pressure transducer provides a voltage signal to the PCM, the PCM calculates oil pressure from the voltage signal.

**OIL PRESS (V)**
**Range: ____ 0 to 5.0 V**

Displays the engine oil pressure as voltage.

**OIL TEMP(°C)**
**Range: ____ –40 to 199**
**OIL TEMP(°F)**
**Range: ____ –40 to 389**

Displays the PCM calculated engine oil temperature on vehicles that have an oil temperature sensor. The PCM calculates the oil temperature from the sensor voltage signal.

**OPEN/CLSD LOOP**
**LOOP STAT B1**
**LOOP STAT B2**
**Range: ____ OPEN/CLSD**

Indicates whether the engine, or one bank of cylinders, in open or closed loop.

These parameters read as follows:

- OPEN during warm-up
- CLSD once the engine reaches normal operating temperature

Some failure conditions, many associated with trouble codes, cause the PCM to return to open-loop operation. Additionally, some vehicles may normally return to open-loop operation at idle because the O2S cools off at idle.

To restore closed-loop operation, accelerate off idle to warm up the sensor. High ambient temperatures or towing heavy loads may also cause the PCM to return to open-loop operation to prevent catalytic converter damage.

**OPEN LOOP REGION**
**Range: 1 to 4**

Displays the current open-loop region on minimum-function systems (Chevette, Acadian, and T-1000 models). The system goes through four open-loop regions before entering closed loop.

**OUTPT DRV1 OPEN**
**Range: YES/NO**

Indicates whether the output driver module, which provides a ground circuit, has an open.

**OUTPT DRV1 SHORT**
**Range: YES/NO**

Indicates whether the output driver module, which provides a ground circuit, has a short.

**OUTPT DRV2 OPEN**
**Range: YES/NO**

Indicates whether the output driver module, which provides a ground circuit, has an open.

**OUTPT DRV2 SHORT**
**Range: YES/NO**

Indicates whether the output driver module, which provides a ground circuit, has a short.

**OUTPUT RPM**
**Range: 0 to engine max**

Displays the speed of the transmission output shaft.

**OUTSIDE(°C)**
**Range: –40° to +101°C**

Displays the ambient temperature outside the passenger compartment. The HVAC module sends this information to the PCM.

**OVERDRIVE**
**Range: YES/NO**

Displays the overdrive enabled status. On many vehicles, the PCM prevents the automatic transmission from going into overdrive until certain conditions are met. Reads YES when all requirements are met, NO when they are not.

**OVERSPEED LAMP**
**Range: ON/OFF**

Displays the PCM command to the engine overspeed governor and warning lamp on medium duty trucks. Reads OFF during normal operation. When the ECM recognizes that the engine RPM is too high, it turns ON a dash light and the parameter reads ON.

**P/N SWITCH**
**Range: P-N—/-R-DL**

Displays the status of the park/neutral switch. The display should read:

- P-N— if the transmission is in either park or neutral.
- -R-DL if the transmission is in any forward gear or reverse.

The park/neutral switch is a grounding switch that is closed in park or neutral and open in any forward gear or reverse.

**PASSKEY ENABLE**
**Range: YES/NO**

Indicates whether the PCM received the correct password from the Passlock module. A YES reading means that no failure has occurred and the PCM is enabling fuel.

**PASSKEY FUEL**
**Range: ______ ON/OFF**

Displays the input from the Pass-Key II module, which enables the injectors, and should read:

- ON under normal conditions
- OFF only if the passkey test failed, which may indicate that the fuel system is disabled

**PASSKEY INPUT**
**Range: ______ ON/OFF**

Indicates whether a fault was detected in the Passkey II system.

**PASSKEY 2(mS)**
**Range: ______ 0 to 85**

Displays the elapsed time in milliseconds from when the PCM receives a theft deterrent fuel enable signal until fuel is supplied.

**PCM/BCM COL LCK**
**Range: ______ PASS/FAIL**

Displays the status of the vehicle theft deterrent (VTD) system monitor. The PCM disables the fuel when a BCM DTC related to the VTD system is detected.

**PCM EEPROM**
**Range: ______ XXXX**

Displays the PCM indexes. When PCM power is disconnected these indexes remain in memory.

**PCM IN VTD FAIL**
**Range: ______ YES/NO**

Indicates whether the ECM received a good password from the passlock module, the vehicle has started, and a failure has occurred. The ECM continues to enable fuel.

**PCM RESET**
**Range: ______ YES/NO**

Indicates whether an internal PCM reset occurred.

**PCM RIDE CTRL**
**Range: ______ NORMAL/FIRM**

Displays the operating mode that the ride control is operating in for vehicle stability.

**PCM ROM PASS**
**Range: ______ YES/NO**

Displays the status of the internal PCM read only memory (ROM) test. A YES reading indicates:

- The diagnostic passed the last test.
- The diagnostic ran and passed during this ignition cycle.
- The diagnostic ran and passed since DTCs were last cleared.
- This test has not failed since DTCs were last cleared.

**PCS(%)**
**Range: ______ 0 to 100%**

Displays the commanded state of the pressure control (PC) solenoid as a duty cycle and reads:

- 0% when the solenoid is off
- 100% when the solenoid is fully energized

**PEDAL POS 1(V)**
**PEDAL POS 2(V)**
**PEDAL POS 3(V)**
**Range:** ______ **0.00 to 5.00 V**

Displays the throttle position sensor inputs used by the PCM to determine the throttle demand requested by the driver. Readings during normal operation should be as follows:

- PEDAL POS 1 — 0.35 to 0.95 V at idle, above 4.00 V at WOT
- PEDAL POS 2 — 4.50 V at idle, decreasing to 1.00 V at WOT
- PEDAL POS 3 — 4.00 V at idle, decreasing to 2.50 V at WOT

If the PCM detects a fault in a single sensor signal, a current and history code are set, and vehicle operation is unaffected. If the PCM detects faults in two sensor signals, a current and history code set, the Service Throttle Soon lamp turns on, and some engine performance is lost.

If the PCM detects faults in all three sensor signals, both a current and history code set, the warning lamp turns on, and the PCM only allows the vehicle to idle. If an intermittent fault occurs, the PCM only allows limited vehicle performance.

**PEDAL ROT(%)**
**Range:** ______ **0 to 100%**

Displays the amount of throttle opening as a percentage.

**PILOT INJ(°)**
**Range:** ______ **XXX°**

Displays the timing of the small injection of fuel before the main injection pulse.

**PIL INJ CMD(µS)**
**Range:** ______ **XXX µS**

Displays the commanded on time for the pilot injection pulse in microseconds.

**PILOT FUEL(mm3)**
**Range:** ______ **variable**

Displays the calculated amount of fuel in the pilot injection pulse.

**PLENUM VALVE**
**RESON. VALVE**
**Range:** ______ **OPEN/CLSD**

Displays the PCM command status of the multi-ram system valves—plenum switch-over valve and resonance switch-over valve—inside the intake plenum. This system increases engine efficiency at high and low speeds by modifying the intake air path within the intake runner.

These parameters read OPEN when the PCM is commanding the valve to open.

**PNP SWITCH**
**Range:** ______ **P-N--/-R-DL**

Displays the current state of the park/neutral position (PNP) switch and reads as follows:

- P-N-- with the gear selector lever in park or neutral
- -R-DL when in reverse or a forward gear

**PORT THROTTLES**
**Range:** ______ **OPEN/CLSD**

Displays the feedback signal from the secondary intake throttles in the cylinder head ports on the ZR1 Corvette LT5 engine and reads as follows:

- OPEN when the secondary throttles are open

- CLSD when the engine is operating on the primary intake runners

**NOTE:**
The “valet mode” must be deactivated, the engine must be warm, operating in closed loop, and operating with certain combinations of speed, throttle opening, and load before the primary intake runners open.

**PORT THROT REQU**
**Range: YES/NO**

Displays the PCM command to the secondary intake throttles in the cylinder head ports on the ZR1 Corvette LT5 engine and reads as follows:

- YES if the PCM is commanding the port throttles to open
- NO at idle

**NOTE:**
The engine must be warm, in closed loop, and operating with certain combinations of speed, throttle opening, and load before the port throttles open.

**POST HO2S RDY**
**Range: YES/NO**

Indicates whether the VCM has determined that the downstream HO2S is sufficiently warm for full feedback operation.

**POWER ENRICH**
**Range: YES/NO**

Indicates whether the PCM is commanding a rich mixture for high-power operation on some fuel-injected engines and reads as follows:

- YES if power enrichment is being applied—should be accompanied by an increased injector pulse width
- NO during idle, deceleration, and normal cruising

**POWER RELAY**
**Range: ON/OFF**

Displays the actual state of the power relay output circuit and reads ON when active.

**PRE HO2S RDY**
**Range: YES/NO**

Indicates whether the VCM has determined that the upstream HO2S is sufficiently warm for full feedback operation.

**PRESSURE(KPA)**
**Range: 10 to 105 kPa**
**PRESSURE(“Hg)**
**Range: 0 to 31.1 “Hg**

Displays the intake manifold vacuum on some Oldsmobile 5.0L engines as pressure. The MAP sensor is used as a vacuum sensor, interpret readings as if it were a vacuum gauge reading. Because the sensor is a MAP sensor, instead of an actual vacuum sensor, these readings are identified as pressure.

This value should be zero when the engine is off and the manifold is at atmospheric pressure. Vacuum readings increase on a running engine.

**Table 14-6** *Pressure/voltage conversion*

| Unit Of Measure | Voltage | | | | | | |
|---|---|---|---|---|---|---|---|
| | High | | | | | | Low |
| MAP (kPa) | 70 | 60 | 50 | 40 | 30 | 20 | 10 |
| MAP (inHg) | 21 | 18 | 15 | 12 | 9 | 6 | 3 |

Refer to "VACUUM(KPA)" on page 596 for more information.

**PRESSURE(V)**
**Range:** ________ **0 to 5.12 V**

Displays the intake manifold vacuum on some Oldsmobile 5.0L engines as voltage. Readings are based on the MAP sensor signal and follow the same principles as those for the Vacuum Voltage parameter.

Manifold vacuum is the intake manifold pressure below atmospheric pressure. Manifold vacuum and MAP are inversely related:

- Vacuum voltage is low when MAP is high.
- Vacuum voltage is high when MAP is low.

Refer to "VACUUM(V)" on page 597 for more information.

**PRGE DR OPN/SHT**
**Range:** ________ **YES/NO**

Indicates whether an open or short was detected in the output driver (ODM) for the purge control circuit. A YES reading indicates a circuit problem.

**PRIM MSFRNG CYL**
**Range:** ________ **variable**

Indicates the number of the cylinder with the most detected misfires. If no cylinders are misfiring, 0 displays.

**PRNDL SW**
**Range:** ________ **see description**

Displays the gear presently selected according to the PRNDL switch.

Readings for most models are LOW, 2ND, 3RD, 4TH, and P/N. On some vehicles, it may be D1, D2, D3, D4, NEUT, REV, and PARK. If the transmission is between gears or the switch sends an invalid signal, "????" displays.

**PROM ID**
**PROM 1 ID**
**PROM 2 ID**
**PCM PROM ID**
**Range:** ________ **0 to 99999**

Displays the identification numbers of the programmable read only memory (PROM) in the PCM. The PROM is a replaceable electronic device that contains the operating programs and calibration values for a specific vehicle, engine, and accessory combination. Service manuals for some late-model vehicles may refer to the PROM as the MEMCAL because it contains both memory and calibration functions.

Often, a PROM is revised, or there is a new PROM issued to cure a driveability problem or to improve operation. Also, the PROMs are interchangeable, so it is possible for the wrong PROM to be installed. Compare the displayed value to specifications to determine if the correct PROM is installed.

The numbered parameters display on the 1981–84 Cadillac V8/6/4 system and some other 1982 and earlier Cadillac DFI systems. The PCM parameter distinguishes the PCM from the body computer module (BCM) on some vehicles.

**PROPOR STEP**
**Range: ________ RICH/LEAN**

Displays the direction of the PCM fuel correction command on some port fuel-injected engines and reads as follows:

- LEAN if the command tends toward lean
- RICH if the command tends toward rich

**PS PRESS(KPA)**
**Range: ________ 0 to 9999 kPa**
**PS PRESS(psi)**
**Range: ________ 0 to 1450 psi**

Displays the calculated power steering system pressure. The PCM computes the displayed value based on the input voltage of a pressure sensor.

**PS PRESS(V)**
**Range: ________ 0 to 5.12 V**

Displays the direct voltage signal from the power steering pressure sensor on some models, such as the Cadillac Allante.

**PSP SWITCH**
**Range: ________ NORM/HIGH**

Displays the power steering system pressure as indicated by the power steering pressure (PSP) switch and reads as follows:

- NORM under normal conditions
- HIGH if high pressure is indicated

**PURGE BATT SHRT**
**Range: ________ YES/NO**

Indicates whether the EVAP purge solenoid control circuit is shorted to battery voltage and reads as follows:

- YES only if a short exists
- NO during normal operation

**PURGE LEAK PASS**
**Range: ________ YES/NO**

Displays the status of the EVAP diagnostic test and reads YES if the test completed.

**PURGE LEARN**
**Range: ________ 0.00 to 1.00**

Displays the purge learn memory, which is based on the EVAP purge. The number indicates whether fuel is being added or subtracted to the fuel trim by the PCM.

- Numbers near 1 indicate fuel is being added.
- Numbers near 0 indicate fuel is being subtracted.

**PURGE STAT**
**Range: ______________________________ fault/ok/invalid**

Displays the current status of the EVAP diagnostic routine.

**PWR UP VAC PASS**
**Range: ______________________________ YES/NO**

Displays the status of the weak vacuum test, which only runs if the loaded canister test does not pass. Insufficient vacuum in the EVAP system causes test failures.

PWR UP VAC PASS reads YES if the test ran and passed.

**QUAD DRIVER 1**
**QUAD DRIVER 2**
**QUAD DRIVER 3**
**QUAD DRIVER 4**
**Range: ______________________________ HI/LO**

Displays the status of the quad drivers. Quad drivers are the PCM output power devices that control solenoids, fuel injectors, and other high-current components. Each quad driver powers up to four circuits. How many quad driver parameters display varies by vehicle.

These parameters read as follows:

- LO when a quad driver and its related circuits are operating correctly
- HI if any circuit controlled by a quad driver is open or shorted

A HI reading does not necessarily mean the quad driver has failed. Check vehicle service manuals for more information on conditions that cause the parameter to read HI.

**QUAD DRIVER A**
**QUAD DRIVER B**
**Range: ______________________________ OK/FAULT**

Displays the state of QDM B output circuits. The monitored output circuits are the components connected to PCM.

These parameters normally read OK and read FAULT only if the circuit is open or grounded

**QDM 1 FAULT**
**QDM 2 FAULT**
**QDM 3 FAULT**
**QDM 4 FAULT**
**QDM A FAULT**
**QDM B FAULT**
**QDM C FAULT**
**QDM D FAULT**
**Range: ______________________________ YES/NO**

Indicates whether a quad driver module (QDM) fault occurred and read as follows:

- YES when a fault exists
- NO at all other times

A fault indicates that a QDM circuit is shorted or open. A YES reading does not necessarily mean the quad driver has failed. Check vehicle service manuals for more information on conditions that could cause the parameter to read YES.

**RCKR ARM PS SW**
**Range: ______ ON/OFF**

Displays the state of the intake rocker arm solenoid switch. When the intake rocker arm actuator solenoid is ON, engine oil should flow to the intake rocker arms and the rocker arm oil pressure switch. Oil pressure will turn on the intake rocker arm actuator oil pressure switch.

**RCKR ARM SOL**
**Range: ______ ON/OFF**

Displays the commanded state of the intake rocker arm actuator solenoid.

**R FUEL LEVEL (V)**
**Range: ______ 0 to 5.0 V**

Displays the fuel level in the right fuel tank as voltage and reads as follows:

- About 0.8 V = empty tank
- About 2.5 V = full tank

**R PROPSHAFT FLT**
**Range: ______ YES/NO**

No information is currently available for this parameter.

**R PROPSHFT(RPM)**
**Range: ______ variable**

Displays the rotational speed of the rear propshaft on models with an automatic transfer case.

**R SLIPPAGE(RPM)**
**Range: ______ variable**

Displays the total slippage of the rear propshaft on models with an automatic transfer case.

**R/L - L/R SNSR1**
**Range: ______ 0:1 to 15.93:1**

Displays the rich/lean to lean/rich ratio, which the PCM uses for internal calculations. The PCM divides the rich/lean average by the lean/rich average to determine the oxygen sensor ratio.

**R/L SWITCH B1S1**
**R/L SWITCH B2S1**
**Range: ______ 0 to 65535**

Displays the number of times HO2S voltage drops below the lean mean threshold.

**R/L TRN B1S1**
**R/L TRN B2S1**
**Range: ______ 0 to 3187.5**

Displays the time in milliseconds that it takes the HO2S voltage to change from the rich threshold to the lean threshold.

**REDUCED POWER**
**Range: ______ ACTIVE/INACTIVE**

Indicates whether the PCM is receiving a signal from the TAC module that a throttle actuator control system fault is occurring.

Reads as follows:

- ACTIVE if a fault occurs and the PCM limits the engine power
- INACTIVE under normal conditions

**REF LOW (V)**
**Range: ______ see description**

Displays the ignition ground circuit voltage. The PCM maintains a difference of about 2.5 V between ignition ground and PCM ground. This difference shows as 0 V on the display.

**REFERENCE PULSE**
**Range: ______ YES/NO**

Indicates whether a crankshaft position (CKP) sensor reference pulse has been detected by the VCM and reads as follows:

- YES under normal conditions
- NO if no pulse is detected

**REM TANK LVL(%)**
**Range: ______ 0 to 100%**

Displays the amount of fuel remaining in the fuel tank as a percentage.

**REQ TORQUE**
**Range: ______ 0 to 100%**

Displays the amount of torque that is requested by the PCM as a percentage.

**RESTART CLSD LP**
**Range: ______ ON/OFF**

Indicates whether the system has gone into closed loop and reads ON in closed loop.

**REV MIS INDEX**
**Range: ______ 0 to 65535**

Displays a count of crankshaft decelerations, which the PCM uses for misfire detection.

- Less than 1000 indicates an engine is operating without a misfire.
- Over 1000 indicates an engine misfire occurred.

**REV W/MISFIRE**
**Range: ______ 0 to 200**

Displays the number of misfires within 200 cycles.

**REVERSE ENABLE**
**Range: ______ YES/NO**

Indicates whether conditions are acceptable for reverse gear operation.

**REVERSE INHIBIT**
**Range: ______ ON/OFF**

Displays the status of the reverse inhibit solenoid and should read ON at speeds below 4 MPH (6 KPH), indicating the reverse inhibit solenoid is preventing reverse gear engagement.

**RICH/LEAN TRANS**
**Range: ______ 0 to 255**

Displays a count of the number of times oxygen sensor (O2S 1) voltage goes from high (rich exhaust) to low (lean exhaust) within a 100 second period.

The reading should incrementally increase when the vehicle is operating within the conditions for setting O2S DTCs.

**RICH/LN AVG(ms)**
**Range: ______ 0 to 249**

Displays the rich/lean average in milliseconds. The PCM takes the rich/lean transition value following the completion of the data collection period as specified in the conditions for setting DTC P0133 and DTC P1133. The PCM divides the value with the 100 second period.

**RIDE CTRL**
**Range: ______ normal/firm**

Displays the operating mode that the ride control is currently operating in for vehicle stability.

**RIDE OPEN/SHRT**
**Range: ______ YES/NO**

Indicates whether the ride control output driver (ODM) B output #1 circuit is open or shorted.

**RIDE OVER AMPS**
**Range: ______ YES/NO**

Indicates whether the electronic strut actuators or control circuit are drawing excess current, a YES reading indicates a short.

**RKE FEEDBACK**
**Range: ______ YES/NO**

Displays whether a feedback voltage from remote keyless entry (RKE) system power supply is being received and reads as follows:

- YES under normal conditions
- NO if a fault has been detected

**RO2 TIME TO ACT**
**Range: ______ 0:00 to 4:15**

Displays the time it takes for the oxygen sensor voltage to cross over the rich/lean threshold.

**RPM**
**Engine RPM**
**Range: ______ 0 to 10,000 rpm**

Displays the engine speed, which the PCM computes from the ignition reference pulses. Engine speed should remain close to desired idle under various engine loads with the engine idling.

**RPM AT MISFIRE**
**Range: ______ 0 to 9999 rpm**

Displays what the engine RPM was when DTC P0300, a misfire code, set.

**RPM LO RES**
**Range: ______ +60 to -30°**

Displays the deviation from the ideal camshaft timing in degrees.

A reading of zero indicates no deviation. That is, the camshaft is not advanced or retarded in relation to the crankshaft. The displayed value varies slightly under normal conditions, and it naturally increases as the timing belt or chain wears.

**SAFETY FUEL C/O**
**Range: ______ YES/NO**

Indicates whether the PCM has cut off fuel on some fuel-injected engines. Fuel may be cut for one of the following reasons:

- Low oil pressure
- Engine overspeed (rev limiter)

- Vehicle overspeed (speed limiter)

The display should read NO during normal operation and YES only when one of the above conditions exists.

**S/C IN PRS(V)**
**Range:** ______ **0.0 to 5.0 V**

Displays the boost pressure on a turbocharged or supercharged engine.

**S/C INLET(KPA)**
**S/C IN PRS(KPA)**
**Range:** ______ **0 to 83 kPa**

Displays the signal from a pressure sensor indicating boost pressure.

- At idle, boost pressure should be about the same as barometric pressure.
- At a full boost, the PCM may limit boost pressure to 60 to 83 kPa.
- At decel with a closed throttle, boost pressure should be low.

Boost pressure readings are opposite of what you would read with a vacuum gauge when manifold pressure is high and vacuum is low.

**SEC AIR SYS RDY**
**Range:** ______ **YES/NO**

Displays the status of the secondary air system diagnostic test and reads YES if the test has been performed at least once.

**SEC MISFIRNG CYL**
**Range:** ______ **variable**

Indicates which cylinder has the second most misfires, after the cylinder indicated in the primary misfiring cylinder parameter.

If no cylinders are misfiring, the reading is 0 (zero).

**SERVICE NOW LT**
**SERVICE SOON LT**
**Range:** ______ **ON/OFF**

Displays the output signals from the PCM to instrument panel lamps on some Cadillac models and reads ON when the corresponding panel lamp is illuminated.

**SEVERE KNOCK**
**Range:** ______ **YES/NO**

Indicates whether the PCM is able to eliminate engine knock by retarding spark timing on Saturn models only. Normally reads NO, reads YES only when the PCM is unable to control detonation.

The knock sensor cannot distinguish between spark knock and excessive engine noise. When the module cannot eliminate engine knock by retarding spark timing, the YES value displays. In most cases, severe knock is due to engine noise, rather than spark knock.

**SHIFT LIGHT**
**Range:** ______ **ON/OFF**

Displays the PCM command to the instrument panel lamp shift lamp on some models with a manual transmission. The PCM determines when to light the shift lamp based on vehicle speed and engine speed and load.

The ON value displays when the lamp is illuminated and OFF displays when the lamp is off.

**SHIFT SOL A**
**SHIFT SOL B**
**Range:** ____________ **ON/OFF**

Displays the status of the two solenoids used to activate the transmission shift valves. Solenoid A reads ON in first and fourth gear, and OFF in second and third. Solenoid B reads ON in first and second gear, and OFF in third and fourth.

**SHIFT TP(%)**
**Range:** ____________ **0 to 100%**

Displays the amount of throttle opening as a percentage.

**SINCE FIRST SET**
**SINCE LAST SET**
**Range:** ____________ **XXXX**

Displays the distance (miles or kilometers) accumulated since an emission diagnostic trouble code set. The PCM stores this mileage in the freeze frame and failure records memory.

**SKIPSHIFT ACTIVE**
**Range:** ____________ **YES/NO**

Displays the feedback signal that indicates the PCM sensed a shift out of first gear while skipshift is enabled on a Corvette with a 6-speed manual transmission.

**SKIPSHIFT ENABLED**
**Range:** ____________ **YES/NO**

Indicates whether skipshift is enabled on a Corvette with a 6-speed manual transmission.

The display reads YES when skipshift is enabled and NO if not.

The following three conditions must be met to enable the 1st-to-4th shift function:

- Coolant temperature above 120°F (49°C)
- Vehicle speed between 12 and 19 MPH (19 to 30 KPH)
- Throttle opening of 35% or less

The PCM activates solenoids to block the 2nd and 3rd shift gates for the transmission when conditions are met. The 1-to-4 indicator lamp should be on when YES displays.

**SKIPSHIFT LAMP**
**Range:** ____________ **ON/OFF**

Displays the PCM command to the 1-to-4 indicator lamp, which is used only on the Corvette with a 6-speed manual transmission.

Reads ON if the lamp is on and OFF if it is off.

**SLIP ADPT DC(%)**
**Range:** ____________ **0 to 100%**

Displays the commanded duty cycle applied to the automatic transfer case motor.

**SMALL LEAK PASS**
**WEAK VAC PASS**
**Range:** ____________ **YES/NO**

Displays the status of the evaporative emission system EVAP diagnostic test.

**SOFTWARE ID**
**Range:** ____________ **YES/NO**

Displays the current calibration ID number.

**SPARK ADV(°**
**Range: ______________ –90° to +90°**

Displays the total spark advance or retard, including base timing, commanded by the PCM.

**SPARK ADV(°)**
**SPARK MOD(°)**
**Range: ______________ -64 to +64°**

Displays the PCM commanded spark advance on the IC circuit in degrees. The PCM computes the desired spark advance based on engine coolant temperature (ECT), engine speed (RPM), engine load, and vehicle speed. The PCM adjusts the timing accordingly.

**SPARK CTRL ADV**
**Range: ______________ YES/NO**

Indicates whether the VCM is commanding spark advance.

**SPARK CTRL RET**
**Range: ______________ YES/NO**

Indicates whether the VCM is commanding spark retard.

**SPARK RET**
**Range: ______________ 0.0 to 90°**

Indicates the amount of spark retard the PCM is commanding to control detonation.

**SPEED DENSITY_NO**
**SPEED DENSITY_YES**
**Range: ______________ YES/NO**

Indicates whether the PCM is controlling timing and fuel delivery based on the speed density control mode.

**SRV ELEC SYS**
**Range: ______________ ON/OFF**

Indicates whether the BCM is commanding the Service Electrical System message to display on the DIC. This may be caused by under or overcharging of alternator.

**ST TRIM-1(%)**
**ST TRIM-2(%)**
**Range: ______________ –100 to 100%**

Displays short term fuel correction as a percentage. The short term fuel trim represents a short term correction to fuel delivery by the PCM in response to the amount of time the oxygen sensor (O2S) voltage spends above or below the 450 mV threshold.

If O2S voltage mainly remains below 450 mV, indicating a lean air-fuel mixture, short term fuel trim increases into the positive range (above 0%). The PCM adds fuel. If the O2S voltage stays mainly above the threshold, the short term fuel trim decreases below 0% into the negative range. The PCM reduces the fuel delivery in order to compensate for the indicated rich condition.

Under certain conditions, such as an extended idle and a high ambient temperature, the canister purge may cause the short term fuel trim to read in the negative range during normal operation. The fuel trim values at maximum authority may indicate an excessively rich or lean system.

**ST TRIM-1**
**ST TRIM-2**
**Range: ______________ 0 to 255 counts**

Displays the operation and short-term correction of the fuel-metering on a fuel-injected engine as an incremental count.

- A value below 128 indicates that O2S feedback shows a rich condition, so the vehicle control module (VCM) is commanding a lean mixture.
- A value above 128 indicates O2S feedback shows a lean condition, so the VCM is commanding a rich mixture.

The number designations in the parameter name indicate cylinder bank 1 and bank 2.

**ST TRM AVG1(%)**
**ST TRM AVG2(%)**
**Range: _______ –100 to 100%**

Displays the average of the short term fuel trim cells as a percentage. The short term fuel trim cells are rated for the amount of which they are used.

For example, the PCM rates an idle cell higher than a wide open cell. If a malfunction occurs in both the idle cell and the wide open cell, the idle cell would affect more than the wide open cell.

- A negative value significantly below 0% indicates that the fuel system is rich and the PCM is reducing the fuel delivery.
- A positive value significantly more than 0% indicates a lean condition exists and the PCM is compensating by adding fuel.

When the average of the cells reach a predetermined high or low, a fuel trim DTC sets.

**START CLNT**
**Range: _______ –39 to +140°C or –38 to +284°F**
**START CLNT(°C)**
**Range: _______ –40 to 199°C**
**START CLNT(°F)**
**Range: _______ –40 to 302°F**
**START COOLANT**
**Range: _______ –40 to 302°F**

Displays the engine coolant temperature (ECT) at start-up. Readings change every key cycle.

**START IAT(°)**
**Range: _______ –40 to 151°C or –40 to 304°F**

Displays the intake air temperature (IAT) at startup. It is used by the PCM to determine if the last startup was a cold start.

**START TWC STG1**
**START TWC STG2**
**Range: _______ 0 to 765°C or 32 to 1409°F**

Displays the PCM estimated catalytic converter temperature of the STG1 (bank 1) and STG2 (bank2) converters at start-up.

**STARTER INHIBIT**
**Range: _______ ON/OFF**

Indicates whether starter operation is inhibited and reads ON when engine start is prohibited.

The PCM has the ability to disable the starter operation if conditions inappropriate for starter operation exist. The PCM disables the starter if the engine is running, if a correct VTD password is not received from the VTD system, or if the vehicle operator attempts to engage the starter for an extended period of time.

**STARTER RELAY**
**STARTER RLY CMD**
**Range: _______ ON/OFF**

Displays the PCM commanded state of the starter relay control circuit.

**STOP LAMP SW**
**Range: ____ ON/OFF**

Displays the state of the stop lamp switch and reads as follows:

- ON when the brake pedal is pressed
- OFF when released

**STS LAMP**
**Range: ____ ON/OFF**

Displays the commanded state of the service throttle soon (STS) lamp.

**ST TRIM AVG**
**ST TRIM AVG B1**
**ST TRIM AVG B2**
**Range: ____ 0 to 255**

Displays the PCM calculated averages of the short-term fuel trim from all cells. Numbered parameters refer to the cells for each cylinder bank on a V-type engine.

- A value below 128 or a negative percentage indicates a lean condition, with injector pulse width being increased to compensate.
- A value above 128 or a positive percentage indicates a rich condition, with injector pulse width being decreased to compensate.

**SVC 4WD LAMP**
**Range: ____ ON/OFF**

Displays the commanded state of the Service 4WD Lamp.

**SVC LAMP QDM**
**Range: ____ PASS/FAIL**

Indicates whether an open or short exists on the output driver (ODM) of the 4WD service lamp. Reads FAIL only if a circuit problem exists, and PASS under normal conditions.

**TAC DIRECTION**
**Range: ____ CLSD/OPEN**

Displays the direction of the throttle blade commanded by the TAC system. The scan tool will display CLSD when the throttle is being commanded to the closed position. The scan tool will display OPEN when the throttle is commanded to an OPEN position.

**TAC FORCE IDLE**
**Range: ____ YES/NO**

Indicates whether the ECM has commanded the forced idle mode on. In this mode, the ECM limits engine speed to idle either by changing the throttle position, or by controlling the fuel and spark if the throttle is off and ignoring the accelerator pedal input.

**TAC FORCE STALL**
**Range: ____ YES/NO**

Indicates whether the ECM has entered limp home mode due to a TP sensor 1 circuit error.

When the display reads YES, the Reduced Power lamp turns on and the ECM either shuts off fuel or enters one of the two limp home modes (random injector disable with limited RPM) for the remainder of the ignition cycle even if the fault corrects itself.

**TAC LMT AUTH**
**Range: ____ YES/NO**

Indicates whether the ECM has entered limp home mode due to an accelerator pedal position (APP) sensor 1 or sensor 2 circuit fault.

If the display reads YES, the MIL turns on and the vehicle operates in one of two limp home modes (slow acceleration) for the rest of the ignition cycle even if the fault corrects itself.

**TAC LMT PWR**
**Range: ______ YES/NO**

Indicates whether the ECM is commanding limited engine power due to a throttle actuation control (TAC) failure relating to a TP sensor 1 circuit fault, a throttle actuator motor circuit fault, or a concern with the TP angle versus the TP desired angle.

**TAC MTR CMD(%)**
**Range: ______ 0 to 100**

Displays the required duty cycle to maintain a desired throttle position. The scan tool will display a higher value if more effort is required to move the throttle to the desired position, such as physical resistance. The scan tool will display a lower value if less effort is required to move the throttle to the desired position.

**TAC PWR INHB(V)**
**Range: ______ 0.0 to 24.3 V**

Displays the internal voltage of the TAC motor inhibit circuit.

- Normal circuit operation voltage is approximately 0.67 V.
- Most DTC setting TAC system failures cause the reading to default to 0.0 V.
- An open in the TAC module ground circuit can cause an inhibit circuit voltage of 0.96 V.

**TAC/PCM COMM FLT**
**Range: ______ OK/FLT**

Indicates whether communication between the TAC Module and the PCM is interrupted and reads as follows:

- OK under the normal operating conditions
- FLT if a failure is detected

**TAC BR SW APPLD**
**Range: ______ YES/NO**

Indicates the state of the brake switch and reads YES when the brake pedal is pressed.

**TACH CURRENT HI**
**Range: ______ YES/NO**

Indicates whether the TACH circuit is drawing too much current. Reads YES if current is high.

**TACH OPEN/SHRT**
**Range: ______ YES/NO**

Indicates whether the IPC 12 V supply circuit to the PCM TACH is open or shorted.

**TANK PRESS(mmHg)**
**Range: ______ –32.7 to +13.96 mm/Hg or –17.4 to +7.5 in H2O**

Displays the pressure or vacuum in the fuel tank:

- A negative value indicates a vacuum.
- A positive value indicates a pressure.

**TANK PRS(mmHg)**
**Range: ______ –32.0 to 16.8 mmHg**

Indicates the pressure in the fuel tank. A high reading indicates negative pressure. A low reading indicates positive pressure.

**TC DES TORQ(%)**
**Range: ______ 0 to 100%**

Displays the duty cycle of the EBCM requested torque signal. The reading indicates how much torque the EBCM is requesting the PCM to deliver.

TC DES TORQ(%) normally reads from 10% to 90%:

- 90% when traction control is not active
- About 10% when traction control is active

**TC SLIP IN CTRL**
**Range: ______ YES/NO**

No information is currently available for this parameter.

**TC SPARK IS 0**
**Range: ______ YES/NO**

No information is currently available for this parameter.

**TC TORQ REQ(%)**
**Range: ______ 0 to 100%**

Displays the amount of engine torque requested from the antilock brake system and traction control (ABS/TC) module.

**TCC APPLIED**
**TCC FORCED OFF**
**TCC SLIPPING**
**Range: ______ YES/NO**

Displays the state of the PCM commands to the TCC on trucks with a 4L80E transmission.

**TCC BRAKE SW**
**Range: ______ OPEN/CLSD**

Displays the state of the TCC/CC brake switch circuit input and reads as follows:

- OPEN = no voltage input (brake switch open, brake pedal applied)
- CLSD = a B+ voltage input (brake switch closed, brake pedal released)

TCC BRAKE SW should read OPEN only when the brakes are applied, which disengages the torque converter clutch and cruise control.

**TCC COMMAND**
**Range: ______ ENAB/DISAB**

Displays the command status to the torque converter clutch (TCC) enable solenoid and reads:

- ENAB (enable) when lockup is allowed
- DISAB (disabled) if lockup conditions are not met

**TCC COMMAND**
**VCC COMMAND**
**Range: ______ P1/P2**

Displays the state of the PCM signal to the torque converter clutch (TCC). A P1 reading indicates the initial PCM command, and P2 indicates the PCM command changed.

For TCC engagement, the PCM grounds one side of the circuit that energizes the TCC solenoid, which allows hydraulic engagement of the TCC. The circuit must also be completed by various other transmission, speed, and brake switches. This parameter indicates the PCM command has changed. It is not a feedback signal to indicate if the clutch actually engaged.

Cadillac refers to the torque converter clutch as the viscous converter clutch (VCC).

**TCC DUTY CYCLE**
**Range: ____________________ 0 to 100%**

Displays the TCC pressure control solenoid position on 4L60E and 4L80E transmissions, which is pulse-width modulated. Interpret as follows:

- 0% = no lockup
- 100% = full lockup

**TCC MODE**
**Range: ____________________ see description**

Displays the status of the torque converter clutch (TCC) pressure control solenoid and the TCC-enable solenoid on some models with a 4T60E transmission.

TCC MODE readings should change from OFF to ON, APPLIED, RELEASED, and back to OFF as the TCC cycles.

On Saturn vehicles, the current TCM command to the TCC displays. The display reads PWM when TCC operation is under pulse width modulated (PWM) control.

**TCC OPEN/SHRT**
**Range: ____________________ YES/NO**

Indicates whether the TCC PWM solenoid feedback circuit to the PCM is open or shorted and may display YES when the solenoid is commanded OFF and duty cycle is 0%.

**TCC SLIP(RPM)**
**Range: ____________________ 0 to engine max**

Displays the speed difference between the input and output vanes of the torque converter on 4L60E and 4L80E transmissions.

**TCC/CC BRAKE SW**
**Range: ____________________ OPEN/CLSD**

Displays the current state of the torque converter clutch (TCC)/cruise brake pedal switch. This is used for stop lamps and a redundant cruise control disengagement switch.

**TCS ACTIVE**
**Range: ____________________ YES/NO**
**TCS ACTIVE**
**Range: ____________________ ACTIVE/INACTIVE**

Displays the status of the traction control system (TCS) and read as follows:

- YES or ACTIVE when the TCS is operating
- NO or INACTIVE at all other times

**TDC OFFSET(°)**
**Range: ____________________ –4.00° to 4.00°**

Displays the amount of offset needed to bring the engine up to top dead center. It is used to calculate injection timing and delivery.

**THROT ANT DC(%)**
**Range: ____________________ 0 to 255**

No information is currently available for this parameter.

**THROT PLT IDLE**
**THR/PLT AT IDLE**
**Range:** ______ **YES/NO**

Indicates whether the throttle is closed (at idle) and reads YES if the throttle plate position indicated by the TP sensor 1 is less than 8% open; 7% is the limp home or rest position for idle speed. This is not the actual commanded position.

**THROT PLT WOT**
**Range:** ______ **YES/NO**

Indicates whether the throttle is wide open and reads YES if the throttle plate position indicated by TP sensor 1 is greater than 98% open. This is not the actual commanded position.

**THROTTLE(°)**
**Range:** ______ **–9.8 to 90.0°**
**THROTTLE(%)**
**TPS(%)**
**Range:** ______ **0 to 100%**

Displays the throttle opening as a percentage or degrees. These are PCM calculated values based on the throttle position (TP) sensor voltage.

Cadillac displays these values as degrees. A reading of 82 or more indicates wide open throttle. Closed-throttle readings vary due to idle speed control (ISC) motor position and throttle body adjustments.

All other vehicles display this parameter as a percentage. It is usually found on a vehicles with an autoranging TP sensor. The PCM resets the range in relation to actual TP sensor voltage as new minimum and maximum voltages are recorded. This value is used for determining transmission shift pattern and mainline pressure.

**THROTTLE SW**
**Range:** ______ **CLSD/OPEN**

Displays the position of the throttle switch inside the idle speed control (ISC) motor on some Cadillac models and reads as follows:

- CLSD when the throttle is closed and TPS should be less than 20°
- OPEN when the engine is off idle and TPS should be more than 20°

**TIME**
**Range:** ______ **hh:mm:ss**

Displays how long the engine has been operating in hours/minutes/seconds. When the ignition is cycled off, the value resets to zero.

**TORQUE**
**TORQ REQST(Nm)**
**Range:** ______ **0 to 9999 lb. ft. or 0 to 13556 Nm**

Displays the amount of torque requested by throttle angle and driving conditions.

**TP #1 ERROR**
**TP #2 ERROR**
**Range:** ______ **YES/NO**

Indicates whether the signal from throttle position (TP) sensor numbers 1 and 2 are out of the specified range and read YES only if an error is detected.

The sensor signal should be as follows:

- Below 1 V at closed throttle
- Above 3.5 V at full throttle

**TP 1&2 AGREE**
**TPS 1&2 AGREE**

**Range:** ______ **YES/NO**

Displays the results of a control module test that compares the signals from the throttle position (TP) sensors 1 and 2.

- YES indicates that TP sensors 1 and 2 voltages correspond to the same throttle position.
- NO indicates that TP sensors 1 and 2 voltages correspond to different throttle positions.

**TP LEARN ENABLE**

**Range:** ______ **YES/NO**

Displays the status of the throttle position learn system. If the system is in the mode to learn the throttle position, the reading is YES. The reading is NO if throttle position is not being learned.

**TP LEARNED**

**Range:** ______ **YES/NO**

Displays the status of the throttle position learn system. If the system has learned the throttle position, the reading is YES. The reading is NO if throttle position has not been learned.

**TP LRN REQUIRED**

**Range:** ______ **YES/NO**

Displays the status of the throttle position learn system. If the system has not learned the throttle position, the reading is YES. The reading is NO if the throttle position has already been learned or the system is currently learning the throttle position.

**TP SNR DISAGREE**

**Range:** ______ **YES/NO**

Indicates whether the two TP sensor signals agree with each other and reads as follows:

- YES If the two TP sensor signals are not in the proper relationship to each other
- NO under normal operating conditions

**TPS(V)**

**Range:** ______ **0 to 5.0 V**

Displays the throttle position (TP) sensor voltage input to the PCM.

**TPS 1(V)**
**TPS 2(V)**
**TP SENSOR(V)**

**Range:** ______ **0 to 5.0 V**

Displays the throttle position (TP) sensor voltage input to the PCM. The TP sensor produces a voltage signal that is in proportion to throttle opening.

These parameters should read low at closed throttle and high at wide open throttle. The full range of TP sensor voltage available to the PCM is about 0.0 to 5.1 V:

- 0.5 V = idle
- 4.5 V = full throttle

**TPS-1 MIN(%)**
**TPS-2 MIN(%)**

**Range:** ______ **variable**

Displays the absolute minimum voltage from TP sensors 1 and 2 that the ECM learned during a throttle body learn procedure. The ECM scales this voltage to the 0% value as long as it falls within a certain range.

**TPS1(%)**
**TPS2(%)**
**Range:** ______ **0 to 100%**

Displays the amount of throttle opening and reads as follows:

- 0% with a closed throttle
- 100% with a wide open throttle

**TPS1 LRN MIN(V)**
**TPS2 LRN MIN(V)**
**Range:** ______ **0 to 5**

Displays the learned minimum voltage for throttle position sensor 1 (TPS1) and throttle position sensor 2 (TPS2) as determined by the control module during the current ignition cycle.

**TP/SHFT DN REQ**
**Range:** ______ **YES/NO**

Displays the downshift request from the TAP Shift System and reads as follows:

- YES when the amount of voltage measured at the remote shift selector input is equivalent to the voltage defined as a downshift request
- NO when downshift is not currently requested

**TP/SHFT UP REQ**
**Range:** ______ **YES/NO**

Displays the upshift request from the TAP Shift System and displays as follows:

- YES when the amount of voltage measured at the remote shift selector input is equivalent to the voltage defined as an upshift request
- NO when upshift is not currently requested

**TPS ANGLE(%)**
**Range:** ______ **0 to 100%**

Displays the throttle angle calculated by the PCM based on the TP sensor voltage signal.

**TPS NORM(%)**
**Range:** ______ **0 to 100%**

Displays the PCM learned throttle position. The PCM compensates for carbon deposits in the throttle body by learning the closed throttle position as 0% and zero degrees.

**TPS OUT OF RNGE**
**Range:** ______ **YES/NO**

Indicates whether the PCM detects throttle position sensor voltage above 4 V at closed throttle or below 1.5 V at WOT. Reads YES if out of range and NO under normal operating conditions.

**TR SW (D)**
**TR SW (I)**
**TR SW (L)**
**TR SW (N)**
**TR SW (R)**
**Range:** ______ **HI/LO**

Displays the status of the inputs from the transmission range switch.

- HI indicates an ignition voltage input to the control module
- LO indicates a zero voltage input to the control module

**TRACTION CTRL**
**Range: ______ YES/NO**

Indicates whether the vehicle has a traction control system (TCS), reads YES if so equipped.

**TRAC CTRL STAT**
**TRACTION SIGNAL**
**TRAC CTRL SIG**
**Range: ______ ON/OFF**

Indicates whether the traction control system (TCS) is on. Reads ON when TCS is on.

**TRAC SPARK RET**
**Range: ______ YES/NO**

Indicates whether the PCM is retarding ignition spark to reduce engine torque for the traction control system. Reads YES when retarding spark, NO at all other times.

**TRANS FLUID(V)**
**Range: ______ 0 to 5.0 V**

Displays the input voltage signal of the transmission fluid temperature (TFT) sensor.

- High fluid temperature (304°F/151°C) produces a low signal voltage (0 V).
- Low fluid temperature (-40°F/C) produces high signal voltage (5.0 V).

**TRANS FWD RNG**
**Range: ______ HI/LO**

Displays the status of the four inputs from the transmission range switch.

- HI indicates an ignition voltage input to the control module
- LO indicates a zero voltage input to the control module

**TRIM CELL**
**Range: ______ -28 to 28**

Displays the fuel trim cell factor being used in the base pulse width equation.

**TWC B1&B2 READY**
**Range: ______ YES/NO**

Indicates whether the catalytic (CAT) monitor performed at least one test and reads as follows:

- YES if the vehicle is ready to display CAT diagnostic trouble codes (DTCs) that were set by the Monitor during the last test
- NO if another monitor is needed to display DTCs

**TWC DIAG ENABLE**
**Range: ______ YES/NO**

Displays the status the Three Way Converter (TWC) Monitor. The monitor does not run if a MAF, HO2S, ECT, or VSS diagnostic trouble code (DTC) is set.

The reading is YES if one or more of these DTCs set and the TWC Monitor test is prevented.

**TWC MONITOR**
**Range: ______ PASS/FAIL/NOT COMPLETE**

Displays the current status of the Catalyst diagnostic monitor.

**TWC PROTECT ACTV**
**Range: ______ YES/NO**

Displays the status of the control module control for catalytic converter protection. The reading is YES if the control module is adjusting fuel and ignition to protect the catalytic converter from damage. The reading is NO if the control module is in a normal fuel and ignition control mode.

**TWC SYS DTC SET**
**Range: YES/NO**

Indicates whether a diagnostic trouble code (DTC) set during the current Catalyst diagnostic monitor ignition cycle.

**TWC TEMP(°C)**
**TWC TEMP(°F)**
**TWC TMP CALC(°C)**
**TWC TMP CALC(°F)**
**Range: variable**

Displays the PCM calculated temperature of the catalytic converter, which can be used to determine if the catalyst monitor test has run.

**TWC TEST DONE**
**Range: YES/NO**

Indicates that at least one pass or fail test decision has been made during the idle catalyst test (P0420). It may take more than one test to obtain a pass or fail decision.

**TWC TEST ENABLD**
**Range: YES/NO**

Indicates whether the Idle Catalyst Test is enabled. There is a 5 second delay between the time TWC test initialization conditions are met and the test is enabled.

**TWC TST COND OK**
**TWC TST W/U OK**
**Range: YES/NO**

Indicates whether the idle (COND) or warm-up (W/U) conditions required to test the catalyst have been met. When both reading are YES, the catalyst is ready to test.

**UPSHFT LMP QDM**
**Range: PASS/FAIL**

Indicates whether an open or short circuit exists on the output driver (ODM) output for the upshift lamp. Reads PASS under normal conditions, and FAIL when there is a circuit fault.

**VAC DECAY(“H20)**
**Range: 0 to 9.18**
**EVAP DCY(“H20/s)**
**Range: variable**

Indicates how quickly vacuum dissipates from the EVAP system during a monitor test.

**VACUUM(KPA)**
**Range: 0 to 105 kPa**
**VACUUM(“Hg)**
**Range: 0 to 31.1 “Hg**

Displays the PCM calculated manifold vacuum based on the vacuum sensor voltage signal.

This value should be zero when the engine is off and the manifold is at atmospheric pressure. Vacuum readings increase on a running engine.

**Table 14-7** *Pressure/voltage conversion*

| Unit Of Measure | Voltage | | | | | | |
|---|---|---|---|---|---|---|---|
| | High | | | | | | Low |
| MAP (kPa) | 70 | 60 | 50 | 40 | 30 | 20 | 10 |
| MAP (inHg) | 21 | 18 | 15 | 12 | 9 | 6 | 3 |

Compare the vacuum voltage parameter and vacuum pressure parameter readings. Manifold vacuum is high when voltage is high, and low when voltage is low. If readings seem abnormal for the apparent engine load, the signal may be inaccurate or the PCM calculations may be incorrect. Negative pressure indicates a disconnected or defective sensor.

The ZR1 Corvette with an LT5 engine displays a separate parameter for vacuum in the secondary throttle ports.

**VACUUM(V)**

**Range: ______________________________ 0 to 5.12 V**

Displays the vacuum differential sensor signal, which is used on some carbureted engines instead of a manifold absolute pressure (MAP) sensor.

Manifold vacuum is the intake manifold pressure below atmospheric pressure. Manifold vacuum and MAP are inversely related:

- Vacuum voltage is low when MAP is high.
- Vacuum voltage is high when MAP is low.

The PCM uses vacuum sensor voltage to calculate manifold pressure, and, along with engine speed, to calculate engine load.

Carbureted 1988 and later Oldsmobile 5.0L (307-cid) engines have a MAP sensor instead of a vacuum sensor. The PCM inverts the voltage signal and it displays as if it were a vacuum sensor voltage. Refer to the explanation of the pressure parameter.

The ZR1 Corvette with a LT5 engine displays a separate parameter for vacuum in the secondary throttle ports.

**VAC BREAK SOL**

**Range: ______________________________ ON/OFF**

Displays the state of a solenoid that controls the vacuum applied to the rear vacuum break on some engines with a Quadrajet carburetor. This vacuum break holds the choke closed in the secondary barrels. This is the PCM command to the solenoid.

Reads as follows:

- OFF on a cold engine when the solenoid is de-energized, vacuum is applied, and the choke is closed
- ON as the engine starts to warm up and the solenoid is energized to cut off vacuum and allow the choke to open

**VALET MODE ACTV**

**Range: ______________________________ YES/NO**

Indicates whether the valet mode is active on the ZR1 Corvette with an LT5 engine.

When valet mode is active, the PCM prevents the secondary throttles from opening to limit engine power. This is a feedback signal indicating if the PCM activated the requested mode.

**VALET MODE REQ**

**Range: ______________________________ YES/NO**

Indicates whether the valet mode request on the ZR1 Corvette with an LT5 engine is active, this prevents secondary throttle opening to limit power.

**VALID P/N INFO**

**Range: ______________________________ YES/NO**

Displays the state of the transmission range selector as perceived by the ECM and reads YES when Park or Neutral is selected.

**VARIABLE TUNING**
**Range: ________________________________________________ ON/OFF**

Displays the status of the intake tuning valve on 1992 and later 4.3L truck engines with central port injection (CPI). The intake tuning valve is used to vary the intake air runner length.

**VAT FUEL CUTOFF**
**Range: ________________________________________________ YES/NO**

Indicates whether the vehicle antitheft system (VATS) has cut off, or inhibited, fuel delivery.

**VATS PROBLEM**
**Range: ________________________________________________ YES/NO**

Indicates whether a problem is detected in the vehicle antitheft system (VATS).

**VCC GROUNDED**
**Range: ________________________________________________ YES/NO**

This parameter is only used on vehicles that have VCC solenoid voltage available on pin F of the ALDL connector. It is not part of the serial data list and it does not appear in a recorded movie.

Reads as follows:

- YES = no voltage at pin F (the circuit is closed to ground)
- NO = high voltage at pin F (the circuit open)

If pin F is not present or is open, the parameter continuously reads YES.

A YES indicates the PCM grounded its side of the circuit; it does not indicate that the circuit is complete. The circuit is not complete until all other switches in series are closed. This parameter is useful to ensure the PCM is not at fault when the solenoid does not energize.

**VEH SPEED**
**Range: ______________________________________________ 0 to 98 MPH**

Displays vehicle speed as calculated by the ECM based on input pulses from the vehicle speed sensor (VSS). Use it to check TCC lock-up speed or speedometer accuracy.

**VENT BATT SHRT**
**Range: ________________________________________________ YES/NO**

Indicates whether the EVAP vent solenoid control circuit is shorted to battery voltage.

**VOTE**
**Range: __________________________________________________ 0 ±54**

Displays the rich or lean condition of the exhaust on a minimum-function system (Chevette, T 1000, or Acadian). The O2S for these models does not provide a variable voltage signal. These system indicates rich or lean conditions with a counting system called votes.

The vote count starts at zero and counts up and down to 54:

- Each time a rich exhaust signal is received, the counter adds a vote (+1).
- Each time a lean exhaust signal is received, the counter subtracts a vote (-1).
- The counter vote goes either up or down to 54, then resets to zero.
- +54 indicates a fully rich condition.
- -54 indicates a fully lean condition.
- 0 indicates an equal number of rich and lean votes over a given time.

Compare the vote reading to the MC dwell reading.

- A zero vote should equal a 30° MC dwell.

- A positive vote should produce a 30° to 60° MC dwell reading.
- A negative vote produces a 30° to 0° MC dwell reading.

The MC solenoid should always react opposite of the vote.

**VTD AUTO LRN**
**Range: ____ YES/NO**
**VTD AUTOLRN TMR**
**Range: ____ ON/OFF**

Indicates whether the vehicle theft deterrent (VTD) system is still in the learning mode. Reads YES or ON while learning and NO or OFF when it has timed out.

**VTD FAIL ENABLD**
**Range: ____ YES/NO**

Indicates whether the powertrain control module (PCM) received the correct password from the passlock module and a failure has occurred. The PCM continues to enable fuel.

**VTD FUEL**
**Range: ____ ON/OFF**

Indicates whether the vehicle theft deterrent (VTD) is preventing fuel delivery and reads:

- ON only if the ECM has not received the correct password from the passlock module and is disabling the fuel system
- OFF during normal operation

**VTD PASSWORD OK**
**Range: ____ YES/NO**

Indicates whether a valid vehicle theft deterrent (VTD) password was received.

**VTD PW LRN ACTV**
**Range: ____ YES/NO**

Indicates the status of the vehicle theft deterrent system password learn.

**WAIT TO START**
**Range: ____ ON/OFF**

Displays the commanded state of the wait to start lamp on diesel engines.

**WASTEGATE(%)**
**Range: ____ 0 to 100%**

Displays the wastegate operation as a duty cycle on some turbocharged fuel-injected engines. A PCM operated solenoid directs manifold pressure to the wastegate diaphragm. The solenoid cycles on and off at a fixed frequency, but the PCM varies the duty cycle of the signal.

The duty cycle percentage is directly proportional to wastegate opening and the amount of excess manifold pressure vented to the atmosphere. This parameter indicates the output command from the PCM to the control solenoid.

- When the reading is low, very little boost pressure is vented.
- When the reading is high, more boost pressure is vented.

**WATER IN FUEL**
**Range: ____ ON/OFF**

Displays the commanded state of the water in fuel lamp on diesel engines.

**WEAK CYL**
**Range: ______________________________________________________1 to 6 or NONE**

This PCM calculated parameter indicates a weak cylinder on some V6 engines. It is based on RPM variations between firing pulses and changes in manifold pressure or mass airflow.

**WIDE OPEN THROT**
**Range: ____________________________________________________________ YES/NO**

Indicates whether the throttle is wide open and reads YES at full throttle. The engine must be running for this parameter to change from NO to YES. With the key on and the engine off, a fully open throttle produces maximum TP sensor voltage, but this parameter reads NO.

**WOT AC DISABLED**
**Range: ____________________________________________________________ YES/NO**

Indicates whether the PCM is commanding the A/C compressor clutch relay off due to a wide open throttle (WOT) condition and reads as follows:

- YES when the PCM is commanding the relay off because throttle angle is above 90%
- NO at all other times

**WOT DIVERT**
**Range: ____________________________________________________________ YES/NO**

Indicates whether the PCM is commanding the air injection diverter solenoid off due to a wide open throttle (WOT) condition and reads as follows:

- YES if the solenoid is commanded off, which diverts air pump output to atmosphere to prevent converter overheating
- NO at all other times

**WOT SWITCH**
**Range: ____________________________________________________________ ON/OFF**

Displays the state of the wide open throttle (WOT) switch and reads as follows:

- ON if the throttle opening angle is 80% or more
- NO at all other times

**WSTGATE BYPASS**
**Range: ____________________________________________________________ YES/NO**

Displays the wastegate operation on some turbocharged fuel-injected engines. The PCM controls a solenoid that directs manifold pressure to the wastegate diaphragm. The solenoid opens when energized.

This is the output command from the PCM to the solenoid and reads as follows:

- YES when the solenoid is energized to open the line and vent excess pressure
- NO when the solenoid is off and the wastegate should be closed

# Instrument Panel Cluster (IPC) Parameters

This section defines data parameters that are available from the Instrument Panel Cluster (IPC) on General Motors vehicles.

**1 - 4 SHIFT LAMP**
**Range:** ____ **ON/OFF**

Indicates the manual transmission range state as determined by the ECM.

**4 WHEEL DRIVE/4WD**
**Range:** ____ **ON/OFF**

Displays the 4WD indicator state as commanded by the IPC.

**8 DIGIT PART NUMBER**
**Range:** ____ **variable**

Displays the GM part number of the IPC.

**ABS INPUT**
**Range:** ____ **ON/OFF**

Displays the backup ABS indicator signal state. The IPC uses the class 2 serial circuit in order to determine if the IPC loses communication with the electronic brake control module (EBCM).

**ABS LAMP**
**Range:** ____ **ON/OFF**

Displays the ABS indicator state, as commanded by the instrument panel cluster (IPC).

**ABS LAMP COMMAND**
**Range:** ____ **ON/OFF**

Displays the ABS telltale state, as commanded by the IPC.

**AIR BAG INDICATOR**
**Range:** ____ **ON/OFF**

Displays the air bag indicator state, as commanded by the SDM.

**AIR BAG LAMP**
**Range:** ____ **ON/OFF**

Displays the air bag lamp state, as commanded by the IPC. The IPC receives a class 2 message from the SDM.

# Transmission and Transfer Case Parameters

This section defines parameters available from the following:

- Transmission Control Module (TCM)
- The transmission data list from the Powertrain Control Module (PCM)
- The Transfer Case Shift Control Module (TCSCM) on vehicles equipped with an automatic AWD (All Wheel Drive) or an automatic 4WD (4 Wheel Drive) electronic control transfer case

  Some “Selectable” or “Electric shift” transfer case parameters definitions from the powertrain control module data lists may be found in this section.

**1ST GEAR**
**1ST GEAR-AT**
**1ST GEAR-MT**
**2ND GEAR**
**3RD GEAR**
**3RD GEAR-MT**
**4TH GEAR**
**4TH GEAR-AT**
**HIGH GEAR**
**Range: ____ P1/P2**

Displays various input signals to the PCM from switches on the transmission. For all these parameters, a displayed value of P1 indicates the initial state of the switch position, while P2 indicates the switch position has changed.

On some vehicles, all of these switches may not be installed, or they may be installed but not be connected at the transmission. However, the circuits to the PCM may be present. A gear switch parameter reads P1 at all times for an unconnected circuit.

**1-2 0% TPS(MPH)**
**1-2 100%TP(MPH)**
**Range: ____ 0 to vehicle max**

Displays the vehicle speed and throttle opening when a 1-2 upshift occurred as a percentage. The throttle position (TP) readings are in fixed increments that vary by 6 or 7%.

**1-2 ERROR(SEC)**
**Range: ____ –6.38 to +6.38 sec**

Displays the difference between the TCM desired and the actual 1-2 shift times. These readings are only accurate when the Adaptable Shift parameter reads YES. See “ADAPT SHIFT” on page 609 for more information.

**1-2 BATT SHORT**
**1-2 SOL BATT SHRT**
**2-3 BATT SHORT**
**3-2 BATT SHRT**
**Range: ____ YES/NO**

Indicates whether the vehicle control module (VCM) feedback signals from the 1-2, 2-3, and 3-2 shift solenoid valves are shorted to battery voltage.

These parameters read as follows:

- YES if a short is detected
- NO under normal operation

Readings are only valid when 1-2, 2-3, or 3-2 shift solenoids are on.

**1-2 ERROR(SEC)**
**2-3 ERROR(SEC)**
**3-4 ERROR(SEC)**
**Range: –3.20 to 3.18 sec**

Displays the difference between the desired shift time and the actual shift time. A negative number reflects a long shift time.

**1-2 GRND SHORT**
**2-3 GRND SHORT**
**Range: YES/NO**

Indicates whether the vehicle control module (VCM) feedback signals from the 1-2 or 2-3 shift solenoid valve are open or shorted to ground and read as follows:

- YES if a short is detected
- NO under normal operation

Readings are only valid when the 1-2 or 2-3 shift solenoids off.

**1-2 LO ADAPT**
**1-2 HI ADAPT**
**2-3 LO ADAPT**
**2-3 HI ADAPT**
**3-4 LO ADAPT**
**3-4 HI ADAPT**
**Range: YES/NO**

Indicates whether adaptive memory is active for the 2-3 and 3-4 upshift and downshift points of the transmission.

These parameters read as follows:

- YES when adaptive memory is active for the indicated shift
- NO at all other times

**1-2 OPEN/SHRT**
**Range: YES/NO**

Indicates if an open or short to ground exists in the 1-2 shift solenoid valve feedback signal to the PCM. The reading is valid only when the 1-2 shift solenoid valve is commanded off.

**1-2 SHIFT (SEC)**
**2-3 SHIFT (SEC)**
**3-4 SHIFT (SEC)**
**Range: 0 to 7.97 sec**

Indicates how long it takes for the transmission to automatically shift from 1st gear to 2nd gear, 2nd gear to 3rd gear, and 3rd gear to 4th gear in seconds.

**1-2 SHIFT(SEC)**
**2-3 SHIFT(SEC)**
**3-4 SHIFT(SEC)**
**DELAY TIME(SEC)**
**Range: 0 to 6.38 sec**

Displays the part of the adaptive report on vehicles with the 4T80E automatic transmission.

The 1-2, 2-3, and 3-4 SHIFT(SEC) parameters indicate the most recent shift times for each upshift. Shift time for these parameters begins when the PCM commands a shift and ends when it recognizes a ratio change.

DELAY TIME(SEC) is the differential in seconds it takes for a complete gear change to occur.

**1-2 SHIFT(mS)**
**Range: ________ 0 to 6.38 sec**

Displays the actual time of the most recent 1-2 shift, determined by the time elapsed from the commanded 1-2 shift to the RPM drop. It is accurate only if Adaptable Shift reads YES. See “ADAPT SHIFT” on page 609 for more information.

**1-2 SOL**
**1-2 SOLENOID**
**1-2 SOL FDBK**
**2-3 SOL**
**2-3 SOLENOID**
**2-3 SOL FDBK**
**Range: ________ ON/OFF**

The 1-2 and 2-3 solenoid (SOL) parameters are the PCM commanded valve state, and the feedback (FDBK) parameters indicate the actual valve state. As shown in Table 14-8, the solenoid ON and OFF states match certain gear positions. Check the factory manual for a chart for the specific transmission being serviced.

**Table 14-8** *SOL/SOLENOID and SOL FDBK parameter readings*

| GEAR | 1-2 Solenoid | 1-2 Feedback | 2-3 Solenoid | 2-3 Feedback |
|---|---|---|---|---|
| 1st | ON | ON | ON | ON |
| 2nd | OFF | OFF | ON | ON |
| 3rd | OFF | OFF | OFF | OFF |
| 4th | ON | ON | OFF | OFF |

**1-2 SOL CKT**
**2-3 SOL CKT**
**Range: ________ OPEN/CLSD**

Displays the PCM feedback from the 1-2 and 2-3 shift solenoids and read as follows:

- OPEN if the circuit is open
- CLSD if the circuit is closed

**1-2 SOL OPEN**
**Range: ________ ON/OFF**

Indicates whether the PCM feedback signal circuit from the 1-2 shift solenoid is open.

**1-2 SOL SHRT**
**Range: ________ ON/OFF**

Indicates whether the PCM feedback signal circuit from the 1-2 shift solenoid is shorted to battery voltage.

**1-2 TAP HI CELL**
**2-3 TAP HI CELL**
**3-4 TAP HI CELL**
**Range: ________ variable**

Indicates the amount of pressure added to the base transmission line pressure to adjust the holding effort of a clutch or a band during a 3-4, 2-3, or 1-2 shift with high shift torque.

**1-2 TAP LO CELL**
**2-3 TAP LO CELL**
**3-4 TAP LO CELL**
**Range: ______________________________ variable**

Indicates the pressure added to base transmission line pressure to adjust the holding effort of a clutch or band during a 3-4, 2-3, or 1-2 shift with low shift torque.

**1-2 WOT(RPM)**
**Range: ______________________________ 0 to 6553 RPM**

Displays the desired maximum engine speed during a 1-2 upshift at wide open throttle.

**1-2 WOT(MPH)**
**Range: ______________________________ –16 to +15 MPH**

Displays the MPH offset used to modify the 1-2 shift point at wide open throttle to achieve the desired 1-2 WOT RPM.

**2-1 SHIFT (SEC)**
**Range: ______________________________ 0 to 6.38 seconds**

Displays the actual time of the most recent 2-1 shift, determined by the time elapsed from the commanded shift to the gear ratio change.

**2-3 0% TPS(MPH)**
**2-3 100%TP(MPH)**
**Range: ______________________________ 0 to vehicle max**

Displays the vehicle speed and percent of throttle opening when the last 2-3 upshift occurred. Throttle position (TP) readings are fixed increments that vary by 6 or 7%.

**2-3 ERROR(SEC)**
**Range: ______________________________ –6.38 to +6.38 sec**

Displays the time difference between the desired and actual 2-3 shift times. It is accurate only if the adaptable shift parameter reads YES. See “ADAPT SHIFT” on page 609 for information.

**2-3 SOL OPEN**
**Range: ______________________________ ON/OFF**

Indicates whether the PCM feedback circuit from the 2-3 shift solenoid is open.

**2-3 SOL SHRT**
**Range: ______________________________ ON/OFF**

Indicates whether the PCM feedback circuit from the 2-3 shift solenoid is shorted.

**2-3 SHIFT(SEC)**
**Range: ______________________________0 to 6.38 sec**

Displays the actual time of the most recent 2-3 shift, determined by the time elapsed from the commanded shift to the actual RPM drop. It is accurate only if the adaptable shift parameter reads YES. See “ADAPT SHIFT” on page 609 for more information.

**25% TP TAP(psi)**
**31% TP TAP(psi)**
**38% TP TAP(psi)**
**44% TP TAP(psi)**
**50% TP TAP(psi)**
**56% TP TAP(psi)**
**63% TP TAP(psi)**
**69% TP TAP(psi)**
**75% TP TAP(psi)**
**81% TP TAP(psi)**
**88% TP TAP(psi)**
**94% TP TAP(psi)**

**Range: ______ –16.0 to 15.9**

Displays the additional pressure applied to baseline pressure at a specific throttle opening, or transmission adaptive pressure (TAP) to perform a gear change.

For example, when 25% TP TAP reads 15, that means the PCM is commanding 15 psi of TAP when the TP sensor is 25% open.

An automatic transmission uses hydraulic circuits to control the apply effort of the clutches or bands during shifting. Some transmissions are capable of adjusting this apply effort based on throttle opening.

**2ND GEAR START**

**Range: ______ YES/NO**

Indicates whether a 2nd gear start has been requested and reads YES when the PCM de-energizes the 1-2 shift solenoid and the vehicle starts off in 2nd gear for increased traction in slippery conditions (following gears will shift as normal).

Hard acceleration (full throttle) overrides the 2nd gear start and the vehicle starts off in 1st gear.

**2ND START LMP**

**Range: ______ YES/NO**

Indicates if the 2nd gear start selector switch is on. Reads ON if on and NO at all other times.

This switch enables the 2-3 shift solenoid and disables the 1-2 shift solenoid, and allows starting in second gear for better traction. Wide open throttle overrides the switch.

**2ND W/TCC**

**Range: ______ 0 to 876 kPa or 0 to 127 psi**

Displays the amount of pressure increase added to baseline transmission pressure to compensate for a worn or slipping component in second gear with the TCC applied.

**3-2 DOWNSHIFT**
**3-2 DWNSHFT SOL**

**Range: ______ YES/NO**

Displays the PCM command to the 3-2 shift solenoid, which changes states during a 3-2 downshift to regulate pressure.

**3-2 IN PROGRESS**

**Range: ______ YES/NO**

Indicates if the transmission is downshifting from 3rd to 2nd gear. Reads YES while shifting.

**3-2 OPEN/SHRT**
**Range: ______ YES/NO**

Indicates whether the PCM feedback signal circuit from the 3-2 shift solenoid is open or shorted. This parameter is only valid when the 3-2 solenoid is commanded off.

**3-2 PWM SOL(%)**
**Range: ______ 0 to 100%**

Displays the pulse width modulated (PWM) signal to the 3-2 control solenoid and reads:

- 0% when the valve is not energized
- 100% when the valve is fully energized

During normal operation, readings should fluctuate between 0% and 60%.

**3-2 SHIFT (SEC)**
**Range: ______ 0 to 6.38 sec**

Displays the actual time of the most recent 3-2 shift, determined by the time elapsed from the commanded shift to the time of the gear ratio change.

**3-2 SOL OPEN**
**Range: ______ ON/OFF**

Indicates whether the PCM feedback signal circuit from the 3-2 downshift solenoid is open or shorted to ground.

**3-2 SOLENOID**
**Range: ______ ON/OFF**

Indicates whether the 3-2 shift solenoid is on. The solenoid is on during a 3-2 downshift to regulate pressure.

**3-2 SOL SHRT**
**Range: ______ ON/OFF**

Indicates whether the PCM feedback signal circuit from the 3-2 downshift solenoid is shorted to battery voltage.

**3-2 STARTED**
**Range: ______ YES/NO**

Indicates if the commanded state of the 3-2 shift solenoid valve assembly. The commanded state is based on the transmission temperature. The solenoid changes states during a 3-2 downshift to regulate pressure.

The commanded state of the solenoid occurs at approximately 30 MPH (48 KPH) with an increase in throttle.

**3-4 ERROR(SEC)**
**Range: ______ –6.38 to +6.38 sec**

Displays the time difference in seconds between the PCM desired time and the actual time of a 3-4 shift. The value is only accurate if the adaptable shift parameter reads YES. See “ADAPT SHIFT” on page 609.

**3-4 SHIFT(SEC)**
**Range: ______ 0 to 6.38 sec**

Displays the actual time of the most recent 3-4 shift, determined by the time elapsed from the commanded 3-4 shift to RPM drop. It is accurate only if adaptable shift reads YES. See “ADAPT SHIFT” on page 609 for more information.

**4-3 DOWNSHIFT**
**Range: YES/NO**

Indicates whether the PCM recognized the 4-3 downshift and should unlock the torque converter clutch on some fuel-injected vehicles, particularly light trucks.

When 4-3 DOWNSHIFT reads YES, the TCC Command parameter should read OFF.

**4-3 SHIFT(SEC)**
**Range: 0 to 6.38 sec**

Displays the actual time of the most recent 4-3 shift, determined by the time elapsed from the commanded shift to the actual gear ratio change. A display of zero indicates that engine RPM equals output shaft RPM—the torque converter clutch is applied.

**4-5 SHIFT(SEC)**
**Range: 0.75 to 2.5**

Displays the actual time of the last adaptable 4-5 shift. The time is obtained by measuring the time required for the input shaft to decelerate from the previous ratio to the current ratio.

**4WD**
**Range: ON/OFF**

Indicates whether the vehicle is currently in a four-wheel drive mode.

**4WD ACTIVE**
**Range: YES/NO**

Displays the operating status of the 4WD system on models with a VCM and 4WAL or RWAL and reads as follows:

- YES when the VCM disables antilock braking
- NO under normal operating conditions

**4WD HIGH LAMP**
**Range: ON/OFF**

Indicates whether 4WD high range is selected and reads ON when the 4WD high switch is on. The indicator lamp on the dash should also be on.

**4WD HIGH SW**
**Range: YES/NO**

Indicates whether 4WD high range is selected and reads YES when the 4WD switch is on.

**4WD LOW**
**Range: ENAB/DISAB**

Displays the state of the four-wheel drive low circuit and reads as follows:

- ENAB (enabled) when 4WD low (0 voltage) is requested
- DISABL (disabled) at all other times (B+ voltage)

**4WD LOW ACTV**
**Range: YES/NO**

Indicates whether 4WD LOW is the current commanded mode in which the ATC is operating.

**4WD LOW SW**
**Range: ON/OFF**

Displays the position of the four-wheel drive low switch and reads ON when the switch is on.

**ABS SYS DISABLE**
**Range: YES/NO**

Indicates whether ABS is disabled and reads as follows:

- NO during normal operation
- YES if the PCM is not receiving input from the ABS, which also disables the AWD system

**A/C CLUTCH**
**Range: ______ ON/OFF**

Displays the feedback signal from the A/C compressor clutch and reads as follows:

- ON when the clutch is engaged
- OFF when disengaged

**A/C REQUEST**
**Range: ______ YES/NO**

Displays the position of the air conditioning switch on the instrument panel or the setting of the A/C request on the automatic climate control panel.

The value reads YES if the A/C switch has been turned on or the BCM has commanded the A/C system to turn on.

In some cases, the A/C compressor may not turn on even though the switch is closed. Several other switch or sensor signals may prevent the PCM from engaging the A/C compressor clutch. The request means the switch is closed or the PCM has been commanded to turn on the A/C when all other conditions permit.

Refer to the A/C Clutch parameter description for information on the feedback signal from the A/C compressor clutch.

**ADAPT CELL(psi)**
**1-2 LO(psi)**
**1-2 HI(psi)**
**2-3 LO(psi)**
**2-3 HI(psi)**
**Range: ______ –64 to 64 psi**

Displays the part of the adaptive report available on vehicles with a 4T80E automatic transmission. They indicate the “learned” amount of pressure added to baseline pressure to complete each upshift under low and high torque conditions.

**ADAPT SHIFT**
**Range: ______ YES/NO**

Indicates whether adaptive shift control is operating.

- YES indicates that operating conditions (TP sensor, engine torque, vehicle speed data, engine vacuum, shift delay, etc.) are all within the proper operating range during the last shift and the shift time was accurate. This shift information is then used through the adaptive function to update the adapt cells.
- NO indicates that not all of the operating conditions were met in order to enable this function and that the adapt cells were not updated.

**ADAPT SHIFT(psi)**
**Range: ______ –64 to +64 psi**

Displays the pressure increase over transmission baseline pressure the TCM is applying to adjust the holding effort of a clutch or band during a shift.

**A/F RATIO**
**Range: ______ 0 to 99.9**

Displays the desired air-fuel ratio during closed-loop operation on some fuel-injected vehicles. This is not a measured value, but the calculated value of the ratio that the PCM wants to be delivered based on sensor input signals.

Although the measurement range is from 0 to 99.9, the actual value should be near 14.7 in most cases. Lower numbers indicate a rich ratio commanded for startup. Higher numbers indicate a leaner ratio.

**AIRFLOW(gm/Sec)**
**Range: ____________________________________________ 0 to 255**

Displays the engine intake airflow. Some engines display both a MAF and an Airflow parameter. When the MAF sensor is working correctly, both readings are the same.

If the MAF sensor fails, it should set a code 33 or 34. In this case, the PCM substitutes a calculated, or default, value for mass airflow based on the signals from several other sensors. The MAF reading is the default value, so the faulty MAF sensor value displays.

**APP AVG**
**Range: ____________________________________________ 0 to 255**

Displays the accelerator pedal position (APP) as step counts. The throttle actuator control (TAC) module calculates an average after sampling signals from the three APP sensors. The TAC converts this average into the step count displayed.

**APP(%)**
**Range: ____________________________________________ 0 to 100%**

Displays the accelerator pedal position (APP) as an average. This parameter is PCM calculated from APP sensor voltages and reads as follows:

- 0% = idle
- 100% = wide open throttle (WOT)

**APP1(V)**
**APP2(V)**
**APP3(V)**
**Range: ____________________________________________ see description**

Displays the accelerator pedal position (APP) sensor signals, which the PCM uses to control fuel delivery as requested by the driver. An APP sensor module is located at the base of the accelerator pedal. During normal operation, the PCM only uses the APP1 sensor input, the other two serve as fail safe sensors.

These parameters normally read as follows:

- APP1 — 0.35 to 0.95 V at idle, 4.00 to 5.00 at WOT.
- APP2 — About 4.50 V at idle and steadily decrease to about 1.00 V at WOT.
- APP3 — About 4.00 V at idle and steadily decrease to about 2.5 V at WOT.

**APP INDICATED(%)**
**Range: ____________________________________________ 0 to 100%**

Displays the position of the accelerator pedal.

- 0% indicates that the accelerator pedal is fully released
- 100% indicates that the accelerator is fully pressed

The value indicated may not correspond to the TP angle value.

**ATC EEPROM**
**Range: ____________________________________________ 0 to 99999**

Displays identification numbers of the electronic erasable programmable read only memory (EEPROM) in the Automatic Transfer Case shift control module. The EEPROM is a re-programmable electronic device that contains the operating software and calibration values for a specific vehicle, engine, transmission, transfer case and accessory combination.

Often, an EEPROM may be re-programmed by the manufacturer or the dealership when a control module is replaced, if there is new software issued to cure a driveability problem or to improve operation.

**AUTO 4WD LAMP**

**Range: ______ ON/OFF**

Indicates whether the Auto 4WD indicator light is being commanded on by the transfer case shift control module.

**AWD CKT STATUS**

**Range: ______ OK/OPEN/SHORT**

Displays the status of the PWM signal line to the AWD solenoid. The PCM can detect a short to ground, a short to power, or an open in the PCM line signal. The AWD disable lamp will be illuminated for a short or open condition.

**AWD CLT TMP DSBL**

**Range: ______ YES/NO**

Displays the status of the powertrain software that has the ability to disable the AWD based on the rear drive module clutch slip/time calculation.

If the software determines that a clutch over temperature condition exists, the PCM deactivates the AWD system by disabling the PWM signal line to the AWD solenoid. The AWD system is enabled again when the software calculates that clutch temperature has dropped sufficiently.

The AWD disable lamp should be lit when the display reads YES.

**AWD DISABLED**

**Range: ______ YES/NO**

Indicates whether the AWD system has been disabled by the PCM. The AWD disabled lamp is lit when AWD DISABLED reads YES.

**AWD DUTY(%)**

**Range: ______ 0 to 100%**

Displays the commanded duty cycle of the AWD solenoid.

- At vehicle start-up, duty cycle should be at 75–90% for 3 seconds (“pull-in” duty cycle).
- After 3 seconds, the duty cycle should drop to 20–30% for 30 seconds (“hold-in” duty cycle).
- After each 30-second hold-in period, the duty cycle increases to 75–90% for a ½ second before returning to the hold-in duty cycle. This is to assure solenoid pull-in.

**AWD INDCTR LMP**

**Range: ______ ON/OFF**

Indicates whether the Auto AWD indicator light is being commanded on by the transfer case shift control module.

**AWD TORQ MGMT**

**Range: ______ ON/OFF**

Indicates whether torque management is being performed to protect the AWD system and reads ON when torque management is active.

**AWD VOLTS DISAB**

**Range: ______ YES/NO**

Indicates whether the ignition voltage to the AWD solenoid is in the proper range. The ignition voltage range to the AWD solenoid is 9.0 to 16.0 V. The PCM deactivates the AWD system by disabling the PWM signal line to the AWD solenoid if the voltage is out of range. The AWD disable lamp is lit when AWD VOLTS DISAB reads YES.

**BARO(“Hg)**
**Range: ______ 0 to 37.0 “Hg**

Displays the PCM calculated barometric pressure reading from the BARO sensor voltage signal.

BARO(“Hg) reads as follows:

- About 100 kPa (29.6 inHg) at sea level
- About 60 kPa (17.8 inHg) at 14,000 feet

Compare the BARO voltage and pressure parameter readings. Voltage should be high when pressure is high, low when pressure is low. If either, or both, of the readings appears abnormal for the expected local barometric pressure, the sensor signal to the PCM is inaccurate or the PCM calculations are incorrect for some reason.

**BARO(V)**
**Range: ______ 0 to 5.12 V**

Displays the voltage signal from the barometric pressure (BARO) sensor, which varies directly with atmospheric (barometric) pressure. Voltage should be high when barometric pressure is near atmospheric pressure at sea level, and it should drop as barometric pressure drops.

Some systems do not have a BARO sensor, but the PCM provides a BARO reading by sampling the MAP sensor reading with the key on and engine off, just before cranking. At this point, manifold pressure should equal, or be very close to, atmospheric pressure. The PCM also updates these BARO estimates when the engine is running by sampling MAP voltage when the engine is at wide open throttle.

**BATTERY(V)**
**Range: ______ 11.5 to 14.5 V**

Displays the battery voltage as monitored by the TCM.

The TCM safely operates when battery voltage is between 8.5 and 19.5 V. If voltage is outside limits, the TCM sets a code, shifts into second gear, disables torque converter clutch (TCC) operation, and establishes maximum line pressure.

**BRAKE REQUEST**
**Range: ______ YES/NO**

Displays the status of the brake pedal switch and reads as follows:

- YES when the brake pedal is pressed
- NO at all other times

**BRAKE STAT INV**
**Range: ______ ENAB/DISA**

Displays the status of the brake pedal switch and reads as follows:

- ENAB (enabled) during normal operation
- DISA (disabled) when the brake pedal is pressed

**BRAKE SW**
**Range: ______ OPEN/CLSD**

Displays the status of the brake pedal switch and reads as follows:

- CLSD (closed) when the brake pedal is pressed
- OPEN at all other times

**CALIB P/N**
**Range: ______ 0 to 99999**

Displays the alphanumeric value indicating the numbers or characters assigned to the current version of software used in the transfer case shift control module.

The calibration identification number is a specific set of values that have been defined by the manufacturer. These values modify the base programming in a module for a specific vehicle, engine, transmission, transfer case and accessory combination.

**CC BRAKE SW**
**Range: ______ OPEN/CLSD**

Displays the status of the cruise control (CC) contacts of the brake switch. The PCM uses this signal for cruise control and torque converter clutch operation.

CC BRAKE SW reads as follows:

- CLSD (closed) when the brake pedal is pressed
- OPEN at all other times

This parameter is not active unless the cruise control is turned on.

**CC ENABLED**
**Range: ______ YES/NO**

Indicates whether the PCM has enabled cruise control (CC) system operation and reads YES only when the cruise control switch is turned on and the brake pedal is released.

**CC ENGAGED**
**Range: ______ YES/NO**

Displays the status of the cruise control system and reads as follows:

- YES if cruise control is controlling vehicle speed
- NO when cruise control is turned off or disengaged because of acceleration or braking

**CLUTCH FILL(mS)**
**CLU FILL 2ND LO**
**CLU FILL 2ND HI**
**CLU FILL 3RD LO**
**CLU FILL 3RD HI**
**CLU FILL 4TH LO**
**CLU FILL 4TH HI**
**Range: ______ –128 to 512 mS**

Displays the clutch fill times under low and high torque conditions, which determines clutch wear. These parameters are part of the adaptive report on Saturn transmissions. Values are “learned” only during upshifts, but are also used for downshifts. As clutches wear, clutch fill times increase.

**CLU FILL ERROR**
**Range: ______ see description**

Indicates whether the clutch applied during the last adaptive shift was underfilled or overfilled. This parameter is part of the adaptive report available on Saturn automatic transmissions and reads as follows:

- 128 = normal
- Below 128 = overfill
- Above 128 = underfill

**CLU PRIOR ACT**
**Range:** ____ **YES/NO**

Indicates whether the clutch priority valve interrupted a shift. This parameter is a part of the adaptive report available on Saturn automatic transmissions. The priority valve prevents two gears from being applied at the same time, and also disables TCC operation.

Reads as follows:

- YES if the priority valve interrupted the last shift
- NO at all other times

**CLUTCH LEARND ADAPT**
**LEARNED 2ND**
**LEARNED 3RD**
**LEARNED 4TH**
**Range:** ____ **YES/NO**

Indicates whether clutch learning took place in the adaptive mode and are part of the adaptive report available on Saturn automatic transmissions.

These parameters read YES when the designated clutch has learned in the adaptive mode.

**CLUTCH SLIP RPM**
**Range:** ____ **0 to 255**

Displays the TCM calculated value that represents slippage across the presently applied clutch. The TCM uses vehicle speed sensor (VSS), turbine speed sensor, and current gear ratio data to calculate clutch slippage.

A reading of 124 to 132 indicates there is no clutch slippage.

**CMD LINE(KPA)**
**Range:** ____ **396 to 1530 kPa**
**CMD LINE("Hg)**
**Range:** ____ **117 to 452.7 "Hg**

Displays the amount of line pressure that the TCM is currently commanding. This value varies slightly when compared to an actual pressure gauge reading.

**COLD SHFT PTTRN**
**Range:** ____ **ENAB/DISA**

Indicates whether the transmission is operating under a cold shift strategy and reads as follows:

- ENAB (enabled) when in cold shift strategy
- DISA (disabled) at all other times

**COMPLETE SHIFT**
**Range:** ____ **YES/NO**

Indicates whether a shift completed and reads as follows:

- YES when a shift has been completed and remains YES until the next shift begins
- NO during a shift

**COMMAND GEAR**
**Range:** ____ **see description**

Displays the PCM commanded gear on 4T60E transmissions. The PCM uses two shift solenoids to change forward gear ranges when the selector is in D-4 (overdrive).

On all models except Saturn, the readings are: NONE, 1ST, 2ND, 3RD, and 4TH. For Saturn, the readings are: LOW, 2ND, 3RD, 4TH, NEUT, and REV. The display is "????" between gears or if the signal is invalid.

**CONVERTER(°)**
**Range: 0 to 765°C or 32 to 1409°F**

Displays the temperature of the 3-way catalyst as calculated by the PCM.

**COOLANT(V)**
**Range: 0 to 5.00 V**

Displays the voltage signal of the engine coolant temperature (ECT) sensor to the vehicle control module (VCM). The ECT is a thermistor that transmits a variable voltage signal to the VCM.

On a cold engine, voltage is high, and decreases as the engine warms up.

**COOLANT**
**Range: –40 to 151°C or –40 to 304°F**

Displays the engine coolant temperature (ECT) in degrees based on the ECT sensor signal.

The ECT sensor is a thermistor in the intake manifold that transmits a variable voltage signal to the PCM, the PCM converts ECT voltage to temperature readings:

- 185 to 220°F (85 to 105°C) indicates a fully warmed engine running at idle.
- -40° C or -40° F may indicate an open in the sensor or the sensor circuit.
- Above 366°F (185°C) may indicate a short in the sensor or the sensor circuit.

On several engines, GM uses a shunted ECT sensor. At about 122°F (50°C), the PCM shunts the 5 V reference voltage applied to the ECT sensor past part of the internal resistance provided by the PCM. This causes the voltage signal from the sensor to jump abruptly from about 1.0 V to about 3.7 V. This change is seen if the ECT voltage is measured directly with a voltmeter as the engine warms up. This is a normal condition for this type of sensor and does not affect readings.

**CRUISE ENABLED**
**Range: YES/NO**

Displays the commanded state of the cruise control system.

- YES indicates that the PCM is allowing cruise control operation.
- NO indicates that the PCM has disabled cruise control operation.

When “YES” is displayed, shift patterns will be altered for 2-3 and 3-4 or 4-3 and 3-2 shifts.

**CRUISE SW**
**Range: ON/OFF**

Indicates whether the cruise switch, located on the turn signal lever, is turned on or off.

**CURRENT GEAR**
**Range: LOW/2ND/3RD/4TH/NEUT/REV/PARK**

Displays the current operating gear.

**CURRENT GEAR**
**Range: 1 to 5**

Displays the current commanded state of the shift solenoids.

**CURRNT TAP CELL**
**Range: 4 to 16**

Displays the current torque cell that is being used for fluid line pressure adaptation.

**DESIRED IDLE**
**Range: 0 to engine max**

Displays the idle speed the PCM is trying to maintain. On some vehicles, the parameter does not become active until the engine has run for 5 seconds.

If there is a large difference between actual idle and desired idle RPM readings, the PCM may have reached its control limit without being able to control the idle speed. Suspect a basic mechanical or electrical problem with the engine.

**DESIRED TP(%)**
**Range: ________ 0 to 100%**

Displays the desired throttle angle the PCM is trying to maintain. The readings for desired and actual throttle angle should be equal, or very close to each other.

**DES EGR(%)**
**Range: ________ 0 to 100%**

Displays the percent of EGR needed for certain operating conditions based on an internal PCM calculation. It displays on some late-model vehicles.

When the engine control system is operating correctly, the desired EGR and the EGR duty cycle parameter readings should be close to equal. See “EGR DUTY(%)” on page 531.

**DES MOTOR AMP**
**FORCE MOTR AMP**
**Range: ________ 0 to 5.00 A**

Displays the desired force motor amperage the TCM is trying to maintain, which is calculated by the TCM. The force motor drives a valve-actuated pressure regulator to control mainline pressure. The TCM monitors actual current across the motor coil.

The force motor is designed to operate in a 0.1 to 1.1 amp range. If actual current varies more than 0.16 amp, a code sets.

**DES PCS AMP**
**PRESS CTRL AMP**
**Range: ________ 0 to 1.10 A**

Indicates the desired (DES) amperage that the TCM is attempting to maintain to the pressure control solenoid (PCS), and the PCS feedback (CTRL) signal to the PCM. The feedback signal indicates actual PCS circuit current.

The reading for both parameters should be close to equal:

- 0 amps = high line pressure
- 1.10 amps = low line pressure

**DES TORQUE**
**Range: ________ 0 to 100%**

Displays the level of desired torque requested from the EBTCM by the PCM when reduced torque is desired to prevent wheel slip during acceleration.

**DN PRESS ERROR**
**Range: ________ see description**

Displays a count that indicates if the oncoming clutch was underpressured or overpressured during a downshift. This parameter is a part of the adaptive report on Saturn transmissions.

Reads as follows:

- 128 = normal
- Below 128 = overpressure
- Above 128 = underpressure

**DNSHFT IN PROG**
**Range: ____ YES/NO**

Indicates whether the transmission is downshifting and reads as follows:

- YES when downshifting
- NO at all other times

**DNSHIFT CANCEL**
**Range: ____ YES/NO**

Indicates whether a downshift is initiated but cancelled before completion. This parameter is part of the adaptive report on Saturn transmissions.

**DOWNSHIFT DES**
**Range: ____ YES/NO**

Indicates if downshift conditions are present and the VCM/PCM sent a downshift command.

**DOWNSHIFT REQ**
**Range: ____ YES/NO**

Indicates if the VCM/PCM sent a downshift command, but the shift has not started.

**DRIVER 1 STAT**
**DRIVER 2 STAT**
**DRIVER 3 STAT**
**DRIVER 4 STAT**
**Range: ____ enabled, off-hi volts, off-hi temp**

Displays the current state of each solenoid driver.

**DRVR REQ TORQ**
**Range: ____ 0 to 9999 lb./ft.**

Indicates the amount of torque required by the driver.

**DRVR SHFT CTRL**
**Range: ____ ON/OFF**

Reads as follows:

- ON when the gear selector is in the manual (M) position which enables TAP Shift
- OFF when the gear selector is not in the (M) position and TAP Shift is disabled

**DWNSHFT PRESS ADPT**
**NM 3-2 LO**
**NM 3-2 HI**
**NM 4-2 LO**
**NM 4-2 HI**
**NM 4-3 LO**
**NM 4-3 HI**
**Range: ____ variable**

Displays the “learned” pressure required to complete each downshift under low and high torque conditions. These parameters are part of the adaptive report available on Saturn automatic transmissions. Values display for the NRM (normal) shift mode only.

**EGR DUTY(%)**
**Range: ____ 0 to 100%**

Displays the duty cycle, or percentage of time, that the EGR solenoid is energized to open the EGR valve.

Pulse width modulated (PWM) solenoids control EGR vacuum in two different ways. Some solenoids open a vacuum line to the EGR valve when energized. Others close off, or bleed off, EGR vacuum when energized. Check service manuals to determine the EGR solenoid operation on a specific vehicle. This parameter indicates of the following solenoid operations:

- On some vehicles, the PCM cycles the EGR vacuum solenoid on and off to regulate the amount of vacuum applied to the EGR valve. The solenoid duty cycle is proportional to the EGR flow. A duty cycle of 10% or less equals no EGR, a 50% duty cycle equals 50% EGR, and a 90% or greater duty cycle is maximum EGR.
- On other vehicles, the PCM cycles the EGR solenoid on and off to regulate vacuum applied to the EGR valve or to open a vacuum bleed in the line to the EGR valve. When the solenoid is on, vacuum is bled off. When the solenoid is off, full vacuum is applied. On these systems, the duty cycle is inversely proportional to EGR flow. Readings of 90% or more equal no EGR, and readings of 10% or less equal maximum EGR.

**END OF SHIFT**
**Range: ____________________ YES/NO**

Indicates whether an upshift has completed. Briefly reads YES when an upshift completes, and NO when an upshift is not completed.

**Engine LOAD %**
**Range: ____________________ 0 to 100%**

Displays the amount of load on the engine, which is internally calculated by the PCM.

**Engine RPM**
**Range: ____________________ 0 to engine max**
**INPUT RPM**
**Range: ____________________ 0 to 8192 rpm**
**OUTPUT RPM**
**Range: ____________________ 0 to 8192 rpm**
**TURBINE RPM**
**Range: ____________________ 0 to 8192 rpm**

Displays the rotational speed of the engine, input shaft, output shaft, and turbine shaft. On Saturn vehicles, two sensors provide engine speed and turbine shaft speed data to the TCM. The engine signal comes from the crankshaft position (CKP) sensor. The turbine signal comes from the 2nd/3rd clutch hub sensor. They do not have input and output RPM signals.

On all other GM vehicles with electronic transmissions, three sensors provide engine speed, input shaft speed, and output shaft speed data to the TCM. The engine speed is provided by the ignition system. The TCM uses engine speed to calculate the overdrive ratio. Input speed is used to determine actual turbine speed and to control line pressure. The output speed value is used to control TCC application, line pressure, shift timing, and torque.

Turbine speed is taken directly from the input speed sensor when the transmission is in 1st, 2nd, and 3rd gear. However, if the transmission is in 4th gear the forward clutch drum is overrunning, which makes direct turbine speed reading inaccurate. Therefore, the TCM multiplies input speed by a calibrated value to calculate 4th gear turbine speed.

**Engine WARM**
**Range: ____________________ YES/NO**

Displays the PCM internal operating conditions in relation to engine temperature on 1985–86 Oldsmobile-built carbureted engines and reads as follows:

- YES when the engine is at operating temperature
- NO on a cold engine operating in open loop

**ESTIMAT SPD RAT**
**Range:** ______________________________ **variable**

Displays the estimated turbine speed divided by the transmission output speed (gear ratio). Estimated turbine speed is calculated from engine speed and engine torque.

**EVAP VENT SOL**
**Range:** ______________________________ **ON/OFF**

Displays the state of the EVAP vent solenoid. Reads ON when the EVAP vent solenoid is closed to create a vacuum in the fuel tank, and OFF when the solenoid is open to purge the canister.

**FAN 1 REQUESTED**
**FAN 2 REQUESTED**
**Range:** ______________________________ **YES/NO**

Displays the PCM output commands to the fan relays, which are based on input signals from pressure switches in the high-pressure side of the A/C system. The fan should be on when the reading is YES.

**FLARE ERROR**
**Range:** ______________________________ **0 to 255**

Indicates whether flare was detected on the previous upshift. This parameter is part of the adaptive report available on some Saturn automatic transmissions. The higher the number the more flare.

**FLARE UPSHFT PRESS**
**1-2 FLARE**
**2-3 FLARE**
**3-4 FLARE**
**Range:** ______________________________ **0 to 1350 kPa or 0 to 195 psi**

Displays the “learned” pressure required to eliminate flare during an upshift. These parameters are part of the adaptive report available on Saturn automatic transmissions.

A reading of 0 (zero) indicates factory programmed pressure is adequate to eliminate flare. As components wear, additional pressure is required and the value increases above zero.

**FLUID LIFE(%)**
**Range:** ______________________________ **0 to 100%**

Indicates how much the transmission fluid has broken down since the last fluid change. The TCM internally calculates this value based on data such as the time since the last fluid change, number of ignition cycles, hours of operation, and average operating temperature.

FLUID LIFE(%) reads as follows:

- 100% = full fluid life
- 0% = an immediate need for fluid change

**FORCE MOTOR(%)**
**Range:** ______________________________ **0 to 100%**

Displays the duty cycle command to the force motor. The PCM controls current (amperage) to the force motor by varying the duty cycle. The force motor is operated on a positive duty cycle, which means that the positive side of the force motor electrical circuit at the PCM controls force motor operation.

The displayed value indicates the percentage of time that current energizes the coil.

**FORCE MTR SOL A**
**FORCE MTR SOL B**
**Range: ______ YES/NO**

Displays the commanded state of pressure control solenoids A and B and reads as follows:

- YES when the solenoid is energized
- NO when de-engergized

**FRONT AXLE SW**
**Range: ______ HI/LOW/OFF**

Displays the state of the front axle on a 4WD vehicle that is being detected by the PCM.

**FUEL PUMP RELAY**
**Range: ______ ON/OFF**

Displays the current state of the fuel pump relay.

**FULL POS SW**
**Range: ______ ON/OFF**

Indicates whether the PCM is using the maximum values found on the lookup tables. These values usually include fuel enrichment and spark advance.

FULL POS SW reads ON when the maximum values are in use.

**GARAGE SHIFT(SEC)**
**REV LOW**
**REV HIGH**
**DRIVE LOW**
**DRIVE HIGH**
**Range: ______ –3 to 3 sec**

Displays the “learned” shift time, which is added or subtracted from the factory-set garage shift times. These are part of the adaptive report available on 4T80E automatic transmissions. Learned values are displayed for shifts into reverse and drive, at low idle and high idle.

These parameters read 0 (zero) when the factory programmed time is adequate. As the components wear, shift times vary. Readings from –1.00 to 1.00 are considered normal.

**GAR SHIFT ADAPT**
**Range: ______ YES/NO**

Indicates whether the time of the fill-pressure pulse is being adapted by the PCM during garage shifts. Garage shifts are from park or neutral into reverse or drive.

**GEAR BOX TORQUE**
**Range: ______ 0 to 4088 ft-lbs**

Indicates the torque delivered to the transmission turbine shaft, and includes the torque multiplication effect from the torque converter.

**GEAR COMMANDED**
**Range: ______ 0 to 8**

Displays the commanded gear state from the transmission control module (TCM) and reads:

- 0 (zero) in park or neutral
- 1 when drive is selected and the transmission is in first gear
- 2, 3, 4, and 5 as the transmission shifts through the gears

**GEAR RATIO**

**Range: ______ 0.000 to 8.00:1**

Displays the actual gear ratio of the current commanded gear. Ratio is calculated by dividing the input speed by the output speed in R, D4, D3, D2, and D1range. Gear ratio is calculated by dividing the turbine speed by the output speed in D5 range with the TCC locked.

**GEAR SELECTED**

**Range: ______ 0 to 8**

Displays the selected state of the gear selector lever and reads as follows:

- 8 = park
- 7 = reverse
- 5 = drive
- 3 = third
- 2 = second
- 1 = first
- 0 = neutral

**GEAR SLIP(:1)**

**Range: ______ 0.00 to 0.99:1**

Displays the calculated transmission gear slip ratio determined by comparing the calculated gear ratio to the desired gear ratio.

**HOT MODE**

**Range: ______ ON/OFF**

Indicates whether the transmission is operating in hot mode. The transmission enters hot mode operation (reads ON) if transmission fluid temperature exceeded 275°F (135°C).

During hot mode, the TCC engages in 4th gear until the temperature drops below 275°F (135°C), the brakes are applied, or the TP sensor signal is low.

- If temperature reaches 302 to 307°F (150 to 153°C) for 15 minutes, a DTC sets.
- If fluid temperature exceeds 309°F (154°C) for 1 second, hot mode continues until the next ignition cycle.

**IAC POSITION**

**Range: ______ 0 to 255**

Indicates the position of the idle air control (IAC) valve of a throttle body or port fuel-injected engine. The IAC valve controls air bypassing the throttle at idle and thus the idle speed.

The readings are a step count:

- 0 (zero) indicates the motor has moved to its outer position and closed the IAC valve to cut off air flow.
- A high number indicates that the motor moved inward to open the IAC valve and allow more idle air.

Changes in the count should occur fairly rapidly as engine load changes.

**IGN CYCLE DTC**

**Range: ______ YES/NO**

Indicates whether a diagnostic trouble code (DTC) has set on the current ignition cycle.

**IGNITION (V)**

**Range: ______ 0.0 to 25.5 V**

Displays the voltage level on the Ignition input to the transmission control module (TCM).

The normal ignition voltage is approximately 13.8 V, but may vary between 11 and 16 V.

**IGNITION 1 (V)**
**Range: ______ 0 to 25.5 V**

Displays the system voltage at the PCM ignition input.

**ILLEGAL SHIFT**
**Range: ______ YES/NO**

Indicates whether a garage shift occurred. Adaptive learning does not occur during garage shifts. This parameter is a part of the adaptive report available on Saturn automatic transmissions.

Displays the only reads YES during garage shifts, such as P-D, N-D, P-R.

**IMS PRNDL SW**
**IMS SW**
**Range: ______ PRK/NEUT/REV/4TH/3RD/2ND/LOW**

Displays the decoded status of the four internal mode switch (IMS) inputs to the PCM: IMS RANGE A/B/C/P. The IMS ranges include all possible in-between gear states as well as the detent gear states. The combination of the IMS range inputs are used by the PCM in order to determine what position the manual valve is in at any given time.

**IMS RANGE A**
**IMS RANGE B**
**IMS RANGE C**
**IMS RANGE P**
**Range: ______ HI/LO**

Displays the high or low status of the four inputs from the internal mode switch (IMS) to the PCM:

- HI indicates ignition voltage
- LO indicates no voltage

The PCM detects the selected gear range by deciphering the combination of the voltage signals. The actual voltage combination of the switch signals is compared to an IMS switch combination table stored in memory.

Refer to Table 14-9.

**Table 14-9** *Transmission Internal Mode Switch Logic (part 1 of 2)*

| Gear Selector Position | IMS Range A | IMS Range B | IMS Range C | IMS Range P |
|---|---|---|---|---|
| Park | LOW | HI | HI | LOW |
| Park/Reverse | LOW | LOW | HI | LOW |
| Reverse | LOW | LOW | HI | HI |
| Reverse/Neutral | HI | LOW | HI | HI |
| Neutral | HI | LOW | HI | LOW |
| Neutral/Drive 4 | HI | LOW | LOW | LOW |
| Drive 4 | HI | LOW | LOW | HI |
| Drive 4/Drive 3 | LOW | LOW | LOW | HI |
| Drive 3 | LOW | LOW | LOW | LOW |
| Drive 3/Drive 2 | LOW | HI | LOW | LOW |
| Drive 2 | LOW | HI | LOW | HI |
| HI = Ignition voltage<br>LOW = 0 voltage | | | | |

**Table 14-9** *Transmission Internal Mode Switch Logic (part 2 of 2)*

| Gear Selector Position | IMS Range A | IMS Range B | IMS Range C | IMS Range P |
|---|---|---|---|---|
| Drive 2/Drive 1 | HI | HI | LOW | HI |
| Drive 1 | HI | HI | LOW | LOW |
| Invalid | HI | HI | HI | HI |
| | LOW | HI | HI | HI |
| | HI | HI | HI | LOW |
| HI = Ignition voltage<br>LOW = 0 voltage | | | | |

**INJ PW #1(mS)**
**INJ PW #2(mS)**
**INJ PW #3(mS)**
**INJ PW #4(mS)**
**Range: ____ 0 to 999.9 mS**

Displays the injector base pulse-width modulation (PWM), or on-time, in milliseconds. As engine load increases, the injector PWM should increase as well.

**INTAKE AIR(°C)**
**Range: ____ -40° to 151°C**
**INTAKE AIR(°F)**
**Range: ____ -40° to 304°F**

Displays the intake air temperature (IAT) in degrees. The PCM converts the voltage signal from a thermistor-type sensor to temperature readings. This information is used by the PCM to adjust fuel delivery and spark timing based on the density of the incoming air.

**I/O RPM(RATIO)**
**Range: ____ 0 to 3.99**

Displays the actual transmission input to output speed ratio differential. The TCM compares this internally calculated value to the commanded ratio for diagnostic purposes.

The normal operating ranges are:

- 1st gear: 2.38–2.63
- 2nd gear: 1.43–1.58
- 3rd gear: 0.95–1.05
- Reverse: 1.97–2.17

**KICKDOWN ENABLE**
**Range: ____ YES/NO**

Indicates whether conditions exist for a downshift during acceleration. The PCM looks at various sensors, such as throttle position, input shaft speed, and vehicle speed to enable a downshift.

**KNOCK ACTV CNT**
**Range: ____ 0 to 255 counts**

Displays a randomly fluctuating number that indicates knock sensor activity. The count increments when spark knock is detected, the count does not change if knock is not present.

**KNOCK RET CYL1**
**KNOCK RET CYL2**
**KNOCK RET CYL3**
**KNOCK RET CYL4**
**KNOCK RET CYL5**
**KNOCK RET CYL6**
**Range:** ____ **0 to 191°**

Displays the degrees of spark advance the ECM removes from each cylinder in response to the signal from the knock sensors.

**KNOCK SNR1 ACTV**
**KNOCK SNR2 ACTV**
**Range:** ____ **YES/NO**

Indicates whether the knock sensor has detected any frequencies associated with a knock event.

**KS RETARD**
**Range:** ____ **0 to 90°**

Displays the amount of spark advance the PCM is removing in response to the knock sensor (KS) signal in degrees.

**LAST ADPT DC(%)**
**Range:** ____ **0 to 100%**

Displays the highest commanded duty cycle applied to the automatic transfer case motor.

**LAST ADAPT(psi)**
**Range:** ____ **variable**
**LAST ADAPT(KPA)**
**Range:** ____ **–16 to +16**

Displays the amount of transmission line pressure increase over baseline pressure that was required to adjust the apply effort of a clutch or band during the last adapting shift.

**LAST OSS SHIFT**
**Range:** ____ **0 to 8192 RPM**

Displays the output shaft speed (OSS) at the time the last shift occurred.

**LAST SHFT(SEC)**
**Range:** ____ **0 to 6.38 sec**

Displays the actual shift duration of the last upshift in seconds.

**LAST SHIFT ADAPT**
**Range:** ____ **YES/NO**

Indicates whether adaptive learning occurred during the last shift and reads as follows:

- YES when all related operating conditions were within specifications during the last shift
- NO if any were out of specification

Conditions include TP sensor, torque, vehicle speed, shift delay, and shift time readings. Adaptive cells are only updated when all conditions are within specifications.

**LEARN CONFIDENCE**
**LEARN CONF 3RD**
**LEARN CONF 4TH**
**Range:** ____ **0 to 100**

Displays the shift confidence values. Shift confidence decreases each time a shift error is detected. These parameters are part of the adaptive report available on Saturn transmissions.

**LONG SHFT DELAY**
**Range: ________________________________________ YES/NO**

Indicates whether a long shift delay occurred. Shift delay is the time from when the VCM/PCM sends the shift command until the start of engine RPM drop.

Reads as follows:

- YES when a long shift delay occurs
- NO when shift delay is within a range that enables shift adaptation

**LONG SHFT TIME**
**Range: ________________________________________ YES/NO**

Indicates whether a long shift time occurred. Shift time is the time from the beginning of the RPM drop to the start of RPM increase.

Reads as follows:

- YES when a long shift time occurs
- NO if shift time is within a range that enables shift adaptation

**LOW OIL LEVEL**
**Range: ________________________________________ YES/NO**

Displays engine oil level based on a signal from a sensor located in the engine oil sump.

**LOW VOLTAGE**
**Range: ________________________________________ YES/NO**

Indicates whether low voltage was detected. This parameter is part of the adaptive report available on Saturn automatic transmissions and reads YES anytime ignition voltage drops below 11.5 V. This disables adaptive shifts.

**MAF(gm/Sec)**
**Range: ________________________________________ 0 to 255**

Displays mass airflow (MAF) in grams per second (gm/Sec) on most port fuel-injected engines based on a signal from the MAF sensor. The PCM uses the MAF signal and other sensor signals to determine the required air-fuel ratio and adjust fuel injection pulse width.

Expect low readings at idle that increase as the throttle opens. Readings during WOT acceleration may rise above 100 gm/Sec. A maximum reading near 255 is unlikely.

The MAF sensor on some 1987–88 2.8L V6 engines may have been disconnected as part of a service modification campaign. The MAF or Airflow reading on such an engine may be either fixed at one end of the range or jumbled. Modified systems use the manifold absolute pressure (MAP) sensor for fuel and ignition timing control.

**MAF(Hz)**
**Range: ________________________________________ 0 to 32,000 Hz**

Displays the input signal from the mass airflow (MAF) sensor to the PCM as frequency (Hz), and reads as follows:

- About 3000 Hz at idle
- Above 7000 Hz at WOT

**MAN FORCE SHFT**
**Range: ________________________________________ YES/NO**

Indicates whether a gearshift was initiated by moving the gear selector lever. This parameter is part of the adaptive report available on Saturn automatic transmissions.

**MAP(KPA)**
**Range: ____________________ 0 to 205**
**MAP(“Hg)**
**Range: ____________________ 0 to 60.7**

Displays the manifold absolute pressure (MAP) as calculated by the PCM based on the MAP sensor voltage signal.

When MAP is displayed in kPa, the MAP parameter should read as follows:

- About 100 to 102 kPa with the engine off and the intake manifold close to atmospheric pressure at sea level.
- When the engine is running with high manifold vacuum, the kPa reading drops.
- On a turbocharged engine, the kPa reading rises above 100 as boost is applied.

When MAP is displayed in inHg, the MAP parameter should read as follows:

- About 29.9 inHg with the engine off and the intake manifold close to atmospheric pressure at sea level.
- When the engine is running with high manifold vacuum, the MAP reading in inHg drops.
- On a turbocharged engine, the reading rises above 30 as boost is applied.

**Table 14-10** *Pressure/voltage conversion*

| Unit Of Measure | Voltage | | | | | | |
|---|---|---|---|---|---|---|---|
| | High | | | | | | Low |
| MAP (kPa) | 70 | 60 | 50 | 40 | 30 | 20 | 10 |
| MAP (inHg) | 21 | 18 | 15 | 12 | 9 | 6 | 3 |

Compare MAP voltage and MAP pressure parameter readings. Pressure should be high when voltage is high, and low when voltage is low. If readings appear abnormal for the engine load, the sensor signal may be inaccurate or the PCM calculations may be incorrect.

**MAP(V)**
**Range: ____________________ 0 to 5.12 V**

Displays the manifold absolute pressure (MAP) sensor voltage signal, which varies with manifold pressure. The MAP is intake manifold pressure relative to zero. Therefore, MAP and manifold vacuum are inversely related:

- MAP voltage is low when manifold vacuum is high.
- MAP voltage is high when manifold vacuum is low.

The PCM uses MAP sensor voltage along with the barometric pressure (BARO) sensor voltage to calculate manifold vacuum and true absolute pressure. The PCM also uses MAP voltage along with engine speed to calculate engine load.

**MAX ADAPT**
**Range: ____________________ YES/NO**

Indicates whether the transmission line pressure has reached its maximum adaptive limit.

**MAX TAP**
**Range: ____________________ YES/NO**

Indicates whether a commanded transmission line pressure modification has been reached.

**MODE SW SLCTD(V)**
**Range: ____ 0 to 5.0 V**

Indicates the return voltage from the transfer case shift control switch button specific to the current mode selected.

**MTR A HI/SIDE**
**MTR B HI/SIDE**
**Range: ____ ON/OFF**

Indicates whether battery voltage is applied to the Motor A or B circuits.

**MTR A LO/SIDE**
**MTR B LO/SIDE**
**Range: ____ ON/OFF**

Indicates whether ground is applied to the Motor A or B circuits.

**MTR A/B CKT FLT**
**Range: ____ YES/NO**

Indicates whether a fault (open or shorted circuit) has been detected on one of the A or B motors.

**NO. OF TIMES SET**
**Range: ____ 0 to 50 counts**

Displays a count of the number of warm-up cycles in which an emission failure DTC set.

**NORM SHFT PTTRN**
**Range: ____ ENABLED/DISABLED**

Indicates whether the transmission is operating under a normal shift pattern strategy.

**NXT DWNSHFT RPM**
**NXT UPSHFT RPM**
**Range: ____ 0 to 8192 rpm**

Displays the output shaft speed at which the next upshift or downshift will occur based on current driving requirements.

**O2(mV)**
**Range: ____ 0 to 1800 mV**

Displays the oxygen sensor (O2S) signal as millivolts (mV). The O2S is the primary sensor that indicates whether the engine is running rich or lean.

The O2S generates a signal that ranges from 0 to 1000 mV (0 to 1 V).

- A high signal indicates a rich exhaust.
- A low signal indicates a lean exhaust.
- In normal operation, the O2S signal ranges from 100 to 1000 mV.

The O2S must be hot (above 500°F/260°C), and the PCM must be in closed loop before the PCM responds to the sensor signal.

**OIL LIFE(%)**
**Range: ____ 0 to 100%**

Displays the estimated oil life in percent. The PCM calculates and maintains the oil life index.

**OIL TEMP(V)**
**Range: ____ 0.0 to 5.0 V**

Displays the voltage drop across the transmission fluid temperature (TFT) sensor and the PCM internal resistors.

**OPEN/CLSD LOOP**
**Range: ____ OPEN/CLSD**

Indicates whether the PCM is operating the engine in open or closed loop and reads as follows:

- OPEN during warm-up
- CLSD once the engine reaches normal operating temperature

Some failure conditions, many associated with trouble codes, cause the PCM to return to open-loop operation. Additionally, some vehicles may normally return to open-loop operation at idle because the O2S cools off.

To restore closed-loop operation, accelerate off idle to warm up the sensor. High ambient temperatures or towing heavy loads may also cause the PCM to return to open-loop operation to prevent catalytic converter damage.

**OVERDRIVE RATIO**
**Range: ____ 0 to 3.99**

Displays the TCM calculated overdrive ratio, which is engine speed divided by transmission input speed. In 4th gear, input speed should be within 200 RPM of engine speed.

The TCM compares this value to a stored range of acceptable values. If the calculated value is not within range, a DTC sets, 4th gear and TCC disable, and line pressure increases.

**OVERRUN SHIFT**
**Range: ____ YES/NO**

Indicates whether an overrun shift occurred. This parameter is a part of the adaptive report on Saturn automatic transmissions.

OVERRUN SHIFT reads YES if a shift occurs below minimum engine torque, like if the throttle is released before a shift completes, for example.

**P/N SWITCH**
**Range: ____ P-N—/-R-DL**

Displays the status of the park/neutral (P/N) switch, which indicates whether the transmission is in park, neutral, or in one of the drive ranges.

Reads as follows:

- P-N— in park or neutral
- -R-DL in any forward gear or reverse

Grounding switch that is closed in park or neutral and open in any forward gear or reverse.

**PARK SWITCH**
**Range: ____ OPEN/CLOSED**

Displays the status of the park/neutral (P/N) switch and reads as follows:

- OPEN in reverse or any forward gear
- CLOSED when the transmission is in park or neutral

**PC SOL(AMP)**
**Range: ____ 0.10 to 1.1**

Displays the actual current of the pressure control regulator solenoid circuit at the TCM in amps.

- A low current (0.10 amp) indicates the maximum line pressure is being commanded.
- A high current (1.1 amp) indicates the minimum line pressure is being commanded.

**PC SOLENOID(mA)**
**PC SOL(mA)**
**Range: ______ 100 to 1099 mA**

Displays the actual current of the pressure control regulator solenoid circuit at the TCM in milliamps (mA). Interpret as follows:

- A low current (100 mA) indicates a maximum line pressure command.
- A high current (1099 mA) indicates a minimum line pressure command.

**PC ENABLED**
**Range: ______ ON/OFF**

Displays the commanded state of the pressure control (PC) solenoid and reads as follows:

- ON when the solenoid is energized
- OFF when not energized

**PCS(psi)**
**Range: ______ 0 to 255 psi**

Displays the line pressure commanded by the TCM in pounds per square inch.

**PCS 1 ACT(mA)**
**PCS 2 ACT(mA)**
**Range: ______ 0 to 1305 mA**

Displays the actual current through the clutch pressure control solenoid (PCS) valve circuit. High current results in low line pressure. Low current results in high line pressure.

**PCS 1 CKT STATUS**
**PCS 2 CKT STATUS**
**Range: ______ OK, BATT SHORT/OPN, GND SHORT**

Indicates whether a short to voltage, open circuit,or short to ground exists in the pressure control solenoid (PCS) shift valve 1 (1-2, 4-5) or 2 (2-3, 3-4) feedback signal circuit.

The scan tool displays “OK” when status is normal.

**PCS 1 REF(mA)**
**PCS 2 REF(mA)**
**Range: ______ 0 to 1305 mA**

Displays the commanded current of the clutch pressure control solenoid (PCS) valve circuit. High current results in low line pressure. Low current results in high line pressure.

**PCS A ACT(AMP)**
**Range: ______ 0.00 to 1.10**

Displays the actual current of the pressure control A solenoid circuit at the control module.

**PCS A DUTY(%)**
**PCS B DUTY(%)**
**Range: ______ 0 to 100%**

Displays the duty cycle of the commanded state of pressure control solenoids A and B.

**PCS A ENABLED**
**PCS B ENABLED**
**Range: ______ YES/NO**

Displays the commanded state of pressure control solenoids A and B and read as follows:

- YES when the solenoid is energized
- NO when not energized

**PCS A REF(AMP)**
**Range: ________________________________0.00 to 1.10**

Displays the commanded current of the pressure control A solenoid circuit at the control module.

**PCS ACT(AMP)**
**Range: ________________________________ 0 to 1.10 A**

Displays the actual current of the pressure control A solenoid circuit at the control module.

- High current indicates low line pressure.
- Low current indicates high line pressure.

**PCS B ACT(AMP)**
**PCS B REF(AMP)**
**Range: ________________________________0.00 to 1.10**

Displays the actual current of the pressure control B solenoid circuit at the control module.

**PCS DES (AMP)**
**Range: ________________________________ 0 to 1.10 A**

Displays the current in the pressure control solenoid circuit the TCM is attempting to maintain.

- High current indicates low line pressure.
- Low current indicates high line pressure.

**PCS DUTY(%)**
**PCS DTY CYCL(%)**
**Range: ________________________________ 0 to 100%**

Displays the duty cycle of the commanded state of the pressure control solenoid (PCS) and reads as follows:

- 0% when the solenoid is not energized
- About 60% at idle during maximum on-time

**PCS ENABLE**
**Range: ________________________________ YES/NO**

No information is currently available for this parameter.

**PCS ERROR(AMP)**
**Range: ________________________________ 0 to 4.98 A**

Displays the difference between the desired current in the pressure control solenoid circuit and the actual current.

**PCS LOW VOLTAGE**
**Range: ________________________________ YES/NO**

Indicates whether the pressure control solenoid (PCS) feedback voltage to the PCM/VCM is low and reads as follows:

- YES when voltage is low and the PCS is off
- NO when voltage is normal

**PEDAL POS 1(V)**
**PEDAL POS 2(V)**
**PEDAL POS 3(V)**
**Range: ________________________________ 0.00 to 5.00 V**

Displays the throttle position sensor inputs used by the PCM to determine the throttle demand requested by the driver. Readings during normal operation should be:

- PEDAL POS 1—0.35 to 0.95 V at idle, above 4.00 V at WOT

- PEDAL POS 2—4.50 V at idle, decreasing to 1.00 V at WOT
- PEDAL POS 3—4.00 V at idle, decreasing to 2.50 V at WOT

If the PCM detects a fault in a single sensor signal, a current and history code set, and vehicle operation is unaffected.

If the PCM detects faults in two sensor signals, a current and history set, the Service Throttle Soon lamp turns on, and some engine performance is lost.

If the PCM detects faults in all three sensor signals, both a current and history code set, the lamp turns on, and the PCM only allows the engine to idle. If an intermittent fault occurs, the PCM allows limited performance.

**PEDAL ROT(%)**
**Range: ______________________________ 0 to 100%**

Displays the amount of throttle opening as a percentage.

**PERFORM PATTERN**
**NORMAL PATTERN**
**Range: ______________________________ YES/NO**

Displays the selected position of the performance switch on the shift console and read YES when the switch is in the indicated position.

**POWER ENRICH**
**Range: ______________________________ YES/NO**

Indicates whether the PCM is commanding a rich mixture for high-power operation.

**PRESS CONTROL(%)**
**Range: ______________________________ 0 to 100%**

Displays the duty cycle of the PCM command to the pressure control solenoid.

During normal operation, readings range from 0 to 60%.

- 0% indicates the valve is not energized.
- 100% indicates the valve is continuously energized.

**PREVIOUS GEAR**
**Range: ______________________________0 to 7**

Displays the most recent gear change the transmission has completed. During an upshift or downshift, it continues to display the gear it was currently in until the new gear position has been successfully completed.

**PRNDL(A)**
**PRNDL(B)**
**PRNDL(C)**
**PRNDL(P)**
**Range: ______________________________ HI/LO**

Displays the status the PRNDL (gear selector lever position) switch. The display switches from HI (high) to LO (low) as different combinations are met.

**PRNDL SW**
**Range: ______________________________ see description**

Displays the status the PRNDL (gear selector lever position) switch. Readings are LOW, 2ND, 3RD, 4TH, and P/N. On some vehicles, it may be D1, D2, D3, D4, NEUT, REV, and PARK. If the transmission is between gears or the switch sends an invalid signal “????” displays.

**PWR TAKE OFF SW**
**Range:** ______________________________ **YES/NO**

Displays the status of the power takeoff (PTO) and reads as follows:

- YES when the PTO is engaged
- NO when disengaged

All transmission diagnostic functions are disengaged in PTO mode.

**QDM 1 FAULT**
**QDM 2 FAULT**
**QDM 3 FAULT**
**Range:** ______________________________ **YES/NO**

Indicates whether a quad driver module (QDM) fault has occurred. A QDM is an electronic device that controls up to four separate outputs.

A YES reading indicates that a QDM circuit is shorted or open, it does not necessarily mean the quad driver has failed. Check vehicle service manuals for more information on conditions that could cause the parameter to read YES.

**RANGE A**
**RANGE B**
**RANGE C**
**Range:** ______________________________ **0/12 V**

Displays the switch (A, B, or C) status of the selected gear. The PCM uses this information for line pressure and TCC solenoid control. These parameters read as indicated in Table 14-11.

**Table 14-11** *RANGE A, B, and C parameter readings*

| Gear | Switch A | Switch B | Switch C |
|---|---|---|---|
| Park | 0 V | 0 V | 0 V |
| Neutral | 0 V | 12 V | 0 V |
| Reverse | 12 V | 12 V | 0 V |
| 4th | 0 V | 12 V | 12 V |
| 3rd | 0 V | 0 V | 12 V |
| 2nd | 0 V | 0 V | 0 V |
| 1st | 12 V | 0 V | 0 V |

**R/AXLE LOCK IND**
**Range:** ______________________________ **ON/OFF**

Indicates when the Rear Axle Lock Indicator Lamp has been commanded on by the transfer case shift control module.

**REAR AXLE LOCK**
**Range:** ______________________________ **ON/OFF**

Indicates when the Rear Axle Lock solenoid has been commanded on by the transfer case shift control module.

**REAR AXLE RQST**
**Range:** ______________________________ **ON/OFF**

Indicates whether the transfer case shift control module has received a request from the rear axle lock switch or the scan tool to command the rear axle lock solenoid on or off.

**REDUCED POWER**
**Range: ____________________ YES/NO**

Indicates whether the PCM is limiting engine power because a fault in the throttle actuator control system was detected by the TAC module.

REDUCED POWER reads YES if a fault is present.

**REQUESTED TORQUE**
**Range: ____________________ 0 to 9999 lb./ft**

Indicates the amount of torque required by the driver.

**REVERSE (psi)**
**Range: ____________________0 to 127 psi**

Displays the amount of increase in the reverse line pressure over transmission baseline pressure to compensate for a worn or slipping component.

**S TIME ERR(psi)**
**Range: ____________________ –128 to +127 psi**

Displays the TCM calculated pressure necessary to correct the measured shift time error for the next shift.

**SEQ UPSHIFT**
**Range: ____________________ YES/NO**

Indicates whether the last shift was a sequential shift, which are shifts that do not use adaptive values. Typically, sequential shifts occur on a cold transmission. This parameter is part of the adaptive report available on Saturn automatic transmissions.

SEQ UPSHIFT reads YES if the last shift was sequential.

**SHFT DELAY(SEC)**
**Range: ____________________ 0 to 6 sec**
**SHIFT DLY(SEC)**
**Range: ____________________0 to 6.38 sec**

Displays the time delay in seconds between the point when a shift is commanded and when the gear ratio actually begins to change.

**SHFT ERR(SEC)**
**Range: ____________________ –3.20 to +3.18 sec**

Displays the difference between the desired shift time and the actual shift time. Negative numbers indicate the shift was too long, and positive numbers indicate a shift was too short.

**SHFT MODE**
**Range: ____________________ ON/OFF**

Indicates the position of the mode select switch and reads ON when performance is selected.

**SHFT SELECT SW**
**SHIFT MODE**
**Range: ____________________ PERF/NORM**

Displays the current status of the transmission mode select switch and reads as follows:

- PERF (performance) in performance mode
- NORM (normal) in normal mode

**SHFT TIME(SEC)**
**Range: ____________________0 to 6.38 sec**

Displays the actual shift time of the most recent upshift in seconds.

**SHFT TORQ Ft-Lbs**
**Range:** ____ **0 to 510 ft-lbs**

Displays the torque of the last shift in foot pounds. This value is used in the commanded pressure calculation during shifting.

**SHIFT CANCEL**
**Range:** ____ **YES/NO**

Indicates whether a shift was initiated and then cancelled before completion. This parameter is part of the adaptive report available on Saturn automatic transmissions.

Reads YES if the last shift was canceled.

**SHIFT FAIL(mS)**
**Range:** ____ **–3.20 to +3.18**

Displays the time in milliseconds (mS) from when a shift command is given and the time when the shift actually occurs.

**SHIFT LIGHT**
**Range:** ____ **ON/OFF**

Displays the PCM command to the instrument panel lamp shift lamp on models with a manual transmission. The PCM determines when to light the shift lamp based on vehicle speed and engine speed and load.

Reads ON when the lamp should be lit.

**SHIFT PRES(psi)**
**Range:** ____ **0 to 255 psi**

Displays the commanded line pressure value.

**SHIFT REQ(V)**
**Range:** ____ **0.0 to 5.0 V**

Displays the voltage measured at the Remote Shift Selector input.

**SHIFT RPM**
**Range:** ____ **0 to 6553 rpm**

Displays the maximum engine speed that was reached during an upshift.

**SHIFT SOL 1**
**SHIFT SOL 2**
**SHIFT SOL 3**
**SHIFT SOL 4**
**Range:** ____ **ON/OFF**

No information is currently available for these parameters.

**SHIFT SOL A**
**SHIFT SOL B**
**SHIFT SOL C**
**SHIFT SOL D**
**SHIFT SOL E**
**Range:** ____ **ON/OFF**

Displays the commanded state of the shift solenoid valves. Reads ON when the solenoid is energized, reads OFF when the solenoid is not energized.

**SHIFT TP(%)**
**Range:** ____ **0 to 100%**

Displays the throttle position (TP) at the time of a shift as a percentage.

**SKIPSHIFT ENABLED**
**Range: ____________________ YES/NO**

Indicates whether skipshift is enabled on a Corvette with a 6-speed manual transmission. Reads YES when the 1st-to-4th skipshift function is allowed.

The following three conditions must be met to enable skipshift:

- Coolant temperature above 120°F (49°C)
- Vehicle speed between 12 and 19 MPH (19 to 30 KPH)
- Throttle opening of 35% or less

The PCM activates solenoids to block the 2nd and 3rd shift gates for the transmission when conditions are met. Reads YES only when the instrument panel 1-to-4 indicator lamp is lit, NO when the lamp is off.

**SLIP ADAPT ENBL**
**Range: ____________________ YES/NO**

Indicates whether slip adaptation is enabled.

The PCM monitors input shaft speed (ISS) and output speed (OSS) after a shift in order to calculate the amount of slippage in that gear. This value is used to adjust the pressure control solenoid (PCS) signal in order to maintain slippage below a set amount.

**SLIP ADPT DC(%)**
**Range: ____________________ 0 to 100%**

Displays the commanded duty cycle being applied to the automatic transfer case motor.

**SLIP MONITOR PRESS**
**1ST**
**2ND**
**3RD**
**4TH**
**Range: ____________________ 0 to 600 kPa or 0 to 87 psi**

Displays the adaptive pressure required to eliminate slip during a shift. A reading of zero indicates the factory programmed pressure is adequate. As components wear, additional pressure is needed and the displayed value increases above zero.

If the value reaches 87 psi (600 kPa) and a slip is still detected, a DTC sets. These parameters are part of the adaptive report available on Saturn automatic transmissions.

**SLIPPAGE(RPM)**
**Range: ____________________ –4080 to 4079 rpm**

Displays the difference between transmission output shaft speed (OSS) and engine speed.

- A negative value indicates engine speed is less than the output speed (deceleration).
- A positive value indicates engine speed is greater than the output speed (acceleration).
- A value of zero indicates that the engine speed is equal to the output speed (TCC applied).

**SOFTWARE P/N**
**Range: ____________________ 0 to 99999**

Displays an alphanumeric value indicating the numbers or characters assigned to the current version of software used in the transfer case shift control module. Compare the displayed value to latest specifications to determine if the most current software is installed.

**SOL 1 OPEN/SHRT**
**Range: YES/NO**

Indicates whether an open or short exists in the output number 5 circuit of output driver module 2 (ODM2).

**SOL 1 OVER AMPS**
**Range: YES/NO**

Indicates whether there is excessive current in the output number 5 circuit of ODM2.

**SOL 2 OPEN/SHRT**
**Range: YES/NO**

Indicates whether an open or short exists in the output number 6 circuit of ODM2.

**SOL 2 OVER AMPS**
**Range: YES/NO**

Indicates whether there is excessive current in the output number 6 circuit of ODM2.

**SOL C BATT SHRT**
**Range: YES/NO**

Indicates whether a short to B+ exists in the feedback signal from shift solenoid C to the PCM.

**SOL C OPN/SHRT**
**SOL D OPN/SHRT**
**SOL E OPN/SHRT**
**Range: OPN/SHRT**

Indicates whether the feedback signal from shift solenoids C, D, or E to the PCM are open (reads OPN) or shorted (reads SHRT) to ground.

**SOL D BATT SHRT**
**Range: YES/NO**

Indicates whether a short to B+ exists in the feedback signal from shift solenoid D to the PCM.

**SOL E BATT SHRT**
**Range: YES/NO**

Indicates whether a short to B+ exists in the feedback signal from shift solenoid E to the PCM.

**SOLENOID A**
**SOLENOID B**
**Range: ON/OFF**

Displays the status of the two solenoids that activate the transmission shift valves.

- Solenoid A is for the 1-2 and 3-4 shift valves.
- Solenoid B is for the 2-3 shift valve.

Table 14-12 shows the solenoid states for the various gears.

**Table 14-12** *Solenoid A and B states*

| Gear | Solenoid A | Solenoid B |
|---|---|---|
| 1st | ON | ON |
| 2nd | OFF | ON |
| 3rd | OFF | OFF |
| 4th | ON | OFF |

**SPARK ADV(°)**
**Range: ____ –90° to +90°**

Indicates the total spark advance or retard, including base timing, commanded by the PCM.

**SPEED NOISE**
**Range: ____ YES/NO**

Indicates whether the vehicle speed sensor (VSS) or turbine speed sensor (TSS) is generating noise, or if a signal is not received. This parameter is a part of the adaptive report on Saturn automatic transmissions.

**SPEED RATIO**
**Range: ____ 0.00:1 to 8.00:1**

Displays a ratio of engine speed to transmission speed, which the TCM uses to determine the gear ratio.

**SPORT LAMP**
**Range: ____ ON/OFF**

Displays the commanded state of the sport indicator lamp and reads ON when on, OFF when off.

**SPORT MODE**
**Range: ____ ON/OFF**

Displays the perceived state of the program push button and reads ON when on, OFF when off.

**SS MODE(COUNTS)**
**Range: ____ 0 to 7 count**

Displays the steady state (SS) adaptive pressure currently in use:

1 = SS transmission adaptive pressure (TAP) 1st gear
2 = SS TAP 2nd gear
3 = 3rd gear
4 = 4th gear
5 = SS TAP 2nd gear/torque converter clutch (TCC) applied
6 = SS TAP 3rd/TCC applied
7 = SS TAP 4th gear/TCC applied

**SS RATIO FAILS**
**Range: ____ ON/OFF**

No information is currently available for this parameter.

**SS SLIP**
**Range: ____ 0 to 255**

Displays the slip accumulator value, which influences steady state (SS) transmission adaptive pressure. Expect the readings to fluctuate depending upon clutch pack and TCC slip speeds.

**SS TAP 1GR**
**SS TAP 2GR**
**SS TAP 3GR**
**SS TAP 4GR**
**Range: ____ variable**

Displays the extra amount of pressure applied to compensate for a slipping clutch or band.

**SS TAP 2GR/TCC**
**SS TAP 3GR/TCC**
**SS TAP 4GR/TCC**
**Range: ______ variable**

Displays the extra amount of pressure applied to compensate for a slipping clutch or band.

**SS TAP REV**
**Range: ______ 0 to 876 kPa or 0 to 127 psi**

Displays the pressure modification that is added to the line pressure in Reverse when the PCM detects a worn or slipping component.

**SS TCC SLIP**
**Range: ______0 to 255**

Displays the slip accumulator, which increases or decreases depending on the clutch slip speed and the torque converter clutch slip speed, as a step count. This value is used to modify the steady state adaptive pressure.

**SS TCC SLIP(RPM)**
**Range: ______0 to 400**

Displays the slip accumulator, which increases or decreases depending on the clutch slip speed and the torque converter clutch slip speed, as RPM. This value is used to modify the steady state adaptive pressure

**ST TRIM-1(%)**
**ST TRIM-2(%)**
**Range: ______ –100% to 100%**

Displays the operation and short-term correction of the fuel-metering for cylinder banks 1 and 2.

- Negative percentages indicate that O2S feedback shows a rich condition, and a lean mixture is being commanded.
- Positive percentages indicate O2S feedback shows a lean condition, and a rich mixture is being commanded.

**STANDARD TAP**
**Range: ______ YES/NO**

Indicates whether the PCM or TCM used standard transmission adaptive pressure (TAP) during the last shift and reads as follows:

- YES if the last shift used standard TAP and the actual shift was not too long or delayed.
- NO if the last shift required an adjustment to standard TAP.

Adaptive learning is not used on all shifts and varies by application.

**START OF SHIFT**
**Range: ______ YES/NO**

Indicates whether an upshift is detected. Reads YES during a shift and NO at all other times.

**STDY ST TAP**
**STEADY ST(psi)**
**Range: ______0 to 876 Kpa or 0 to 127psi**

Displays the steady state pressure modifier that is currently being used.

**STEADY ADAPT(psi)**
**1ST(psi)**
**2ND(psi)**
**3RD(psi)**
**4TH(psi)**
**3RD W/TCC(psi)**
**4TH W/TCC(psi)**
**Range: ____________________ 0 to 128 psi**

Displays the amount of adaptive pressure added to base line pressure to adjust the holding effort of a clutch or band for the designated gear. These are part of the adaptive report available on a 4T80E transmission.

**STL**
**Range: ____________________ ON/OFF**

Displays the command to the service transmission lamp (STL), reads ON if the lamp is lit.

**TAP SHIFT TORQ**
**Range: ____________________ EXCD/NORM**

Displays the amount of pressure added to the base line pressure to adjust the holding effort of a clutch or a band during a shift.

**TC DES TORQ(%)**
**Range: ____________________ 0 to 100%**

Displays the duty cycle of the requested torque signal from the EBCM to the PCM.

Normal values are between 10% and 90%.

- 90% when traction control is not active
- About 10% when traction control is active

**TC TORQ(%)**
**Range: ____________________ 0 to 100%**

Displays the duty cycle of the actual torque signal from the EBCM to the PCM.

Normal values are between 10% and 90%.

- 90% when traction control is not active
- About 10% when traction control is active

**TC TORQ REQ(%)**
**Range: ____________________ 0 to 100%**

Displays the amount of engine torque requested from the ABS/TC electronic control module.

**TCC ADAPT(kPa)**
**Range: ____________________ variable**

Displays the additional pressure required to keep the TCC on while modulating the pulse width of the TCC actuator. This parameter is a part of the adaptive report on Saturn transmissions.

**TCC APPLY CKTA**
**Range: ____________________ YES/NO**

Displays the current status of the TCC apply control driver and reads YES when a fault is set.

**TCC BATT SHORT**
**Range: ____________________ YES/NO**

Indicates whether the TCC solenoid circuit is shorted to battery and reads YES when shorted.

**TCC BRAKE SW**
**Range: ____ OPEN/CLSD**

Displays the status of the torque converter clutch (TCC) brake switch and reads OPEN when the switch is open, and CLSD when closed.

This is a normally-closed, 2-pole switch with a vacuum port. The TCC brake switch supplies ignition voltage to the TCC and a feedback signal to the PCM. When the brake pedal is pressed, the switch opens, ignition voltage is removed from the TCC, the PCM receives a feedback, and the switch vents the cruise control servo to atmosphere.

**TCC CKT SHRT**
**Range: ____ YES/NO**

Indicates whether the TCC solenoid circuit is shorted to ground or B+. Reads YES if shorted.

**TCC CMD(psi)**
**Range: ____ 0 to 255 psi**

Displays the desired TCC pressure in pounds per square inch.

**TCC COMMAND**
**Range: ____ P1/P2**

Displays the state of the PCM signal to the torque converter clutch (TCC) and reads as follows:

- P1 = the initial state of the PCM command
- P2 = the command changed

TCC engagement (lockup) depends on gear selection, speed, engine temperature and throttle position. The PCM grounds one side of the circuit that energizes the TCC solenoid. The circuit, which allows hydraulic engagement of the TCC, must also be completed by various transmission, speed, and brake switches.

This parameter indicates that the PCM command has changed. It is not a feedback signal to indicate that the clutch has actually engaged. Refer to “TCC GROUNDED” on page 642 for more information.

**TCC CURRENT HI**
**Range: ____ YES/NO**

Indicates whether high current is detected in the TCC circuit. Reads YES if current is high.

**TCC DC BAT SHRT**
**TCC DC GND SHRT**
**Range: ____ YES/NO**

Indicates whether the TCC duty cycle solenoid circuit is shorted to power (B+) or ground (GND). Reads YES if the circuit is shorted.

**TCC DC OPN/SHRT**
**Range: ____ YES/NO**

Indicates whether the TCC duty cycle solenoid circuit is open or shorted to ground or B+. Reads YES if a circuit problem exists.

**TCC DELTA TP**
**Range: ____ YES/NO**

Indicates whether the throttle position (TP) is within a delta range that allows the TCC to apply. The delta range is the amount the TP moves during the shift calculation.

Reads YES only if the value changed too quickly and TCC engagement is prevented.

**TCC DRV**
**Range: OK/OPEN/SHORT/OVER CURRENT**

Displays the status of TCC solenoid control circuit driver.

**TCC DUTY(%)**
**Range: 0 to 100%**

Displays the commanded duty cycle of the TCC solenoid and reads a follows:

- 90% = the TCC solenoid is fully energized
- 0% = the TCC solenoid is off

**TCC DUTY CYCLE**
**Range: 0 to 100%**

Displays the commanded duty cycle of the TCC solenoid on some 4T60E transmissions. On these models, the PCM modulates the TCC vent solenoid closing for a few seconds when it is first energized. This cushions torque converter lockup by letting hydraulic pressure build up gradually instead of all at once. Interpret readings as follows:

- 100% when the solenoid valve is fully open to vent TCC pressure and unlock the TCC
- 0% when the solenoid valve is fully closed to hold pressure on the fully locked TCC
- Changes steadily between 100% and 0% as the TCC engages and disengages

**TCC EFFIC(%)**
**Range: 0 to 100%**

Displays the percent of a ratio calculated by multiplying the speed ratio by a value related to the “K factor” of the torque converter. The “K factor” is the looseness or tightness of the torque converter for a given torque.

The nearer the torque converter is to full coupling (1.0:1), the closer the torque converter efficiency number will be to 100%.

**TCC ENABLED**
**TCC ENABLE SOL**
**TCC SOL**
**Range: YES/NO**

Displays the PCM commanded state of the torque converter clutch (TCC) solenoid and read YES when the TCC solenoid is energized.

**TCC ENABLE OPEN**
**Range: YES/NO**

Indicates whether the torque converter clutch (TCC) feedback signal to the PCM is open or shorted to ground. Reads YES when a circuit problem is detected.

**TCC ENABLE SHRT**
**Range: YES/NO**

Indicates whether the torque converter clutch (TCC) feedback signal to the PCM is shorted to battery voltage. Reads YES when shorted.

**TCC ENBL B+ SHRT**
**Range: YES/NO**

Indicates whether a short to voltage exists on the TCC solenoid valve control circuit. Reads YES when shorted. This parameter is valid only when the TCC solenoid is commanded on.

**TCC ENBL OPN/SH**
**Range:** ____ **YES/NO**

Indicates whether an open or a short to ground exists on the TCC solenoid valve control circuit. Reads YES when a circuit problem is detected, and is valid only when the TCC solenoid is commanded off.

**TCC ENGAGED**
**Range:** ____ **YES/NO**

Displays the current state of the TCC solenoid and reads YES when the TCC is engaged.

**TCC FORCED OFF**
**Range:** ____ **YES/NO**

Displays the state of the PCM output command to the TCC on trucks with a 4L80E transmission and reads YES if the TCC is being forced off.

**TCC GRND SHORT**
**Range:** ____ **YES/NO**

Indicates if the ground side of the TCC solenoid circuit is shorted and reads YES when shorted.

**TCC GROUNDED**
**Range:** ____ **YES/NO**

Displays the state of the TCC circuit on some models. This parameter is only available on vehicles that have TCC solenoid voltage available on pin F of the ALDL connector. It is not available on any 1981 or 1982 models that have a 5-pin in-line ALDL connector. Because this parameter is not part of the serial data list, it does not appear in a data movie recording.

Voltage at pin F is interpreted as follows:

- YES if there is no voltage, which means the circuit is closed to ground
- NO if voltage is high, which means the circuit open
- If pin F is not present or is open, the display continuously reads YES.

A YES indicates the PCM grounded its side of the circuit; it does not indicate that the circuit is complete. The circuit is not complete until all other switches in series are closed.

**TCC MIN TP**
**Range:** ____ **YES/NO**

Indicates whether the minimum throttle position (TP) value to allow TCC engagement has been achieved and reads as follows:

- YES if TCC is allowed
- NO if minimum TP value was not achieved

**TCC MODE**
**Range:** ____ **see description**

Displays the status of the torque converter clutch (TCC) pressure control solenoid and the TCC-enable solenoid on some models with a 4T60E transmission. Readings should change from OFF to ON, APPLIED, RELEASED, and back to OFF as the TCC cycles.

On Saturn vehicles, this parameter displays the current TCM command to the TCC. The reading displays PWM when TCC operation is under pulse width modulated (PWM) control.

**TCC ON W/SHIFT**
**Range:** ____ **YES/NO**

Displays the TCC status during the previous shift. This parameters is part of the adaptive report on Saturn transmissions.

**TCC OPEN CKT**
**Range: YES/NO**
**TCC PWM OPEN**
**Range: ON/OFF**

Indicates whether the TCC solenoid feedback circuit to the PCM is open or shorted to ground and may display YES when the solenoid is commanded off and duty cycle is 0%.

**TCC OPEN/SHRT**
**Range: YES/NO**

Indicates whether an open or short exists in the TCC solenoid circuit.

**TCC OUT OF RNGE**
**Range: YES/NO**

Indicates whether the transmission is in a range which allows the TCC to apply and reads:

- YES if the transmission is not in a range which allows TCC engagement
- NO if conditions allow TCC engagement

**TCC PCS ACT(mA)**
**Range: 0 to 1305 mA**

Displays the actual current in milliamps (mA) of the torque converter clutch (TCC) lock-up pressure control solenoid (PCS) valve circuit. Interpret as follows:

- 0 milliamps (no current) indicates a low TCC apply pressure
- 1100 milliamps (high current) indicates a high TCC apply pressure

**TCC PCS CKT STATUS**
**Range: OK, BATT SHORT/OPN, GND SHORT**

Displays whether a short to voltage, open circuit, or short to ground exists in the torque converter clutch (TCC) pressure control solenoid (PCS) valve feedback signal circuit.

The display reads “OK” when the status is normal.

**TCC PCS REF(mA)**
**Range: 0 to 1305 mA**

Displays the commanded reference current of the torque converter clutch (TCC) lock up pressure control solenoid (PCS) valve circuit. Interpret as follows:

- 0 milliamps (no current) indicates a low TCC apply pressure
- A reading of 1100 milliamps (high current) indicates a high TCC apply pressure

**TCC PWM ENABLED**
**Range: ON/OFF**

Indicates whether the TCC solenoid has been commanded on by the PCM.

**TCC PWM SHRT**
**Range: ON/OFF**
**TCC SHRT CKT**
**Range: YES/NO**

Indicates whether the TCC solenoid feedback circuit to the PCM is shorted to battery voltage.

**TCC RELEASE**
**Range: YES/NO**

Displays the status of the normally-closed TCC release switch and reads as follows:

- YES if the switch is open, meaning TCC release pressure is present and the TCC is released
- NO if the switch is closed and the TCC is applied

**TCC RELEASE PRS**
**Range: ______ YES/NO**

No information is currently available for this parameter.

**TCC SOL CMD**
**Range: ______ ON/OFF**

Displays the commanded state of the TCC solenoid and reads ON when the solenoid is being commanded on.

**TCC SOL OPN/SHRT**
**Range: ______ OPN/SHRT**

Indicates whether an open (OPN) or a short (SHRT) to ground exits in the feedback signal from the TCC solenoid valve to the PCM.

**TCC SLIP(RPM)**
**Range: ______ –4080 to +4079 rpm**
**TCC SLIP(RPM)**
**Range: ______ 0 to engine max**

Displays the TCC slip rate on some 4T60E transaxles and 4L60E and 4L80E transmissions

For a 4T60E transaxle, TCC SLIP(RPM) reads as follows:

- A negative value means engine speed is less than turbine speed (deceleration).
- A positive value means engine speed is greater than turbine speed (acceleration).
- A value of zero means engine speed equals turbine speed (TCC is applied).

For 4L60E and 4L80E transmissions, the speed difference between the input and output vanes of the torque converter displays.

**TCC STATUS**
**Range: ______ ON/OFF/PWM**

Displays the actual state of the TCC solenoid.

**TCC TEMP HIGH**
**Range: ______ YES/NO**

Displays the state of the torque converter clutch (TCC) fluid temperature switch and reads YES only if the PCM has detected an ATF temperature above a predetermined temperature.

**TCM TRQ RED REQ**
**Range: ______ YES/NO**

Indicates whether the TCM is requesting the ECM to reduce the engine torque and reads YES when torque is requested.

**TCS ACTIVE**
**Range: ______ YES/NO**
**TCS ACTIVE**
**TCS-ASR ACTIVE**
**Range: ______ ACTIVE/INACTIV**

Indicates whether the traction control system (TCS) and automatic slip regulation (ASR) are activated. Interpret as follows:

- YES or ACTIVE displays when the system is engaged
- NO or INACTIV (inactive) displays at all other times

**TFP RANGE**
**Range: ______________________________ P/R/N/D4/D3/D2/D1/INVALID**

Displays the decoded status of the three A/B/C inputs from the automatic transmission fluid pressure (TFP) manual valve position switch.

The TFP RANGE reading should match the current gear: P (park), R (reverse), N (neutral), D4 (4th), D3 (3rd), D2 (2nd), D1 (1st). TFP RANGE reads INVALID when the PCM does not recognize a valid combination of inputs.

**TFP SW**
**Range: ______________________________ FAULT/OK/INVALID**

Displays the status of the three A/B/C inputs from the transmission fluid pressure switch.

**TFP SW 3**
**TFP SW 4**
**Range: ______________________________ HI/LO**

Displays the state of the 3rd or 4th clutch oil pressure switch:

- HI indicates an ignition voltage input to the control module
- LO indicates a zero voltage input to the control module

**TFP SW C**
**TFP SW D**
**TFP SW E**
**TFP SW F**
**Range: ______________________________ ON/OFF**

Displays the state of the three inputs from the automatic transmission fluid pressure manual valve position switch assembly:

- ON = 0 V signal
- OFF = B+ voltage signal

**TFP SWITCH A**
**TFP SWITCH B**
**TFP SWITCH C**
**Range: ______________________________ ON/OFF**

Displays the status of three PCM switching inputs from the transmission fluid pressure (TFP) switch assembly and read as follows:

- ON when the voltage signal is low and the switch is closed
- OFF when the voltage signal is high and the switch is open

The PCM uses the combination of high and low voltage signals from switches A, B, and C to determine manual valve position. These inputs are used to control line pressure, TCC, and the shift solenoids.

**THROTTLE(°)**
**Range: ______________________________ –9.8 to 90.0°**
**THROTTLE(%)**
**TPS(%)**
**Range: ______________________________ 0 to 100%**

Displays the PCM calculated amount of throttle opening based on the throttle position (TP) sensor voltage on many fuel-injected engines.

Cadillac displays these values as degrees. A reading of 82° or more indicates wide open throttle (WOT). Closed-throttle readings vary due to idle speed control (ISC) motor position and throttle body adjustments.

All other vehicles display this parameter as a percentage. The parameter usually appears on a vehicles with an autoranging TP sensor. The PCM resets the range in relation to TP sensor voltage as new minimum and maximum voltages are recorded. This value is often used to determine transmission shift pattern and mainline pressure.

The TP angle should read as follows:

- 0% at idle
- 100% at WOT

**THROTTLE SW**
**Range: ______ CLSD/OPEN**

Displays the position of the throttle switch inside the idle speed control (ISC) motor on some Cadillac models and reads as follows:

- OPEN when the engine is off idle and TPS should be more than 20°
- CLSD when the throttle is closed and the engine is at idle with TPS less than 20°

**TIME**
**Range: ______ HR/MIN/SEC**

Displays how long the engine has been in operation during the present ignition cycle. Use this feature to help isolate intermittent problems that occur within a time period after startup or after reaching cruising speed.

**TORQ FACTOR(%)**
**Range: ______ 9 to 92%**

Displays the gear position signal output sent by the TCM to the EBTCM.

- When the vehicle speed is 0 and the gear selector lever is in park or neutral, the signal output is around 9%. If R, D, 3, 2, or 1 is selected the signal output is around 30%.
- When the vehicle speed is greater than 0, and the vehicle is shifting through its gear range, the signal output is typically 23% in 1st gear, 21% in 2nd gear, 16% in 3rd gear, and 14% in 4th gear.

**TORQ MGMT ACTIVE**
**Range: ______ YES/NO**

Indicates if torque management activation is commanded by the PCM, reads YES when on.

**TORQ MGMT DUTY(%)**
**Range: ______ 0 to 100%**

Displays the amount of torque management being used by the TCM as duty cycle.

**TORQUE COUNTS**
**Range: ______ 0 to 255**

Displays the amount of engine torque as a step count. The TCM calculates this value based on PCM data, such as: MAP, engine coolant temperature, engine speed, and throttle position.

The TORQUE COUNTS reading increases in proportion to increases in engine torque. A reading of 255 indicates maximum engine torque.

**TORQUE (N-M)**
**Range: ______ 0 to 691**
**TORQUE (ft./lb.)**
**Range: ______ 0 to 510 ft-lbs**

Displays the calculated torque output transferred from the engine to the transmission. The value is internally calculated by the TCM based on input sensor signals. The electronic brake traction control module (EBTCM) uses this value to control traction system operation.

**TORQUE MANAGEMENT**
**TORQUE MGMT ACTIVE**
**Range: ______ ON/OFF**

Indicates whether the PCM is controlling engine torque by reducing spark advance to protect the transmission. Reads YES when torque is being controlled.

**TORQUE SIG(psi)**
**Range: ______ variable**

Displays the torque signal fluid pressure, which is controlled by the force motor. The PCM uses this internally calculated parameter for adaptive learning. Torque signal fluid pressure is applied to the boost valve, which controls line pressure at the pressure regulator valve.

Torque signal fluid pressure is also used to control accumulator pressure at the accumulator valve. This helps to prevent slippage and control the apply rate of clutches and bands.

**TOW/HAUL MODE**
**Range: ______ACT/INACT**

Indicates whether the driver has placed the vehicle in the Tow/Haul mode. When active (ACT), the TCM modifies its shift strategy in order to provide more torque to the wheels during shifts.

**TP AT SHIFT(°)**
**Range: ______ 0 to 81.6°**

Displays the calculated throttle position angle at the time a shift is commanded in degrees.

**TP AT SHIFT(%)**
**Range: ______ 0 to 82%**

Displays the calculated throttle position angle at the time a shift is commanded as a percentage.

**TP DELTA**
**TP RANGE**
**Range: ______ EXCD/NORM**

Indicates whether the throttle position (TP) is within a delta range that enables shift adapts. A TP delta range is how much the TP is moved during the shift calculation:

- NORM (normal) indicates TP is within range.
- EXCD (exceeded) indicates TP is not within range.

**TPS OUT OF RNGE**
**Range: ______ YES/NO**

Indicates whether the PCM detects a TP sensor signal above 4 V at closed throttle or below 1.5 V at WOT. Reads YES under these conditions, NO at all other times.

**TPS1(%)**
**TPS2(%)**
**Range: ______ 0 to 100%**

Displays the throttle opening as a percentage and read as follows:

- 0% indicates closed throttle
- 100% indicates wide open throttle (WOT)

**TR SW(A)**
**TR SW(B)**
**TR SW(C)**
**TR SW(P)**
**Range: HI/LO**
**TR SW A/B/C/P**
**Range: HI/LO/INV**

Displays the status of the four inputs (A/B/C/P) from the transmission range switch to the PCM:

- HI (high) indicates ignition voltage
- LO (low) indicates no voltage
- INV (invalid) indicates an unrecognizable combination of signals

The PCM detects the selected gear range by deciphering the combination of the voltage signals. The PCM compares the actual voltage combination of the switch signals to a TR switch combination table stored in memory.

**TR SWITCH**
**Range: PARK/NEUT/REV/4TH/3RD/2ND/1ST/INV**

Displays the decoded status of the four inputs from the transmission range switch. An INV (invalid) reading means the PCM does not recognize a valid combination of inputs.

**Table 14-13** *Transmission Range Switch Logic*

| Gear Selector Position | Switch A | Switch B | Switch C | Switch P |
|---|---|---|---|---|
| Park | LOW | HI | HI | LOW |
| Reverse | LOW | LOW | HI | HI |
| Neutral | HI | LOW | HI | LOW |
| Drive 4 | HI | LOW | LOW | HI |
| Drive 3 | LOW | LOW | LOW | LOW |
| Drive 2 | LOW | HI | LOW | HI |
| Drive 1 | HI | HI | LOW | LOW |
| Invalid | All other combinations | | | |
| HI = Ignition voltage<br>LOW = 0 voltage | | | | |

**TRAC SPARK RET**
**Range: YES/NO**

Indicates whether the PCM is retarding ignition spark to reduce engine torque for the traction control system. Reads YES while spark is being retarded.

**TRACTION CTRL**
**Range: YES/NO**

Indicates whether the vehicle has TCS installed, reads YES if so equipped.

**TRANS CODES SET**
**Range: 0 to 255**

Displays the number of active diagnostic trouble codes (DTCs) stored in the freeze frame and failure record.

**TRANS FLUID**
**Range:** ________ **–40 to +151°C, –40 to +304°F**
**TRANS TEMP(°C)**
**Range:** ________ **–40° to 215°C**
**TRANS TEMP(°F)**
**Range:** ________ **–40° to 419°F**
**OIL TEMP(°C)**
**Range:** ________ **–40 to 199°C**
**OIL TEMP(°F)**
**Range:** ________ **–40 to 389°F**

Displays the PCM calculated transmission fluid temperature (TFT) based on the voltage signal of the TFT sensor. On Saturn vehicles, this parameter is displayed as OIL TEMP.

- Fluid temperature is high (304°F/151°C) when the signal voltage is low (0 V).
- Fluid temperature is low (-40°F/C) when the signal voltage is high (5.0 V).
- Above 266°F (130°C) indicates the transmission is overheating.

**TRANS FLUID(V)**
**Range:** ________ **0 to 5.0 V**

Displays the input signal of the transmission fluid temperature (TFT) sensor.

- Fluid temperature is high (304°F/151°C) when the signal voltage is low (0 V).
- Fluid temperature is low (-40°F/C) when the signal voltage is high (5.0 V).

**TRANS SW A**
**TRANS SW B**
**TRANS SW C**
**Range:** ________ **ON/OFF**

Displays the status of the pressure switches used to indicate the transmission gear range. The manual valve feeds pressure to these normally open switches. The switches determine the digital logic at pins A, B, and C of the 3-pin TCM connector. The TCM uses this data for line pressure regulation, TCC application, and solenoid control:

- ON = battery voltage
- OFF = no voltage

Table 14-14 shows the switch states for the various gears.

**Table 14-14** *Switch states for various gears*

| Gear | Switch A | Switch B | Switch C |
|---|---|---|---|
| Park | OFF | ON | OFF |
| Reverse | ON | ON | OFF |
| Neutral | OFF | ON | OFF |
| 4th | OFF | ON | ON |
| 3rd | OFF | OFF | ON |
| 2nd | OFF | OFF | OFF |
| 1st | ON | OFF | OFF |
| Fault | ON | OFF | ON |
| Fault | ON | ON | ON |

**TRANS SW P**
**Range: ______ ON/OFF**

Displays the automatic transmission fluid pressure manual valve position switch assembly input:

- ON = 0 voltage signal
- OFF = B+ voltage signal

**TRANS TEMP(V)**
**Range: ______ 0 to 5.12 V**

Displays the input signal of the transmission fluid temperature (TFT) sensor on some Cadillac models and reads as follows:

- Below 1.00 V at normal operating temperature
- Above 2.00 V when the transmission may be overheating, which triggers the PCM to modify transmission and engine operation in an attempt to cool the transmission

**TRANS TEMP HOT**
**Range: ______ YES/NO**

Displays the general temperature of the transmission fluid on trucks with a 4L80E transmission:

- YES indicates overheating
- NO indicates light-load operating conditions

**TRN TORQ REDUCE**
**TORQ REDUCTION**
**Range: ______ YES/NO**
**TRN TORQ REQ(%)**
**Range: ______ 0 to 100%**

Displays the status of TCM torque reduction requests. When the TCM is requesting a reduction in engine torque, the reduce or reduction parameter reads YES. The request (REQ) parameter shows how much spark timing advance the TCM is commanding to reduce torque during a gear change to deliver a smoother shift.

A reading of 100% represents full advance.

**TURBINE RPM**
**Range: ______ 0 to 8192 RPM**

Displays the speed of the torque converter turbine shaft. The turbine speed should equal input speed in commanded gears 1, 2, and 3. The turbine speed should equal 75% of input speed in commanded gear 4.

**UP PRESS ERROR**
**Range: ______ see description**

Indicates whether the oncoming clutch was underpressured or overpressured during an upshift. This parameter is part of the adaptive report available on Saturn automatic transmissions.

- 128 = normal
- Less than 128 = overpressure
- More than 128 = underpressure

**UPSHIFT DES**
**Range: ______ YES/NO**

Displays the TCM commanded state for an upshift and reads as follows:

- YES when the TCM desires an upshift
- NO when an upshift is not desired

**UPSHFT IN PROG**
**Range: ____________________ YES/NO**

Indicates whether an upshift is actually occurring and reads as follows:

- YES when the transmission is performing an upshift
- NO when an upshift is not in progress

**UPSHFT PRESS ADPT**
**NM 1-2 LO**
**NM 1-2 HI**
**NM 2-3 LO**
**NM 2-3 HI**
**NM 3-4 LO**
**NM 3-4 HI**
**PF 1-2 LO**
**PF 1-2 HI**
**PF 2-3 LO**
**PF 2-3 H**
**PF 3-4 LO**
**PF 3-4 HI**
**Range: ____________________ –288 to 768 kPa or –422 to 112 psi**

Displays the adaptive pressure required to complete an upshift. These parameters are a part of the Saturn adaptive report. Values display for both low and high torque conditions.

Depending upon the position of the shift performance mode switch, different parameters are active. The NM parameters are normal mode, and PF parameters are performance mode.

**UPSHIFT REQ**
**Range: ____________________ YES/NO**

Indicates whether the VCM/PCM is requesting an upshift and reads as follows:

- YES if an upshift is requested
- NO at all other times

**VAT FUEL CUTOFF**
**Range: ____________________ YES/NO**

Indicates whether the vehicle antitheft system (VATS) has cut off, or inhibited, fuel delivery and reads as follows:

- YES if VATS has disabled fuel delivery
- NO for normal vehicle operation

**VEH SPEED**
**Range: ____________________ 0 to max speed**

Displays the vehicle speed input to the transmission control module (TCM).

On Saturn, the displayed value is taken directly from the vehicle speed sensor (VSS). This input is used by both the engine and transaxle control modules. Readings may vary by up to 5 MPH (8 KPH) from the value indicated on the speedometer.

On models with 4L60E and 4L80E transmissions, vehicle speed is calculated by the digital ratio adapter controller (DRAC).

- On 2WD models, the DRAC receives input from the output speed sensor.
- On 4WD models, the DRAC receives input from a sensor on the transfer case.

**WIDE OPEN THROT**
**Range:** ______ **YES/NO**

Indicates whether the engine is operating at maximum throttle opening. The engine must be running for this parameter to change from NO to YES. With the key on and the engine off, a fully open throttle should produce a maximum TP sensor voltage, but this parameter should read NO.

**WINTER LAMP**
**Range:** ______ **ON/OFF**

Indicates whether the Winter Indicator Lamp is commanded on.

**WINTER MODE**
**Range:** ______ **ON/OFF**

Indicates whether the perceived state of the Winter Mode Push Button is on.

# Airbag Parameters

This section defines the data parameters that are available from the airbag, or supplemental restraint system, electronic control module (ECM). To find the description for a specific parameter, locate the parameter name in the General Motors Index, then go the listed page.

**36V LOOP RSV(V)**
**DRV 36VLR(V)**
**PASS 36VLR(V)**
**Range: ______ 28.4 to 44.0 V**

Displays the reserve power, which ensures there is sufficient power to deploy the airbag if ignition voltage is low or lost in a collision. These parameters monitor the 36 V reserve power signal from the DERM to each air bag deployment loop. If the voltage falls below, or exceeds, the operating range specified above, a DTC sets.

On vehicles with a driver side airbag only, the 36 V Loop RSVP parameter displays. Vehicles with two front airbags display the driver (DRVR) and passenger (PASS) parameters.

**ADS A/D(V)**
**Range: ______ 0 to 5 V**

Displays the inflatable restraint front end discriminating sensor (ADS) signal, which is calibrated to supply a signal to the SDM when deceleration is severe enough to warrant deployment. ADS A/D(V) normally reads 2 to 3 V.

**AIRBAG CODES**
**Range: ______ YES/NO**

Indicates whether any airbag codes are stored in the SDM and reads YES with codes present.

**ARMING SENSOR**
**Range: ______ OPEN/CLSD**

Displays the status of the arming sensor switch contacts. The arming sensor monitors changes in vehicle velocity. It consists of a sensing element, a set of normally open switch contacts, a diagnostic resistor, and two diodes. When a low-level velocity change occurs, the sensing element closes the normally open switch contacts and supplies voltage to the high side of the deployment module.

**AUX 1 LP**
**Range: ______ YES/NO**
**AUX 2 LP**
**Range: ______ YES/NO**

Indicates whether the AUX 1 or AUX 2 loop is enabled or disabled. Reads YES when enabled.

**CAL REV**
**Range: ______ XX**

Displays the calibration revision level, a 2 digit number, of software use by the SDM.

**CODE HISTORY**
**Range: ______ BXXX**

Displays the diagnostic trouble codes (DTCs) stored in SDM memory.

**CRANK**
**Range: ______ YES/NO**

Displays the status of the cranking input to the DERM and reads YES when the engine is cranking and system voltage is applied to the DERM cranking input.

During cranking, the DERM grounds the inflatable restraint indicator circuit. This signals the DERM to perform an SIR diagnostic system test.

**DISCRIM SENSOR**
**Range: ______ OPEN/CLSD**

Displays the status of the discriminating sensors. Reads OPEN when open, CLSD when closed.

Two discriminating sensors monitor vehicle velocity changes. Each sensors contains a sensing element, a set of normally open switch contacts, and a diagnostic resistor.

When a high-level velocity change occurs, the sensing element closes the normally open switch contacts. This grounds the low side of the deployment module. The two discriminating sensors are wired in parallel. The reading is the switch status of the parallel sensor circuit.

**DR BELT A/D(V)**
**DR BELT RV(V)**
**DRV BELT HIGH**
**DRV BELT LOW**
**Range: ______ 0 to 12 V**

Displays the status of the driver seat belt. Reads 12 V if the belt is buckled and 0 V if the belt is not buckled.

**DR TENS DIFF(V)**
**Range: ______ 0 to 400 mV**

Displays the difference between DRV BELT HIGH and DRV BELT LOW parameters values as millivolts (mV).

**DRIVER BAG LO(V)**
**Range: ______ 0 to 20V**

Displays the driver frontal low terminal voltage.

**DRIVER BUCKLED**
**Range: ______ YES/NO**

Indicates whether the driver seat belt is buckled or unbuckled after the ignition is turned on.

**DRV IMPACT ID**
**DRIVER SIDE IMPACT SENSOR ID**
**Range: ______ XX**

Displays the driver side impact sensor (SIS) identification, a 2-digit number, which is sent to the SDM when the ignition first turns on.

**DRV FR LP ENBLD**
**Range: ______ YES/NO**

Indicates whether the SDM has enabled the driver inflator loop. Reads YES when enabled.

**DRV PRET LP ENB**
**DRV SIDE LP ENB**
**Range: ______ YES/NO**

Indicates whether the SDM has enabled the driver pretensioner loop. Reads YES when enabled.

**DRV SOURCE(V)**
**PASS SOURCE(V)**
**Range: ______ variable**

Displays the source voltage to the deployment loops, which the DERM monitors for circuit and component malfunctions.

Resistors in the arming sensor and the discriminating sensor make it possible for a small amount of current to pass through the deployment loops during normal, non-deployment operation. If the monitored voltage falls outside the expected limits, the DERM sets a DTC and illuminates the inflatable restraint warning lamp.

**DRVR BELT STATUS CHANGED THIS IGN**
**Range:** ______ **YES/NO**

Indicates if the driver seat belt was been buckled or unbuckled after the ignition is turned on.

**DRVR FRONTAL LOOP ENABLED**
**Range:** ______ **YES/NO**

Indicates whether the SDM has been programmed for the driver frontal deployment loop.

**DRVR LOOP RES**
**Range:** ______ **0 to 6.6** Ω

Displays the resistance in the driver deployment loop.

**DRVR PRET RES**
**Range:** ______ **0 to 6.6** Ω

Displays the resistance in the driver seat belt pretensioner deployment loop.

**DRVR PRETENSIONER LOOP ENABLED**
**Range:** ______ **YES/NO**

Indicates whether the SDM has been programmed for the drivers seat belt pretensioner deployment loop.

**ELEC FRONT SENSOR ID 1**
**ELEC FRONT SENSOR ID 2**
**Range:** ______ **XX**

Displays the front end sensor #1 and #2 identification signals being sent to the sensing and diagnostic (SDM).

- Sensor #1 is the driver or left frontal sensor.
- Sensor #2 is the passenger or right frontal sensor.

**IGN(V)**
**Range:** ______ **0 to 16 V**

Displays the system voltage measured by the SDM at its ignition feed.

**IGN 1(V)**
**Range:** ______ **(range 0 to 16 V**

Displays the ignition power available to the high side of the deployment loop. If adequate ignition voltage is not available, the DERM provides 36 V reserve power for air bag deployment.

Should read as follows:

- About 12 to 12.5 V with the key on and the engine not running
- About 14 to 16 V on an engine at idle
- As low as 10 V during cranking

**LAMP CONTROL**
**Range:** ______ **ON/OFF**

Displays the warning lamp state as commanded by the SDM.

**LAMP DRV FBK**
**Range:** ______ **ON/OFF**

Displays the warning lamp state feedback signal to the SDM.

**LAMP ON TIME**
**Range: ______ 0 to 182 hours**

Displays the continuous warning lamp on time.

**LH SIDE DIF(mV)**
**Range: ______ 0 to 400 mV**

Shows the difference between PAS SIDE HIGH and PAS SIDE LOW values as millivolts (mV).

**LH SIDE LOW(V)**
**Range: ______ 0 to 20V**

Displays the passenger low terminal voltage supplied to the SDM.

**LH SIDE RES**
**Range: ______ 0 to 6.6 Ω**

The SDM performs the resistance measurement test once each ignition cycle and verifies the ignition and 23 VLR voltages are within the normal ranges. Then the SDM sources a constant current to the LH side air bag deployment loop. The SDM then measures the voltage drop across the deployment loop and converts the measured voltage value to a LH side air bag deployment loop resistance value.

**PAS BAG HI(V)**
**PAS BAG LO(V)**
**Range: ______ 11.6 to 26.8 V**

Displays voltage on the low (ground) side of the passenger airbag deployment loop and should read within 41% to 61% of the 36 V reserve power parameter. If voltage falls below this value, a code is set and the airbag warning lamp turns on.

**PAS BELT LO(V)**
**Range: ______ 11.6 to 26.8 V**

Displays the voltage on the low (ground) side of the passenger belt pretensioner deployment loop. Readings should be within 41% to 61% of the 36 V reserve power parameter. If voltage falls below this value, a code is set and the Airbag MIL turns on.

**PAS PRET LP ENB**
**Range: ______ YES/NO**

Indicates whether the passenger pretensioner deployment loop is enabled or disabled, YES means enabled.

**PAS SIDE LP ENB**
**Range: ______ YES/NO**

Indicates whether the passenger side airbag deployment loop is enabled or disabled, YES means enabled.

**PASS BUCKLED**
**Range: ______ YES/NO**

Displays the current status of the passenger seat belt and reads YES when buckled.

**PASS DIFF(mV)**
**Range: ______ 0 to 500 mV**

Displays the difference between the passenger frontal high and driver frontal low terminals.

**PASS F LP ENBLD**
**Range: ______ YES/NO**

Indicates if the passenger frontal air bag deployment loop is enabled. Reads YES if enabled.

**PASS IMPACT ID**
**Range: ______ 10 to 99**

Displays the two digit ID number and typically reads 43.

**PASS LOOP RES**
**Range: ______ 0 to 6.6 Ω**

Displays the resistance in the passenger deployment loop.

**PASS PRET RES**
**Range: ______ 0 to 6.6 Ω**

Displays the resistance in the passenger seat belt pretensioner deployment loop.

**PASS PRETENSIONER LOOP ENABLED**
**Range: ______ YES/NO**

Indicates whether the SDM has been programmed for the passenger seat belt pretensioner deployment loop.

**PASSENGER SIDE IMPACT SENSOR ID**
**Range: ______ XX**

Displays the passenger side impact sensor (SIS) identification, a 2-digit number, which is sent to the SDM when the ignition first turns on.

**PASS SIR CTRL**
**Range: ______ LO/HI**

Displays the current status of passenger SIR deployment loop control driver.

**PASS SIR DISABL**
**Range: ______ LO/HI**

Indicates whether the passenger air bag deployment loop is enabled or disabled.

**PS BAG RV(V)**
**Range: ______ 0 to 30 V**

Displays the voltage of the passenger airbag energy reserve capacitors inside the SDM.

**PS BELT RV(V)**
**Range: ______ 0 to 30 V**

Displays the voltage of the passenger seat belt pretensioner energy reserve capacitors inside the SDM.

**PS SRS DISABLE**
**PS SRS ENABLE**
**Range: ______ LO/HI**

Indicates whether the passenger airbag deployment loop is enabled, reads HI if enabled.

**PS TENS DIFF(V)**
**Range: ______ 0.0 to 0.5 V**

Displays the voltage differential between the RH high and RH low pretensioner deployment loops measured by the SDM.

**QDM FAULT**
**Range: ______ YES/NO**

Indicates whether a quad driver circuit fault exists. Reads YES if a fault is detected. A single quad driver may power up to four circuits.

**RESTRAINT ID**
**Range: ____ 2/4**

Indicates the seventh digit of the VIN which defines the type of restraint system on the vehicle:

- 2 = a frontal air bag system
- 4 = a frontal and side air bag system

**RH SIDE DIF(mV)**
**Range: ____ 0 to 500 mV**

Displays the voltage differential between the RH high and RH low pretensioner deployment loops measured by the SDM. A typical range is 4 to 8 mV.

**RH SIDE LOW(V)**
**Range: ____ 11.6 to 26.8 V**

Displays the DERM status of the low (ground) side of the passenger side airbag deployment loop. Readings should be within 41% to 61% of the 36 V reserve power parameter. If voltage falls below this value, a code is set and the Airbag MIL turns ON.

**RH SIDE RES**
**Range: ____ 0 to 6.6 Ω**

Displays the right side air bag deployment loop resistance. A typical reading is 0.5 to 1.2 ohms.

The SDM performs the resistance measurement test once each ignition cycle and verifies that ignition and 23 VLR voltages are within normal range. The SDM applies a constant current to the RH side air bag deployment loop. The SDM then measures the voltage drop across the deployment loop and converts the measurement to a resistance value.

**RH TENS**
**Range: ____ 0 to 6.6 Ω**

Displays the right side pretensioner deployment loop resistance, typically 0.5 to 1.2 ohms.

The SDM performs the resistance measurement test once each ignition cycle and verifies that ignition and 23 VLR voltages are within normal range. The SDM applies a constant current to the pretensioner deployment loop. The SDM then measures the voltage drop across the deployment loop and converts the measurement to a resistance value.

**RH TENS DIF(mV)**
**Range: ____ 0 to 500 mV**

Displays the voltage differential between the RH high and RH low deployment loops. A typical reading is 4 to 8 mV.

**RH TENS LOW(V)**
**Range: ____ 11.6 to 26.8 V**

Displays the low (ground) side of the Passenger side pretensioner deployment loop voltage. Readings should be within 41% to 61% of the 36 V reserve power parameter. If voltage falls below this value, a code is set and the Airbag MIL turns on.

**SENSOR LOW(V)**
**DRIVER LOW(V)**
**DRV SNSRLO(V)**
**PASS LOW(V)**
**PASS SNSRLO(V)**
**Range: ____ 11.6 to 26.8 V**

Displays the DERM monitored circuit voltage on the low, or ground, side of the airbag deployment loop. Normal readings should be within 41% to 61% of the 36 V reserve power parameter. If voltage falls below this value, a DTC sets and the airbag warning lamp turns on.

The sensor parameter displays on vehicles with a driver side airbag only. Vehicles with driver side and passenger side airbags display the driver and passenger (PASS) parameters.

**SIR LAMP**
**Range: ______ ON/OFF**

Displays the status of the SDM internal air bag indicator driver.

**STEERING(OHMS)**
**DRVR RES(OHM)**
**PASS RES(OHM)**
**Range: ______ see description**

Displays the combined resistance of the airbag coil assembly. The DERM looks at these parameters during each ignition cycle. The value represents the resistance of the coil, the inflator module or initiator, the connectors, and the all of the associated wiring.

These parameters normally read 4.37 ohms.

- Too high of a reading sets a DTC and may indicate an open circuit.
- Too low of a reading also sets a DTC and may indicate a short circuit.

The steering parameter displays on vehicles with a driver side airbag only. Vehicles with two front airbags display the driver (DRVR) and passenger (PASS) parameters.

**SUP LAMP DRV**
**Range: ______ OK/FAULT**

Displays the state of supplemental inflatable restraint (SUP) lamp output circuits as follows:

- OK under normal conditions
- FAULT if the circuit is open or grounded

The warning lamp is in the instrument panel cluster (IPC). The inflatable restraint sensing and diagnostic module (SDM) communicates with the IPC using Class 2 serial data. The SDM commands the IPC to turn the warning lamp on and off through serial data communication.

The SIR system uses the warning indicator to do the following: Verify proper SIR system operation by commanding the lamp off via Class 2 serial data after 7 flashes. The instrument cluster flashes the lamp 7 times when the ignition switch is first turned ON. When lit, alerts the driver of electrical system malfunctions that could affect the operation of the SIR system.

Certain malfunctions may result in:

- Non-deployment in the case of a frontal crash or side impact crash
- Deployment for conditions less severe than intended

# Antilock Brake System Parameters

This section defines the parameters available from the antilock brake system Electronic Brake Control Module (EBCM) or Electronic Brake Traction Control Module (EBTCM).

**3RD CODE SET**
**4TH CODE SET**
**5TH CODE SET**
**6TH CODE SET**
**Range: 0 to 9999**

Shows mileage since ABS codes set conditions last failed for the third, fourth, fifth, or sixth time.

**4WD ACTIVE**
**Range: YES/NO**

Displays the operating status of the 4WD system on 4WAL and RWAL systems and reads:

- YES if the VCM disables ABS braking
- NO when ABS functions normally

**ABS ACTIVE**
**ABS STOP**
**Range: YES/NO**

Indicates if a stop was ABS assisted on Bosch 2, Delco-Moraine VI, and DBC 7 systems, reads:

- YES only when ABS is activated during braking
- NO at all other times

**ABS BATT(V)**
**Range: 0.0 to 17.1 V**

Displays the system voltage available for ABS operation on Delco-Moraine VI systems. This ECM input signal is the ignition switched battery voltage, and is used mainly for diagnostics. If the battery voltage is above or below a programmed threshold, the ECM disables the ABS.

**ABS BATT VOLTS**
**Range: NORM/LOW**

Indicates whether enough system voltage is available for ABS operation on Delco-Moraine III systems and reads:

- NORM (normal) if voltage is above 9.7 V, which is the minimum required for ABS operation
- LOW when voltage drops below 9.7 V

**ABS DISABLED**
**Range: YES/NO**

Displays ABS availability status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems and reads:

- YES only when ABS is disabled
- NO under normal operating conditions

The ABS disables itself under certain component failure conditions, or it can be disabled by the driver through a control switch.

**ABS DTC COL LCK**
**Range: YES/NO**

The PCM disables fuel when an ABS wheel speed sensor and a BCM DTC sets. When this failure occurs the engine starts then stalls after 5 seconds. The engine does not start if you attempt to start it on that same ignition cycle.

**ABS FAILED**
**Range:** ______ **YES/NO**

Indicates whether the electronic brake control module (EBCM) has failed on DBC 7 systems.

**ABS LAMP**
**Range:** ______ **ON/OFF**

Displays the status of the ABS warning lamp, operation varies by system.

Indicates the status of ABS lamp illumination request command from the EBTCM on Bosch and Delco Bosch 5.0/5.3 systems. The reading should match the condition of the warning lamp.

Indicates the status of the ABS lamp on the dash on VCM 4WAL systems. Each time the ignition is switched on, the lamp lights for a bulb check, then shuts off after about 2 seconds. When the VCM detects a system malfunction, it turns the lamp on. Depending on the type of malfunction, the lamp may stay on or shut off. Should a malfunction occur in this lamp circuit, the brake warning lamp on the dash acts as a backup.

Indicates the status of the antilock lamp on the instrument panel on 4WAL and RWAL systems. During normal operation, the lamp is off when no faults are present. The lamp lights continuously whenever a fault is present.

**ABS LAMP**
**Range:** ______ **ON/OFF/FLSH**

Displays the current status of the antilock lamp on the instrument panel on Delco-Moraine III and VI systems. It always appears on the right side of the top line in the ABS codes and data display. Reads as follows:

- OFF when the lamp is off and ABS is fully operational.
- FLSH when the lamp is flashing. This means a fault was detected that does not affect current ABS operation, but should be fixed to avoid additional ABS problems.
- ON when the lamp is lit continuously. This means a fault was detected that does affect current ABS operation. If the fault affects the front ABS, the rear ABS operates and the front brakes operate in a non-ABS condition. If the fault affects the rear ABS or critical parts of the system, ABS is completely disabled and all the brakes operate in a basic non-ABS mode.

If this parameter does not match the condition of the warning lamp on the instrument panel, a fault may exist in the lamp circuit.

**ABS LAMP FBK**
**Range:** ______ **ON/OFF**

Displays the feedback circuit status from the ABS warning lamp and normally reads ON during vehicle operation.

**ABS PROBLEM**
**Range:** ______ **YES/NO**

Indicates whether the EBTCM recognized system failure on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**ABS PUMP**
**Range:** ______ **ON/OFF**

Displays the EBTCM commanded state of the ABS pump motor on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**ABS PUMP REQ**
**Range:** ______ **ON/OFF**

Displays the commanded state of the pump motor control relay.

**ABS RELAY**
**Range:** ________ **ON/OFF**

Displays the state of the ABS relay and reads ON during normal vehicle operation. The EBCM commands the ABS relay on when Ignition positive voltage is present.

**ABS RELAY CMD**
**Range:** ________ **ON/OFF**

Indicates whether the electronic brake control module (EBCM) is commanding the solenoid valve control relay to energize on DBC 7 systems and reads ON when the relay command is on.

**ABS RELAY FBK**
**Range:** ________ **ON/OFF**

Displays the feedback signal from the solenoid valve control relay on DBC 7 systems and reads ON when the relay contacts are closed to energize the solenoid and open the valve.

**ABS RELAY REQ**
**Range:** ________ **ON/OFF**

Displays the actual state of the electronic brake control relay and reads ON when the relay is on.

**ABS REQ TORQ(%)**
**Range:** ________ **variable**

Displays the amount of torque requested by the electronic brake control module (EBCM) on Bosch 2 systems.

**ABS STATE**
**Range:** ________ **ON/OFF**

This is one of four parameters that display only with a related trouble code on Bosch 2 systems. It indicates whether the ABS was active during braking when a code set.

**ABS STATE**
**Range:** ________ **ON/OFF/REAR ONLY**

Displays the current ABS operating state on Delco-Moraine III systems and reads as follows:

- ON when the ABS is fully operational.
- OFF when no antilock functions are available.
- REAR ONLY when rear ABS is operational, but front ABS operation is disabled.

**ABS TEST**
**Range:** ________ **ENABLED/DISABLED**

Displays the status of an ABS test, reads ENABLED only when the ABS test is running.

**ABS WRNG LAMP**
**Range:** ________ **(ON/OFF**

Displays the status of the antilock warning lamp on the instrument panel on DBC 7 systems.

**AH ACTIVE**
**Range:** ________ **ON/OFF**
**AH ACTIVE**
**Range:** ________ **YES/NO**

Displays the operating status of the active handling (AH) system and reads as follows:

- ON or YES when active handling is on
- OFF or NO when it is off

**AH LAMP**
**Range: ______ ON/OFF**

Displays the electronic brake traction control module (EBTCM) command status to the active handling lamp on Bosch 2 systems and reads ON when the EBTCM is commanding the lamp on.

**AH PROBLEM**
**Range: ______ YES/NO**

Indicates whether a problem exists in the active handling (AH) system on Bosch 2 systems.

**ANLG STG POS**
**Range: ______ –720 to 720°**

Displays the angle that the steering wheel is turned.

**ASR SWITCH**
**ASR SW**
**Range: ______ ON/OFF**

Displays the status of the acceleration slip regulation (ASR) switch on Bosch 2 ASR systems and read ON when on, OFF when off.

**AUTO LRN ACTIVE**
**Range: ______ not available**

No information is available for this Delco-Moraine VI parameter.

**AUTO LRN TIMER**
**Range: ______ ON/OFF**

Indicates whether the vehicle theft deterrent (VTD) is operating in learn mode (reads ON) or whether it has timed out (reads (OFF).

**BATTERY(V)**
**Range: ______ 11.5 to 14.5 V**

Displays the PCM calculated battery voltage based on a sensing circuit across the supply voltage circuit. There is not a sensor to measure battery voltage.

The reading should be close to normal charging system regulated voltage (13.5 to 14.5 V at idle) with the engine running. Compare to actual voltage measured at the battery or alternator.

**BRAKE FLUID LVL**
**Range: ______ HI/LOW**

Displays the actual status of the brake fluid level switch.

**BRAKE LAMP**
**Range: ______ ON/OFF/CKT OPEN**

Displays the status of the brake lamp on Delco-Moraine VI systems. Compare this reading to the brake lamp command parameter.

**BRAKE LAMP CMD**
**Range: ______ ON/OFF**

Displays the present state of the ABS module output signal to the brake lamp on Delco-Moraine VI and 4WAL systems.

**BRAKE LAMP SW**
**Range: ______ ON/OFF**

Displays the status of the brake lamp switch, operation varies by system.

Indicates the status of the pedal-mounted brake lamp switch on Bosch 2 systems, and reads ON when the switch is on.

Indicates the status of the brake lamp on the dash on VCM 4WAL systems. Each time the ignition is turned on, the lamp lights for a bulb check, then shuts off after about 2 seconds. The brake lamp acts as a backup if the ABS lamp malfunctions.

Indicates the status of the brake lamp on 4WAL systems. For diagnostic purposes, compare this reading to the brake lamp command parameter. It reads ON if the parking brake is applied or a basic hydraulic brake problem exists. The ABS ECM also may light the red brake lamp to warn the driver if a fault occurs in the antilock lamp circuit that prevents the lamp from lighting.

**BRAKE PRESS**
**Range: ______ see description**

Indicates three states of the ABS accumulator pressure and the pressure switch circuit on Delco-Moraine III systems. It reads as follows:

- NORM (normal) when accumulator pressure is above 1800 psi, which is enough for normal and ABS operation.
- LOW when accumulator pressure is below 1800 psi. In this case, the accumulator may not provide enough pressure for ABS or normal brake operation.
- CKT OPEN (circuit open) when the pressure state is unknown. A fault may exist in the pressure switch circuit.

**BRAKE PRESS(V)**
**Range: ______ variable**

Displays the pressure signal from the brake pressure sensor on Bosch 2.

**BRAKE SW**
**Range: ______ ON/OFF**

Displays the status of the brake pedal switch on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3.

**BRAKE SW**
**Range: ______ ON/OFF**

Displays the status of the brake switch on VCM 4WAL systems and reads as follows:

- ON when the brake pedal is pressed
- OFF whenever the brakes are not applied

When the switch is on, the VCM monitors the wheel speed sensors for signs of wheel lockup, until vehicle braking stops.

**BRAKE SW**
**Range: ______ON/OFF/CKT OPEN**

Displays the current position of the brake switch on Delco-Moraine III and VI systems. It appears on the left side of the top line in the ABS codes and data display:

- ON if the circuit is closed and ABS is operational. The brake switch circuit closes when the pedal is pressed.
- OFF when the brake pedal is not pressed.
- CKT OPEN when the ABS module detected a fault in the brake switch circuit. The ABS may be fully or partially disabled.

**BRAKE SW**
**Range: ______OPEN/CLSD**

Displays the state of the brake switch circuit input. An OPEN reading indicates 0.0 voltage (brake switch open, brake pedal applied). A CLSD reading indicates B+ voltage (brake switch closed, brake pedal released). When OPEN, the torque converter clutch and cruise control disengage.

**BRAKE SW STATUS**
**BRAKE SW STAT**
**Range: ______ ON/OFF**

Displays the status of the pedal-mounted ABS brake switch on DBC 7 systems. Reads ON when the switch is in the on position.

**BRAKE TEMP STAT**
**Range: ______ EXCD/NORM**

Displays the brake temperature status. Reads NORM (normal) when brake temperature is within range and EXCD (exceeded) when brake temperature is above the traction control thermal cutoff point, which suspends traction control until brake temperature cools down.

**BRAKE TRAVEL SW**
**Range: ______ ON/OFF**

Displays the state of the extended travel brake switch.

**BRAKE WRN LAMP**
**Range: ______ ON/OFF**

Displays the state of the brake indicator lamp.

**BRK THRML MDL**
**Range: ______ EXCD/NORM**

Indicates whether brake rotor temperature is above a preset limit on DBC 7 systems and reads:

- EXCD (exceeded) if the brake rotor is so hot that it is in danger of being permanently damaged
- NORM (normal) at all other times

**CENTERING DONE**
**Range: ______ YES/NO**

Indicates whether the electronic brake traction control module (EBTCM) has learned the steering wheel center position for the current key on and engine-run drive cycle on Bosch 2.

**CONFIG. ID**
**Range: ______ variable**

Displays the electronic brake traction control module (EBCM) software version.

**CTRLR BATT(V)**
**Range: ______ 0 to 29.83**

Displays the battery voltage signal to the electronic suspension controller (ESC) on Bosch 2.

**DEL TORQUE(%)**
**Range: ______ 0 to 100%**

Displays the engine torque as calculated by the PCM as a percentage.

**DES TORQUE**
**Range: ______ 0 to 100%**

Displays the EBTCM desired torque request to the ECM as duty cycle on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems. This value is used to reduce engine torque during certain traction control operations.

**DES TORQUE (N-M)**
**Range: ______ not available%**

Displays the desired amount of torque requested by the EBTCM as Newton-meters.

**DIFF. PRESS SW**
**Range: ______ NORM/LOW**

No information is currently available for this 4WAL parameter.

**DRP ACTIVE**
**Range: ______ YES/NO**

Displays the state of the dynamic rear proportion (DRP).

**DRP DISABLED**
**Range: ______ YES/NO**

Indicates whether the EBCM disabled DRP due to a malfunction.

**DOMESTIC**
**Range: ______ variable**

Identifies a US specification system.

**DRV SEL SW(V)**
**Range: ______ ON/OFF**

Displays the status of the driver controlled ABS/TCS disable switch on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**EBTCM ETS ACTV**
**Range: ______ ON/OFF**

Indicates whether traction control is active. Reads ON when active and OFF at all other times.

**ECU**
**Range: ______ (identification number**

Displays the identification number of the installed electronic control unit (ECU) on Bosch 2 systems. It is used to determine if the correct ECU is installed on a specific vehicle.

**ENABLE RELAY**
**Range: ______ ON/OFF**

Displays the state of the ABS module output signal to the enable relay on Delco-Moraine VI and RWAL systems. This relay provides battery voltage and current to the ABS module. The enable relay also powers the electromagnetic brakes (EMBs) when applicable.

**ENG RPM**
**Range: ______ 0 to 10,200**

Displays the engine speed.

**ENG TORQUE**
**Range: ______ 0 to 100%**

Displays the duty cycle of ECM reduced torque response to the electronic brake traction control module (EBTCM) request to reduce engine torque output during a traction control event on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**ETS ACTIVE**
**Range: ______ YES/NO**

Indicates whether the electronic traction system (ETS) is functioning and activated on DBC7 systems. Reads YES when ETS is activated, NO at all other times.

**ETS ACTIVE LAMP**
**Range: ______ ON/OFF**

Indicates whether the electronic brake control module (EBCM) has commanded the ETS active lamp on the instrument cluster to light on DBC7 systems.

**ETS ACTIVE LMP**
**Range: ______ ON/OFF**

Indicates whether the electronic traction control system (ETS) is being commanded on.

**ETS DISABLE LAMP**
**Range: ______ ON/OFF**

Displays the command to the electronic traction control system (ETS) disable indicator.

**ETS ENABLED**
**Range: ______ YES/NO**

Displays the state of the electronic traction system (ETS) on DBC7 systems reads as follows:

- YES when ETS is functional
- NO when ETS is disabled because the traction control switch is off or there is a malfunction

**ETS PRESENT**
**Range: ______ YES/NO**

Indicates whether the vehicle is currently in an electronic traction control system (ETS) event.

**ETS WRNG LAMP**
**Range: ______ ON/OFF**

Indicates whether the electronic brake control module (EBCM) is commanding the electronic traction system (ETS) lamp on or off on DBC 7 systems.

**EXPORT**
**Range: ______ variable**

Identifies a non-US specification system.

**F PRIME ACTV**
**R PRIME ACTV**
**Range: ______ YES/NO**

Indicates the status of the front and rear prime valve solenoids on Bosch 2 systems. Reads YES if the electronic brake traction control module (EBTCM) has activated a solenoid.

**FRNT ENBL RELAY**
**REAR ENBL RELAY**
**Range: ______ ON/OFF**

Displays the status of the front and rear enable relays on Delco-Moraine III systems. The relays provide battery power to the front and rear solenoids for ABS operation. Read as follows:

- ON during normal operation
- OFF when ABS operation is not available

Compare these readings to the ABS State parameter to troubleshoot a problem that affects either front or rear ABS operation.

**F TCS ISO ACTV**
**R TCS ISO ACTV**
**Range: ______ YES/NO**

Displays the status of the front and rear traction control system isolation (TCS ISO) valves on ABS systems. Reads YES when the valves are active.

**HWPS(A)**
**HWPS(B)**
**Range: ______ HI or LO**

Displays the steering wheel position sensor signal A or B input.

**HWPS INDEX**
**Range: HIGH/LOW**

Displays the hand wheel position sensor (HWPS), or steering wheel, centered position index on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**ICCS1 EQUIPPED**
**ICCS2 EQUIPPED**
**Range: YES/NO**

Indicates whether the vehicle has VSES (ICCS1 or ICCS2) installed, reads YES if equipped.

**IGNITION 3(V)**
**Range: 0 to 12 V**

Displays the ignition feed voltage measured at the transfer case shift control module.

**IGNITION 3 SW**
**Range: ON/OFF**

Indicates the presence of a transfer case shift control module, reads YES if equipped.

**ISOLATION SOL**
**DUMP SOLENOID**
**Range: ON/OFF**
**VLV RESET SW**
**Range: OPEN/CLSD**

Displays the status of the isolation valve, dump valve, and a valve reset switch on RWAL systems. RWAL uses a control valve assembly to adjust hydraulic pressure in the rear channel during ABS braking.

The isolation valve and dump valve are solenoid operated and these parameters show the status of the solenoids:

- When ISOLATION SOL reads OFF, the isolation valve allows fluid to pass from the master cylinder to the rear channel. The isolation valve is normally open.
- When DUMP SOLENOID reads OFF, the dump valve is preventing fluid from passing to the accumulator from the rear channel. The dump valve is normally closed.

The valve reset switch is a spring-loaded spool valve with an electrical contact at one end. The valve moves if a difference in pressure exists between the isolation channel and the dump channel in the control valve assembly. When the difference is great enough, the electrical contact on the valve grounds the ECM logic circuit. Under these conditions, the display reads CLSD (closed). The normal reading is OPEN.

**L-FRONT EMB**
**R-FRONT EMB**
**Range: ON/OFF**

Displays the present state of the ABS module output signal to the left and right front electromagnetic brake (EMB) on Delco-Moraine VI systems. They read ON during front wheel ABS operation and OFF at all other times.

**L-FRONT SOL**
**R-FRONT SOL**
**Range: ON/OFF**

Displays the present state of the ABS module output signals to the left and right front solenoids on Delco-Moraine VI systems. They read ON during front wheel ABS operation.

**LAT ACCEL(g)**
**Range: __________________________________________________–1.28 to +1.27**

Displays the output signal of the centrifugal force sensor as the vehicle turns on Bosch 2 ASR.

**LAT ACCEL(V)**
**Range: __________________________________________________ 0 to 4.99 V**

Displays the lateral accelerometer sensor voltage signal to the electronic brake traction control module (EBTCM) on Bosch 2 systems.

**LEFT TC FBK**
**Range: __________________________________________________0 to 20 A**

Displays the amount of feedback current from the left TCS motor.

**LEFT TCS AMP**
**Range: __________________________________________________0 to 20 A**

Displays the amount of commanded current to the left TCS motor.

**LEFT TCS MOTOR**
**LF ABS MOTOR**
**Range: __________________________________________________ FWD/REV**

Displays the commanded direction of the left TCS motor.

**LF DAMP ACT(%)**
**LR DAMP ACT(%)**
**RF DAMP ACT(%)**
**RR DAMP ACT(%)**
**Range: __________________________________________________ 0 to 100%**

Displays the position of the left front (LF), right front (RF), left rear (LR), and right rear (RR) shock position sensors on Bosch 2 systems as a percentage. The higher the reading, the greater the amount of shock compression.

**LF DUMP VLV**
**LF DMP VLV COM**
**RF DUMP VLV**
**RF DMP VLV COM**
**LR DMP VLV COM**
**RR DMP VLV COM**
**REAR DMP COM**
**REAR DUMP COM**
**Range: __________________________________________________ ON/OFF**

Displays the commanded state of the left front (LF), right front (RF), left rear (LR), right rear (RR), and REAR dump solenoid valves.

**LF DMP FBK**
**LF DUMP VLV FBK**
**RF DMP FBK**
**RF DUMP VLV FBK**
**LR DMP VLV FBK**
**RR DMP VLV FBK**
**REAR DMP FBK**
**REAR DUMP FBK**
**Range: __________________________________________________ ON/OFF**

Displays the feedback state of the left front (LF), right front (RF), left rear (LR), right rear (RR), and rear dump solenoid valves.

**LF HOLD SOL**
**Range: ACTIVE/INACTIVE**

Displays the left front (LF) hold solenoid and valve status, or holding pressure to the wheel, on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**LF HOLD SOL**
**RF HOLD SOL**
**REAR HOLD SOL**
**Range: ON/OFF**

Displays the hold status for the left front (LF), Rear Front (RF) and rear solenoids on Delco-Moraine III systems. These systems use three solenoids to hold brake pressure at the level currently being applied by the brake pedal during ABS braking. Separate solenoids are used for the left and right front brakes; a single solenoid is used for both rear brakes.

These parameters should read as follows:

- OFF when the brakes are not applied
- ON and OFF alternately during ABS braking readings as the solenoids are energized and de-energized

**LF HOLD SOL FDBK**
**RF HOLD SOL FDBK**
**REAR HLD SOL FBK**
**Range: HI/LO**

Displays the hold solenoid feedback status for the left front (LF), right front (RF) and rear solenoids on Delco-Moraine III systems. The reading is voltage sensed by the ABS module at the solenoid when the enable relays are on.

These parameters read as follows:

- LO (low) if the solenoid is energized and the feedback voltage should be low as the circuit is grounded.
- HI (high) when the solenoid is de-energized and the feedback voltage reads high as battery voltage is available.

Use the feedback readings to help pinpoint solenoid circuit faults. Be aware, a time delay may exist between the solenoid readings and the feedback readings due to switching delays in the ABS module and circuits.

**LF INLET SOL**
**LR INLET SOL**
**RF INLET SOL**
**RR INLET SOL**
**Range: ON/OFF**

Displays the ECM commands to the left front (LF), right front (RF), left rear (LR), or right rear (RR) inlet solenoids on Bosch 2 and DBC 7 systems.

- ON = the solenoid is energized
- OFF = the solenoid is not energized

**LF ISO ACTIVE**
**LF PRIME ACTV**
**RF ISO ACTIVE**
**RF PRIME ACIE**
**Range: ____ YES/NO**

Displays the VCM commands to the various valves used for controlling hydraulic pressure during antilock braking on DBC 7 systems. The valves are a part of the brake pressure modulator valve (BPMV) assembly.

The BPMV is divided into four hydraulic channels: left front (LF), right front (RF), left rear (LR), and right rear (RR). This allows the VCM to control hydraulic pressure independently for each channel during ABS braking.

**LF ISO SOL**
**RF ISO SOL**
**Range: ____ ON/OFF**

Displays the state of the left front (LF) and right front (RF) isolation solenoid valves.

**LF ISO VALVE**
**RF ISO VALVE**
**LF PWM VALVE**
**REAR PWM VALVE**
**RF PWM VALVE**
**Range: ____ ON/OFF**

Displays the commands to the various valves used for controlling hydraulic pressure during antilock braking on VCM 4WAL systems. These valves are part of the brake pressure modulator valve (BPMV), which is located on the left front inner fender.

The BPMV is divided into three hydraulic channels: left front (LF), right front (RF), and rear. Each channel has an isolation valve and a pulse width modulated (PWM) valve. Isolation valves maintain hydraulic pressure, and PWM valves increase or reduce pressure. This allows the VCM to control pressure independently for each channel.

The valves also cycle during the system self-test. Self-test occurs the first time the vehicle reaches 8 MPH (13 KPH) during an ignition cycle.

**LF ISO VLV COM**
**RF ISO VLV COM**
**LR ISO VLV COM**
**RR ISO VLV COM**
**REAR ISO COM**
**Range: ____ ON/OFF**

Displays the commanded state of the left front (LF), right front (RF), left rear (LR), right rear (RR) or rear isolation solenoid valves.

**LF ISO VLV FBK**
**RF ISO VLV FBK**
**LR ISO VLV FBK**
**RR ISO VLV FBK**
**REAR ISO FBK**
**Range: ____ ON/OFF**

Displays the feedback state of the left front (LF), right front (RF), left rear (LR), right rear (RR) or rear isolation solenoid valves.

**LF PWM VLV FBK**
**RF PWM VLV FBK**
**REAR PWM FBK**
**Range: ______ ON/OFF**

Displays the feedback signals from the valves that control hydraulic pressure during antilock braking on VCM 4WAL systems. Refer to the isolation valve parameters for a more details.

**LF MOTOR AMPS**
**RF MOTOR AMPS**
**REAR MOTOR AMPS**
**Range: ______ 0 to 20 A**

Displays the current applied to the motors by the ABS module on Delco-Moraine VI systems. When the motors are driven in reverse, a minus (–) sign displays in front of the value.

Compare these values to those for the motor feedback parameters. During motor operation, these readings should be a higher than feedback parameter readings.

**LF MOTOR FBK**
**RF MOTOR FBK**
**REAR MOTOR FBK**
**Range: ______ 0 to 20 A**

Displays the feedback current from the motors to the ABS module on Delco-Moraine VI systems. Compare these values to those for the motor amperage parameters. During motor operation, these feedback readings should be lower than motor amps readings.

**LF MTR CMD(AMP)**
**Range: ______ 0 to 20 A**

Displays the amount of commanded current to the Left Front ABS motor.

**LF MTR FBK(AMP)**
**Range: ______ 0 to 20 A**

Displays the amount of feedback current from the Left Front ABS motor.

**LF OUTLET SOL**
**LR OUTLET SOL**
**RF OUTLET SOL**
**RR OUTLET SOL**
**Range: ______ ON/OFF**

Displays the PCM commands to the left front (LF), right front (RF), left rear (LR), and right rear (RR) outlet solenoids on Bosch 2 and DBC 7 systems and read as follows:

- ON if the solenoid is energized
- OFF if the solenoid is not energized

**LF PRIME SOL**
**Range: ______ ON/OFF**

Displays the left front (LF) TCS prime, or inlet, solenoid and valve status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**LF REL SOL FDBK**
**RF REL SOL FDBK**
**REAR REL SOL FBK**
**Range: ______ HI/LO**

Displays the feedback from the release solenoids on Delco-Moraine III systems. The reading is the voltage the ABS module senses at the solenoid when the enable relays are on.

- LO = the solenoid is energized and the circuit is grounded
- HI = the solenoid is de-energized and battery voltage is available

Use the feedback readings to help isolate faults in the solenoid circuits. Be aware, a time delay may exist between solenoid state and feedback readings due to switching delays in the ABS module and circuits.

**LF RELEASE SOL**
**Range: ON/OFF**

Displays the left front (LF) release, or outlet, solenoid and valve status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**LF RELEASE SOL**
**RF RELEASE SOL**
**REAR RELEASE SOL**
**Range: ON/OFF**

Release solenoid status on Delco-Moraine III systems. These solenoids work in conjunction with hold solenoids to modulate braking force at the wheels and provide antilock capabilities. Separate solenoids are used for the left and right front brakes; a single solenoid is used for both rear brakes. These parameters read as follows:

- OFF if the brakes are not applied
- ON and OFF alternately during ABS braking as the solenoids are energized and de-energized

**LF ROTOR(°C)**
**Range: –40 to +650°C**

Displays the estimated temperature of the left front rotor on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems. The EBTCM uses it to determine if the brake is available for traction control.

**LF SOL CMD**
**Range: ON/OFF**

Displays the commanded state of the combined left front (LF) inlet and outlet solenoid valves. It also gives an indication of the hydraulic mode of the valves.

**LF SNSR(V)**
**LR SNSR(V)**
**RF SNR(V)**
**RR SNSR(V)**
**Range: 0 to 4.99**

Displays the voltage signals from the left front (LF), right front (RF), left rear (LR), or right rear (RR) shock position sensor on Bosch 2 systems. The higher the voltage reading, the greater the shock compression.

**LF TCS ISO ACTV**
**Range: ON/OFF**

Displays the left front (LF) isolation valve status on Bosch and Delco Bosch 5.0/5.3 systems. This parameter reads ON when the valve is isolating brake fluid from the master cylinder.

**LF WHEEL**
**Range: 0 to max speed**

Displays the Left front wheel speed measured by the wheel speed sensor on Bosch and Delco Bosch 5.0/5.3 systems.

**LF WHEEL(MPH)**
**LF WHEEL(RPM)**
**LR WHEEL(MPH)**
**LR WHEEL(RPM)**
**RF WHEEL(MPH)**
**RF WHEEL(RPM)**
**RR WHEEL(MPH)**
**RR WHEEL(RPM)**
**Range: ______ 0 to vehicle max**

Displays the speed signals being sent by the left front (LF), Left Right (LR), right front (RF), and right rear (RR) wheel speed sensors to the ECM. Wheel speeds should be equal to each other and to vehicle speed when driving in a straight line without braking. Wheel speeds vary as the vehicle turns a corner and also vary during braking without ABS. During ABS braking, wheels speeds should remain close to equal.

On 4WAL systems values display as RPM instead of MPH due to the wide variety of wheel sizes available for these vehicles.

**LF WHL**
**Range: ______0 to 99**

Displays the actual speed of the left front (LF) wheel.

**LIFT/DIVE ACTV**
**Range: ______ YES/NO**

Displays the status of the Lift/Dive sensor on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems and should read NO (inactive) except during heavy braking or WOT acceleration.

**LIFT/DIVE CHGD**
**Range: ______ YES/NO**

Displays the monitor status of the lift/dive sensor on Bosch and Delco Bosch 5.0/5.3 systems.

**LIFT PUMP FBK**
**Range: ______ ON/OFF**

Displays the feedback status from the lift pump.

**LO TCS LAMP**
**Range: ______ YES/NO**

Displays the status of the low traction lamp. Refer to EBTCM controlled warning lamps.

**LONG. ACCEL(V)**
**Range: ______ 0 to 5.00 V**

Displays the longitudinal accelerometer sensor voltage signal received by the electronic brake traction control module (EBTCM). The reading should be 2.5 V when the vehicle is not accelerating or decelerating.

**LOW BRAKE FLUID**
**Range: ______ YES/NO**

Displays the status of the level switch in the brake fluid reservoir on Bosch 2 ASR systems. When the fluid is low, the display reads YES.

**LOW TIRE PRESS**
**Range: ______ variable**

Displays the tire pressure status.

**LR HOLD SOL**
**Range:** ____ **ON/OFF**

Displays the left rear (LR) hold solenoid and valve status, which is holding pressure to the wheel, on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**LR INLET SOL**
**LR OUTLET SOL**
**Range:** ____ **ON/OFF**

Displays the left rear (LR) inlet or outlet solenoid and valve status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**LR RELEASE SOL**
**Range:** ____ **ON/OFF**

Displays the left rear (LR) release solenoid and valve status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**LR ROTOR(°)**
**Range:** ____ **–40 to +650°C**

Displays the estimated temperature of the left rear (LR) rotor. The EBTCM uses this data to determine if brake is available for traction control.

**MAG STR FBK(A)**
**Range:** ____ **0.00 to 3.00**

Displays the amount of current returning to the EBCM as feedback from the VES actuator.

**MODE 1 ACTIVE**
**MODE 2 ACTIVE**
**Range:** ____ **YES/NO**

Displays the current tire pressure configuration mode. The EBCM learns the tire pressure configuration for each speed range independently. Reads YES when active, NO when inactive.

- In mode 1, the EBCM has only partially learned the tire pressure configuration for the speed range and has limited detection capability for a tire pressure conditions.
- In mode 2, the EBCM has fully learned the tire pressure configuration.

If the EBCM is not in either mode, a tire pressure condition cannot be detected because the EBCM has not learned the tire pressure configuration of the vehicle. The EBCM may have fully learned (Monitor Mode 2) the tire pressure configuration in one speed range, but may have partially learned (Monitor Mode 1) or not learned at all the tire pressure configuration in the other speed ranges.

The instrument cluster through the DIC performs two functions related to the tire monitoring:

- Turns on the tire pressure warning indicator when commanded by the EBCM.
- Sends the tire pressure monitor system reset command to the EBCM, via the class 2 serial data line.

**NOTE:**
The class 2 serial data line is used to send all tire pressure monitor system related information between the EBCM and the instrument cluster.

**MOTOR RELAY**
**Range:** ____ **ON/OFF**

Displays the actual operating status of the ABS pump motor control relay on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**MOTOR RELAY CMD**
**Range: ______ ON/OFF**

Displays the commanded status of the ABS pump motor control relay on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**MSTR CYL PRS SW**
**MSTR CYL PWRS SW**
**Range: ______ ON/OFF**

Displays the current status of the master cylinder pressure switch input to the EBCM. A typical reading is ON.

**MSVA EQUIPPED**
**Range: ______ YES/NO**
**MSVA PRESENT**
**MSVA2 PRESENT**
**Range: ______ variable**

Indicates whether the vehicle has magnetic steering variable assist (MSVA or MAGNASTEER).

**MTR RELAY FBK**
**Range: ______ ON/OFF**

Displays the relay feedback voltage, which provides information to the PCM about the power supply condition through the ABS circuit.

**NO OF TIMES SET**
**Range: ______ 0 to 50 counts**

Displays the number of warm-up cycles in which an emission DTC failure occurred.

**PCM DEL TORQ(%)**
**Range: ______ 0 to 100%**

Displays the percentage of available engine torque as commanded by the PCM.

**PRE CHG COM**
**Range: ______ ON/OFF**

Displays the commanded state of the pre-charge pump.

**PRE CHG FBK**
**Range: ______ ON/OFF**

Displays the feedback state of the pre-charge pump.

**PUMP MOTOR**
**Range: ______ ON/OFF**

Displays the ABS pump motor commanded state on Bosch 2 ASR, Bosch 5.0/5.3, Delco Bosch 5.0/5.3, and DBC-7 systems.

On VCM 4WAL, this parameter shows the status of the pump motor that fills the high-pressure accumulators. The pump is part of the BPMV assembly.

The value reads ON during ABS braking and any other time increased pressure is needed. The pump also runs during the system self-test, which occurs the first time the vehicle reaches 8 MPH (13 KPH) during each ignition cycle.

**PUMP MOTOR**
**Range: ______ON/OFF/CKT OPEN**

Indicates whether the ABS pump is operating and the condition of the switch and relay circuit on Delco-Moraine III systems. A relay operated by a pressure switch in the accumulator controls the pump. The switch closes when accumulator pressure is below 2200 psi. Reads as follows:

- ON when the pump operates to charge the accumulator.
- OFF at all other times. Switch is open and the relay is off.
- CKT OPEN (circuit open) when the operation of the pump motor is unknown. A fault may exist in the pump motor circuit.

**PUMP MOTOR(V)**
**Range: ______ 0 to 17 V**

Displays the voltage being applied to ABS pump motor circuit.

**PUMP MOTOR(V)**
**Range: ______ 0 to 25.5 V**

Displays the voltage from the ABS pump motor circuit.

**PUMP MOTOR FBK**
**Range: ______ ON/OFF**

Indicates whether the ABS pump motor on a DBC 7 system is on. Reads ON if the pump is on.

**PUMP MTR MONITOR**
**Range: ______ ON/OFF**

Indicates whether the ABS pump motor monitor is active or inactive:

- ON = ABS pump motor is active
- OFF = ABS pump motor is inactive

**REAR INLET VLV**
**Range: ______ ON/OFF**

Displays the commanded state of the rear Inlet valve.

**REAR ISO SOL**
**Range: ______ ON/OFF**

Current state of the rear isolation solenoid.

**REAR ISO VALVE**
**Range: ______ ON/OFF**

Displays the commanded state of the rear isolation valve.

**REAR MTR CMD(A)**
**Range: ______ 0.0 to 3.0 A**

Displays the current status of the commanded current being applied to the rear ABS motor

**REAR MTR FBK(A)**
**Range: ______ 0.0 to 3.0 A**

Displays the feedback status of the commanded current being applied to the rear ABS motor. This voltage feedback provides information to the EBCM about the power supply condition through the rear motor circuit.

**REAR OUTLET VLV**
**Range: ______ ON/OFF**

Displays the commanded state of the rear outlet valve.

**REAR PRIME SOL**
**Range: ______ ON/OFF**

Displays the current state of the rear prime solenoid.

**REAR RESET SW**
**Range: OPEN/CLSD**

Displays the status of the rear valve reset switch:

- OPEN = the switch is open, which is the normal operating condition
- CLSD = the switch is closed due to a pressure difference between the isolation solenoid and dump solenoid

**REAR WHEEL**
**Range: 0 to vehicle max**

Displays the rear wheel speed, values vary by system.

On Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems, the display is the rear wheel speed measured by the rear wheel speed sensor, which is mounted on the rear drive axle.

On VCM 4WAL systems, wheel speed is internally calculated by the VCM based on an input from the vehicle speed sensor. On a 2WD model the sensor is in the transmission, and on 4WD models it is in the transfer case.

**REL TIRE PRESS**
**Range: LOW/NORM**

Displays the relative tire pressure detected by the EBCM. The EBCM uses wheel speed data obtained from the wheel speed sensors to detect relative pressure differences.

Any ABS/TCS system activity causes the EBCM to temporarily suspend the tire pressure monitoring system functions. The software requires approximately one half hour of straight line driving to complete the tire pressure learn function.

**REQ TP RED(%)**
**Range: 0 to 100%**

Displays the transmission fluid pressure reduction being requested by the ABS/TCS system.

**RETURN PUMP RLY**
**Range: ON/OFF**

Displays the status of the return pump relay on Bosch 2 systems. Reads ON when the relay contacts are closed and current is being supplied to power the return pump.

**RF ABS FBK(AMP)**
**Range: 0.0 to 3.0 A**

Displays the actual status of the commanded voltage being applied to the right front ABS motor. This voltage feedback provides information to the EBCM about the condition through the right front (RF) ABS circuit.

**RF ABS MOTOR**
**Range: REV/FWD**

Displays the current direction of the right front (RF) ABS motor.

**RF ABS SOL CMD**
**Range: ON/OFF**

Displays the commanded state of the right front (RF) ABS motor

**RF HOLD SOL**
**Range: ON/OFF**

Displays the right front (RF) hold solenoid and valve status, which is the holding pressure to the wheel, on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**RF MOTOR FBK(V)**
**Range: 0.0 to 3.0 V**

Displays the Displays the actual status of the commanded voltage being applied to the right front (RF) ABS motor. This voltage feedback provides information to the EBCM about the condition through the right front ABS motor circuit.

**RF MTR CMD(AMP)**
**Range: 0.0 to 3.0 A**

Displays the current status of the commanded voltage applied to the right front (RF) ABS motor

**RF PRIME ACTV**
**Range: YES/NO**

Displays the right front TCS prime, or inlet, solenoid and valve status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**RF PRIME SOL**
**Range: ON/OFF**

Displays the current state of the right front (RF) prime solenoid.

**RF RELEASE SOL**
**Range: ON/OFF**

Displays the right front (RF) release solenoid and valve status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**RF ROTOR(°C)**
**Range: –40°C to 650°C**

Displays the estimated temperature of the right front (RF) rotor on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems. The EBTCM uses this value to determine if the brake is available for traction control.

**RF TCS ISO ACTV**
**Range: YES/NO**

Displays the right front TCS isolation valve status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems. When reading is YES, brake fluid is isolated from the master cylinder.

**RIGHT TCS AMP**
**Range: 0.0 to 3.0 A**

Displays the status of the commanded voltage being applied to the right traction control motor.

**RIGHT TCS FBK**
**Range: 0.0 to 3.0 A**

Displays the amount of voltage returning to the EBCM from the right traction control actuators. This voltage feedback provides information to the EBCM about the condition through the right traction control circuit.

**RIGHT TCS MOTOR**
**Range: ON/OFF**

Displays the current status of the right front ABS motor.

**ROUGH ROAD(g)**
**Range: 0 to 100 g**

Displays how rapidly the driven wheel speed changes measured in g forces on Bosch 2 and DBC-7 systems.

Driving over rough roads may cause abrupt changes in driveline speed and torque. These fluctuations may fool the Misfire Monitor into setting false diagnostic trouble codes.

The PCM uses the this parameter to determine whether to temporarily disable the Misfire Monitor when driving over rough roads.

**RR HOLD SOL**
**Range: ______________________________ ON/OFF**

Displays the right rear (RR) hold solenoid and valve status, which is the holding pressure to the wheel, on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**RR PWM VLV FBK**
**Range: ______________________________ 0.0 to 3.0 A**

Displays the amount of current returning to the EBCM from the right rear (RR) pulse width modulation valve (PWM). This voltage feedback provides information to the EBCM about the condition through the right rear modulation valve circuit.

**RR RELEASE SOL**
**Range: ______________________________ ON/OFF**

Displays the right rear (RR) release solenoid and valve status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**RR ROTOR TEMP**
**Range: ______________________________ –40°C to +650°C**

Displays the estimated temperature of the right rear (RR) rotor.

**RR WHEEL TCS**
**Range: ______________________________ ACTIVE/INACTIVE**

Displays the status of the EBTCM command for traction control to the right rear (RR) wheel.

**RT FT RESET SW**
**Range: ______________________________ OPEN/CLSD**

Displays the status of the right front valve reset switch:

- OPEN = normal operating conditions
- CLSD (closed) = a pressure difference between the isolation and dump solenoids that is great enough to close the switch

**RT MOTOR FBK(A)**
**Range: ______________________________ 0.0 to 3.0 A**

Displays the commanded voltage being applied to the right front ABS motor. This voltage provides information to the EBCM about the condition through the right ABS motor circuit.

**SOLENOID(V)**
**Range: ______________________________ 0 to 12 V**

Displays the current brake pressure modulator valve (BPMV) solenoid relay voltage on Bosch 2 systems.

**SOL RELAY**
**Range: ______________________________ ON/OFF**

Displays the actual operating status of the solenoid block power control relay on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems. This parameter displays the status of the brake pressure modulator valve (BPMV) relay on DBC 7 systems.

Reads ON when the relay contacts are closed, which allows current to energize the BPMV.

**SOL RELAY CMD**
**Range: ____ ON/OFF**

Displays the command status of the valve solenoid block power control relay on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**SOL RELAY FBK**
**Range: ____ ON/OFF**

Displays the feedback voltage from the ABS master relay supply (B+). This voltage feedback provides information to the EBCM about the power supply condition through the ABS circuit.

**SPEED SENS STEERING**
**Range: ____ YES/NO**

Indicates whether the vehicle has speed sensitive steering (SSS) installed.

**SSS FAILED**
**Range: ____ YES/NO**

Indicates whether a malfunction has occurred in the speed sensitive steering (SSS) system.

**SSS FBK(A)**
**Range: ____ 0.0 to 13.5 Ω**

Displays the feedback voltage to the EBCM from the speed sensitive steering system (SSS) actuator converted to ohms.

**SSS LAMP**
**Range: ____ ON/OFF**

Displays the state of the speed sensitive steering (SSS) system lamp.

**STAB ACTV LAMP**
**Range: ____ ON/OFF**

Shows the EBCM command to the traction active indicator lamp, reads ON when the lamp is on.

**STAB WRNG LAMP**
**Range: ____ ON/OFF**

Shows the EBCM command to the traction off indicator lamp, reads ON when the lamp is on.

**STABIL ACTIVE**
**Range: ____ ON/OFF**

Indicates whether the vehicle stability enhancement system (VSES) is active, reads ON if active.

**STABIL FAILED**
**Range: ____ YES/NO**

Displays the failed status of the vehicle stability enhancement system (VSES), reads YES if the EBCM disabled TCS due to a malfunction.

**STRTS SINCE CODE**
**Range: ____ number**

Displays the number of vehicle starts since a code setting fault occurred on Bosch 2 systems.

**STG CMD (AMP)**
**Range: ____ –3.3 to +3.3 A**

Displays the current command status of Magnasteer™ steering assist level on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**STG FBK (AMP)**
**Range: ________ –3.3 to +3.3 A**

Displays the feedback status of the Magnasteer™ steering assist level on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**STG POS PWM (mS)**
**Range: ________ 0 to max**

Displays the commanded status of the Magnasteer™ steering assist PWM duration on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**STG PROBLEM**
**Range: ________ ON/OFF**

Displays the conditional status of the Magnasteer™ steering assist system on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**STG SNSR(V)**
**Range: ________ 0 to 4.99**

Displays the voltage signal from the steering wheel position sensor on Bosch 2 systems.

**STG WHEEL(V)**
**Range: ________ 0 to 5 V**

Displays the voltage of the Magnasteer™ steering wheel sensor on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**STG WHL POS(°)**
**Range: ________ –1260 to 1260°**

Displays the degrees of rotation of the steering wheel in relation to the centered position. The reading should be 0° when the steering wheel is centered with the front wheels straight ahead.

**STC POS PWM(mS)**
**Range: ________ 0 to 21.9**

No information is currently available for this Bosch 2 parameter.

**SW BATT(V)**
**Range: ________ 0 to 17 V**

Displays the EBCM switched battery voltage to the solenoid valves on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**SW PUMP(V)**
**Range: ________ 0 to 17 V**

Displays the status of the EBCM switched ABS pump motor voltage on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**SWPS(A)**
**SWPS(B)**
**Range: ________ 0 to 5 V**

Displays the voltage signal of steering wheel position sensors A and B on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**SWPS(A)**
**SWPS(B)**
**Range: ________ HI/LOW**

No information is currently available for these Bosch 2 parameters.

**SWPS CORR(°)**
**Range: ______ 0 to 0.39**

Displays the steering wheel position sensor (SWPS) bias correction factor on Bosch 2 systems.

**SWPS INPUT(°)**
**Range: ______ 0 to 0.39**

Displays the steering wheel position sensor (SWPS) input to the electronic brake traction control module (EBTCM) on Bosch 2 systems.

**SWPS PHASE A**
**SWPS PHASE B**
**Range: ______ HI/LO**

Displays the state of the phase A and phase B pulse. The EBTCM uses the state change from phase A and phase B to calculate the position of the front wheels, and also determines the direction that the front wheels are rotating:

- If Phase A changes state first, the wheels are turning left.
- If Phase B changes state first, the wheels are turning right.

**SYSTEM ID**
**Range: ______ variable**

Displays the system identification as a hexadecimal display on Bosch 2.

**TCM CAL ID**
**Range: ______ 1111111 To 9999999**

Displays the calibration part number of the EBTCM.

**TCS ACTIVE**
**Range: ______ ACTIVE/INACTIVE**

Displays the status of the traction control system on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3.

**TCS ACTIVE**
**Range: ______ YES/NO**

Indicates whether the traction control (TCS) system on DBC 7 systems is activated and functioning, reads YES if active.

**TCS ACTIVE LAMP**
**Range: ______ ON/OFF**

Displays the status of the TCS active dash lamp driver on Bosch 5.0/5.3, Delco Bosch 5.0/5.3, and DBC-7 systems.

**TCS ADJUST AMP**
**Range: ______ 0.0 to 1.25 A**

Displays the current the EBTCM is commanding to the (TCS) Traction Control actuator.

**TCS ADJUST FBK**
**Range: ______ 0.0 to 1.25 A**

Displays the feedback current from the (TCS) Traction Control actuator.

**TCS BATT(V)**
**Range: ______ 0 to 30.0 V**

Displays the current battery voltage being applied to the traction control system (TCS).

**TCS DEL TORQ(%)**
**Range: ______ 11 to 91%**

Displays the percentage of torque delivered from the PCM in response to the torque requested by the EBCM/EBTCM.

The display reads 11% when the EBCM/EBTCM requests the minimum percentage of available torque in an attempt to eliminate wheel slip.

**TCS DISABLE LAMP**
**TCS DISABL LAMP**
**TRAC OFF LAMP**
**Range: ______ ON/OFF**

Indicates whether the electronic brake control module and electronic brake traction control module (EBCM/EBTCM) has commanded the disable traction control system (TCS) lamp or the traction off lamp to illuminate.

The reading should be ON if the disable TCS switch is on or the traction (TRAC) off switch is pressed. The disable TCS lamp or the TRAC off lamp should also be on.

**TCS ENABLE SW**
**Range: ______ ON/OFF**

Displays the state of the dash-mounted traction control switch on DBC 7 systems.

**TCS EQUIPPED**
**Range: ______ YES/NO**

Indicates whether the vehicle has a traction control system (TCS) installed.

**TCS FAILED**
**Range: ______ YES/NO**

Indicates whether a fault is preventing the traction control system (TCS) from operating on DBC 7 systems.

**TCS ISO VLV COM**
**Range: ______ ON/OFF**

Indicates the commanded state of the traction control system (TCS) isolation solenoid valve.

**TCS ISO VLV FBK**
**Range: ______ ON/OFF**

Indicates the feedback state of the traction control system (TCS) isolation solenoid valve.

**TCS LAMP**
**Range: ______ ON/OFF**

Displays the Status of TCS activation on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**TCS MDLATR TEMP**
**THERMAL MDL(°)**
**Range: ______ -40 to +650°**

Displays the estimated brake rotor temperature of either of the drive wheels. When the brake rotor temperature exceeds 700°F (375°C) during TCS activation, a DTC sets immediately and the EBCM disables TCS at the end of the TCS event. The brake rotor temperature can exceed 700°F (375°C) without setting a DTC if a TCS activation has not occurred.

**TCS PRESENT**
**TCS REQ TORQ(%)**
**Range: ______ 0 to 100%**

Displays the percentage of available torque requested of the PCM by the EBTCM.

**TCS PROBLEM**
**Range: ON/OFF**

Displays the status of the EBTCM internal fault detection function on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems. reads ON if a fault was detected.

**TCS SPARK REQ**
**Range: YES/NO**

Indicates whether the EBTCM has requested the PCM to decrease ignition spark timing during a TCS event. Reads YES if a timing decrease was requested.

**TCS STATUS**
**Range: ON/OFF**

Displays the status of the traction control system according to the electronic brake traction control module (EBTCM) on Bosch 2 systems.

**TCS SW**
**Range: ON/OFF**

Displays the position of the dash-mounted TCS switch on Bosch 2 systems equipped with a traction control system (TCS). The TCS switch transmits a position signal to the electronic brake traction control module (EBTCM).

**TCS SW PRESSED**
**Range: YES/NO**

Indicates whether the traction control switch was pressed.

**TCS SW STATE**
**Range: ON/OFF**

Displays the status of the traction control switch.

**TCS SYS TEMP**
**Range: –40°C/+650°C**

Displays the estimated temperature of the wheel rotors.

**TCS WRNG LAMP**
**Range: ON/OFF**

Indicates whether the electronic brake control module (EBCM) is commanding the traction control system (TCS) warning lamp on for DBC 7 systems.

**TCS-ASR ACTIVE**
**Range: ACTIVE/INACTIVE**

Displays the current status of the traction control system.

**THROTTLE(%)**
**Range: 0 to 100%**

Displays the throttle position on Bosch 2 ASR systems. This value is calculated by the engine control module, based on an input from the throttle position sensor:

- 100% = wide open throttle
- 0% = closed throttle

**TIM EQUIPPED**
**Range: YES/NO**

Indicates whether the vehicle has the tire inflation monitor (TIM) installed.

**TIM FAILED**
**Range: ______ YES/NO**

Displays the failed status of the tire inflation monitor (TIM or TPM) and reads YES if the EBCM disabled TIM due to a malfunction.

**TIM RESET**
**Range: ______ YES/NO**

Indicates if the IPC is sending the tire pressure monitor system reset command to the EBCM via the class 2 serial data line.

**TIM RESET SW**
**Range: ______ ON/OFF**

Displays the status of the TIM reset switch.

**TIRE PRESS LOW**
**Range: ______ LOW/NORMAL or ON/OFF**

Displays the status of the low tire pressure detection function of the EBTCM on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3 systems.

**VALVE RELAY**
**Range: ______ ON/OFF**

Displays the solenoid and valve block power status on Bosch 5.0/5.3 and Delco Bosch 5.0/5.3.

**VALVE RELAY**
**Range: ______ 0 to 21.7 V**

Displays the output status of the valve relay on Bosch 2 ASR systems. The valve relay supplies control power to the solenoid valves used to control ABS braking.

**VEH SPEED (MPH)**
**Range: ______ 0 to vehicle max**
**ABS REF SPEED**
**Range: ______ variable**

Displays the vehicle speed, values vary by system.

On Bosch 2, the vehicle speed parameter is a measurement of vehicle speed at the time a fault occurs. It appears only as one of four parameters displayed with a related DTC. It indicates the vehicle speed at the time the code set. It does not indicate the current speed.

On Delco-Moraine III and VI, vehicle speed is computed by the ABS module based on the signals received from the four wheel speed sensors. These readings are not taken from the vehicle speed sensor (VSS) used by the ECM, and may differ from the speedometer reading. Abnormally high, low, or erratic readings are usually due to wiring problems or faults in one or more wheel speed sensors.

The RWAL system uses an output shaft sensor to monitor the speeds of the two rear wheels. The sensor produces an AC signal that varies in frequency as output shaft speed varies. Tire size and gear ratio affect output shaft speed. If the rear wheels are decelerating rapidly during braking, the rear axle differential causes a change in output shaft speed.

**VES CMD(mA)**
**Range: ______ 0 to 6.62**

Displays the amount of current the electronic brake transmission control module (EBTCM) is commanding to the Magnasteer actuator.

**VES FBK(mA)**
**Range:** ______________________ **0 to 6.62**

Displays the EBTCM feedback current from the Magnasteer actuator.

**VES PRESENT**
**Range:** ______________________ **YES/NO**

Indicates whether the vehicle has variable effort steering (VES) installed.

**VSES ENABLED**
**Range:** ______________________ **YES/NO**

Indicates whether the vehicle stability enhancement system (VSES) is currently enabled.

**VSES PRESENT**
**Range:** ______________________ **YES/NO**

Indicates whether the vehicle has vehicle stability enhancement system (VSES) installed.

**W/TIRE MONITOR**
**Range:** ______________________ **YES/NO**

No information is available for this Delco-Moraine VI parameter.

**YAW RATE(V)**
**Range:** ______________________ **0 to 4.99 V**

Displays the voltage signal from the yaw sensor to the electronic brake traction control module (EBTCM) on Bosch 2 systems.

# Body Control Module (BCM) Parameters

This section defines the data parameters available from the body control module (BCM) on vehicles equipped with a BCM that communicates via Class 2 serial data. Some BCM parameters are actually PCM engine controller parameters that are monitored by the body control module (BCM). To find the description of a specific parameter, locate the parameter name in the Index, then go to the listed page.

**NOTE:**
Because of the personalized selection of optional equipment and trim packages available, some BCM parameters displayed may not be supported by the vehicle as identified. Some BCM parameters may appear inactive or invalid.

A thorough understanding of vehicle specific BCM operation will prevent lost time or an inaccurate diagnosis based on incorrect interpretation of data for the vehicle being tested.

For example: An inactive FRONT DOOR LOCK RELAY parameter is noticed by a technician diagnosing an intermittent power-door lock problem while sitting in the driver seat and pushing the door lock button. However, the REAR DOOR LOCK RELAY parameter switches as expected. By thinking that this indicates a fault, a lot of time could be wasted looking for an open in the FRONT DOOR LOCK RELAY circuit or replacing a BCM.

In fact, this would be normal operation if the vehicle has a driver door module with an incorporated power-door lock switch. The FRONT DOOR LOCK RELAY parameter is a device the BCM can command, but this may not be the primary method used to command its operation.

The switch activates the FRONT DOOR LOCK RELAY direct without BCM interaction, therefore the parameter does not change. At the same time, the door module sends a lock request input signal to the BCM to command activation of the REAR DOOR LOCK RELAY, therefore the rear parameters change. The BCM commanded the operation of the REAR DOOR LOCK RELAY, but does not need to command the FRONT DOOR LOCK RELAY. In order to see the FRONT DOOR LOCK RELAY parameter change state, a remote keyless entry or key fob lock signal is needed to request the BCM to command the FRONT and/or REAR DOOR LOCK RELAY to lock one or all the doors.

A vehicle that is not equipped with a remote keyless entry option may switch the parameters in a different manner.

**2ND FUEL PUMP**
**Range:** ________ **ON/OFF**

Displays the PCM command to the relay for the second fuel pump on the ZR1 Corvette with an LT5 engine.

**A/C CLUTCH**
**Range:** ________ **ON/OFF**

Displays the PCM commanded state of the A/C clutch control relay. Reads ON when the A/C clutch is engaged.

**A/C CLUTCH CMD**
**A/C CLUTCH FBK**
**Range:** ________ **ON/OFF**

Displays the A/C clutch command and feedback values on 1990–91 Cadillac DeVille and Fleetwood. The clutch command is the BCM signal to the HVAC controller to turn the A/C clutch on or off. The feedback is the signal from the HVAC controller to the BCM indicating actual A/C clutch state.

**A/C-DEF DOOR**
**Range: ______ A/C and DEF**
**A/C-DEF DOOR**
**Range: ______ VAC/VENT**

Indicates the position of the A/C defroster door. When the up/down door is down, air flows through the air distributor to either the A/C outlets or windshield defroster, depending upon the position of the A/C defroster door. A vacuum actuator controls the A/C defroster door.

This parameter reads as follows:

- A/C or VAC when air is flowing to the A/C outlets
- DEF or VENT when air is flowing to the windshield defroster

**A/C ENABLED**
**Range: ______ YES/NO**

Displays the position of the air conditioning switch on the instrument panel and reads YES when the A/C switch is turned on, or the BCM is commanding the A/C system to turn on.

In some cases, the A/C compressor may not turn on even though the switch is closed. There are other switch and sensor signals that may prevent the A/C compressor clutch from engaging.

**ABS DISABLED**
**Range: ______ YES/NO**

Displays the status of the ABS on 1987–89 Cadillac Allante only.

**AC HI-SIDE (°F)**
**AC LO-SIDE (°F)**
**Range: ______ –40 to 418°F**
**AC HI-SIDE (°C)**
**C LO-SIDE (°C)**
**Range: ______ –40 to 215°C**

Displays the A/C temperature calculated by the BCM from two sensor signals. One sensor is in the high-pressure hose, the other is in the low-pressure hose. The BCM uses this data to calculate the A/C line pressure.

**AIR MIX DOOR(%)**
**Range: ______ 0 to 100%**
**AIR MIX DOOR(°)**
**Range: ______ 0 to 100°**

Indicates the position of the air mix door. The value displays in degrees on 1985–86 vehicles and as percentage on 1987–89 vehicles:

- 0 degrees or percent indicates maximum cold air
- 100 degrees or percent indicates maximum warm air

**ALTERNATOR(%)**
**Range: ______ 0 to 100%**
**ALT ENABLE**
**Range: ______ YES/NO**

Displays the charging system status on most 1986–91 vehicles.

The Alternator value displays the on-time of the voltage regulator, the higher the percentage the greater the on time.

The Alt Enable value indicates the status of the alternator field circuit and reads YES if the alternator is charging and NO if not charging.

**AMBIENT TEMP**
**Range: ______ COOL/WARM**

Displays the ambient temperature status on the 1990–91 Corvette only. A thermistor mounted on the right side of the radiator upper support monitors the outside temperature. The HVAC module supplies a 5 V reference to the sensor.

- When the air temperature is WARM, sensor resistance is low and the module sees a low voltage signal.
- When the temperature is COOL, resistance is high and the module sees a high voltage signal.

**AMB LITE(CNTS)**
**Range: ______ 0 to 255**

Displays a count from the ambient light sensor on the 1990–91 Corvette only. It controls instrument panel lamp intensity.

- A high count indicates low ambient light.
- A low count indicates high ambient light.

**ANTITHEFT**
**Range: ______ see description**

Displays the status of the theft detection system on 1990–91 Corvette only. Possible readings are: PASSIVE, ACTIVE, DOORS, DRS+HATCH, ALARM, TIMED OUT.

**BACK DIM DUTY CYCLE(%)**
**Range: ______ 0-100%**

Displays the duty cycle of the pulse width modulated (PWM) signal distributed by the BCM to the PWM controlled IP backlighting based on the position of the IP dimmer switch (Thumbwheel). The scan tool displays 0% when the head lamp switch is in the AUTO position and the daytime running lamps (DRL) are ON or when the IP dimmer switch is in the FULL DIM position. The scan tool displays approximately 85% when either the low beam head lamps or park lamps are activated and the IP dimmer switch is in the FULL BRIGHT position.

**BATT(V)**
**Range: ______ 0 to 16.0 V**

Displays the system voltage measured at the BCM ignition feed input.

**BCM PROM ID**
**Range: ______ 0 to 255**

Displays the PROM identification for the BCM.

**BRAKE SW**
**Range: ______ OPEN/CLSD**

Displays the state of the brake switch circuit input and reads as follows:

- OPEN when the brakes are applied.
- CLSD (closed) when the brake pedal is released.

**CC BRAKE SW**
**CRUISE BRAKE SW**
**Range: ______ OPEN/CLSD**

Displays the status of the cruise control (CC) brake switch contacts, which are normally closed and provide an input signal to the PCM. When the brake pedal is pressed, the contacts open to deliver a high voltage signal to the PCM and the PCM disengages the cruise control.

These parameters are not active and read CLSD unless the cruise control is turned on. With the cruise control on, the reading is OPEN whenever the brakes are applied.

**CC ENABLED**
**Range: ____ YES/NO**

Indicates whether the PCM has enabled cruise control (CC) system operation on Cadillac models. Reads YES only when cruise control is switched on and the brake pedal is released.

**CC RES/ACC**
**CRUISE RES/ACC**
**CC ON/OFF SW**
**Range: ____ ON/OFF**
**CC RES/ACC SW**
**C/C RES/ACC SW**
**CC SET/CST SW**
**C/C SET/CST SW**
**CRUISE SET/CST**
**Range: ____ YES/NO**

Displays the position of the cruise control switches and read as follows:

- ON of YES when the circuits are closed.
- OFF or NO when the circuits are opened.

The resume (RES) accelerate (ACC) and the set coast (CST) switches are in parallel to each other and in series with the on/off switch.

- If the ON/OFF parameters read ON, the YES/NO parameters should read YES.
- If the ON/OFF parameters read OFF, the YES/NO parameters should read NO.

**CC SERVO(%)**
**Range: ____ 0 to 100%**

Displays the feedback signal from the servo on computer-controlled cruise control systems, which indicates the relative position of the servo diaphragm and reads as follows:

- 0% when the servo is fully retracted.
- 100% when it is fully extended.

This parameter is sent to the PCM by the servo position sensor. The PCM calculates the percentage of movement from the sensor signal.

**CC SPEED**
**Range: ____ 0 to vehicle max**

Displays the selected speed that the cruise control system is trying to maintain. Reading increase whenever the resume/accelerate switch is pressed, and decrease if the set/coast switch is pressed.

**CC VACUUM FBK**
**CC VENT FBK**
**Range: ____ ON/OFF**

Displays the feedback signals from the cruise control vacuum and vent solenoids. Both of these parameters display ON whenever the solenoids are energized to apply or vent vacuum.

**CC VACUUM SOL**
**CC VENT SOL**
**Range: ____ ON/OFF**

Displays the PCM output commands to the cruise control vacuum and vent solenoids, which regulate the cruise control servo on some vehicles. These parameters read ON when the solenoids are energized to apply or to vent vacuum. The two readings should have the following relationships with throttle position control.

**Table 14-15** *Cruise control solenoid readings*

| Vacuum Solenoid | Vent Solenoid | Throttle Position |
|---|---|---|
| ON | OFF | Accelerate |
| ON or OFF | ON | Decelerate |
| OFF | OFF | Steady |

**CMD AIR MIX(%)**
**ACT AIR MIX(%)**
**Range: ______ 0 to 100%**

Displays the air mix door position, which the BCM uses to provide the proper mix of warm and cool air. The BCM monitors the outside temperature, the average low-side temperature, and the engine coolant temperature to determine door position.

The CMD (command) value is the signal from the BCM to the air mix door. The ACT (actual) value is a feedback signal that indicates actual door position. Expect actual door position to closely follow command position, except when the door reaches its mechanical limit.

- 0% indicates a cool air mix
- 100% indicates a warm air mix

Some 1989–91 Cadillac models do not allow air mix door movement in codes and data mode.

**CMD BLOWER(V)**
**Range: ______ 0 to 25.5 V**

Displays the commanded blower motor voltage. A variable voltage from the BCM is transmitted to the power module, amplified, and sent to the blower motor to control blower speed.

**COOLING FAN**
**Range: ______ LOW/OFF/HIGH**

Displays the state of the engine cooling fan on 1990–91 Cadillac DeVille and Fleetwood only.

**COURTESY LMP SW**
**Range: ______ ON/OFF**

Displays the position of the instrument panel courtesy amp switch. Should read ON when the switch is turned on. The BCM uses this data in controlling the operation of the courtesy lamps.

**CRTSY LMP RELAY**
**Range: ______ ON/OFF**

Displays the status of the courtesy lamp relay, which activates (reads ON) when the switch is on.

**CRUISE SW**
**Range: ______ ON/OFF**

Indicates whether the cruise switch, located on the turn signal lever, is turned on or off.

**DIC SWITCH(CNTS)**
**Range: ______ 0 to 255**

Displays driver information center (DIC) switch status on 1990–91 Corvette only. DIC switches are momentary switches used by the driver to select various functions.

The DIC switch circuit is a series-parallel divider network. Pressing a particular switch selects a specific resistance value and sends a specific voltage signal to the controller. The controller converts this voltage signal to a digital code. From this value, the controller determines which switch was pressed and performs the desired function. Pressing the same switch again turns off the function. This parameter is proportional to the voltage output of the DIC switch.

**DIMMING INPUT(V)**
**Range: ____ 0 to 5.0 V**

Displays the voltage value indicating the position of the IP dimmer switch (rheostat). The display reads 4 volts when the head lamp switch is in the Auto position and the day time running lamps (DRL) are ON, or the IP dimmer switch is in the Full Dim position. The display reads 5 volts when either the head lamps or park lamps are on and the IP dimmer switch is in the Full Bright position.

**DIMMING LEVEL(%)**
**Range: ____ 0 to 100%**

Displays the duty cycle of the pulse width modulated (PWM) signal supplied by the BCM to the door switch backlighting based on the position of the IP dimmer switch (rheostat). The display reads 0% when the head lamp switch is in the Auto position and the day time running lamps (DRL) are ON, or the IP dimmer switch is in the Full Dim position. The display reads 100% when either the head lamps or park lamps are on and the IP dimmer switch is in the Full Bright position.

**DIMMING POT(%)**
**Range: ____ 0 to 100%**

Displays the illumination setting for the instrument panel and reads as follows:

- 0% = maximum dimming
- 100% = maximum brightness

**DIMMING POT(V)**
**DIM POT REF(V)**
**Range: ____ 0 to 16.3 V**

Displays the voltages to the dimming potentiometer used by the BCM to control instrument panel dimming on 1990 Cadillac DeVille and Fleetwood only.

The REF (reference) value is the BCM output command to the dimming potentiometer and the POT (potentiometer) is a feedback signal.

**DRIVER/LR DOOR AJAR SW**
**PASS/RR DOOR AJAR SW**
**Range: ____ ON/OFF**

Indicates the state of the entry door switches. Reads OFF when the applicable door is fully closed or ON when the door is open or ajar.

**FAN FAILURE**
**Range: ____ YES/NO**

Displays the state of the engine cooling fan. If the engine stalls, this parameter reads YES.

**FLASH TO PASS SW**
**Range: ____ ON/OFF**

Displays the position of the flash to pass switch. Reads ON when the switch is pulled and held to activate the high beams momentarily until switch is released.

**FRONT FOG LAMP SW**
**Range: ____ ON/OFF**

Displays the position of the front fog lamp switch. Reads ON when the front fog lamp switch is activated with the park lamps or low beam head lamps ON.

**FRONT WIPERS ACTIVE**
**Range:** ____ **ON/OFF**

Displays the state of the wiper motor. Reads ON when the wipers are in operation after approximately the first 3 cycles of the wiper blades.

**FUEL LEVEL(V)**
**FUEL REF(V)**
**Range:** ____ **0 to 16.3 V**

Displays fuel level sensor voltages. The REF (reference) value is a BCM output to the fuel level sensor. The LEVEL value is a feedback signal to the BCM that indicates actual fuel level.

**GENERATOR(%)**
**Range:** ____ **0 to 100%**

Indicates generator output based on the field input from the generator F terminal. As engine speed increases, the reading, or duty cycle, decreases.

**HEADLAMP**
**Range:** ____ **ON/OFF**

The BCM monitors the signal circuit of the headlamp switch. A closed switch is displayed as ON.

**HEADLAMP OUT**
**PARK LAMP OUT**
**STOP LAMP OUT**
**TAIL LAMP OUT**
**Range:** ____ **YES/NO**

Indicates whether a lamp is burned out or not functioning on some Toronado models only.

**HEADLAMP SW**
**HAZARD LAMP SW**
**Range:** ____ **ON/OFF**

Indicates whether the headlamp and hazard lamp switches are on, reads ON if the switch is on.

**HEADLAMP WASHER**
**Range:** ____ **ON/OFF**

Displays the position of the headlamp washer switch. Reads ON when the switch is activated.

**HIGH BEAM SELECT**
**Range:** ____ **ON/OFF**

Displays the position of the high beam switch. Reads ON when the switch is activated.

**HIGH BLOWER**
**Range:** ____ **YES/NO**

Indicates whether the BCM is requesting a higher blower speed from the ECM.

**HIGH FAN**
**LOW FAN**
**Range:** ____ **ON/OFF**

Displays the PCM output commands to the fan relay. Some engines have two speeds for the electric cooling fan. The PCM controls the fan speeds through a relay and a resistor.

- When Low Fan reads ON, the PCM energizes the relay through the resistor for first-stage, or low-speed operation.
- When High Fan reads ON, the PCM energizes the relay directly for second-stage, or high-speed orientation.

In both cases, the PCM command is output to a quad driver module that energizes the relay.

**HOOD OPEN SW**
**Range: ______ ON/OFF**

The BCM monitors the signal circuit of the hood ajar switch. An open switch is displayed as ON with the door open.

**HTR WATER VLV**
**Range: ______ VAC/VENT**
**WATER VLV FLOW**
**Range: ______ YES/NO**

Displays the status of the valve that controls engine coolant flow through the heater core. The BCM commands this valve to close when the air mix door is in the maximum A/C position.

When the valve is open, the engine coolant flows through the heater core and you should get the following readings:

- HTR WATER VLV should read VENT.
- WATER VLV FLOW should read YES.

**HVAC LCD(%)**
**Range: ______ 0 to 100%**

Displays the status of the dimming circuit that controls the back lighting on the HVAC LCD display on the 1990–91 Corvette only. This display is controlled by a pulse-width-modulated (PWM) signal.

HVAC LCD(%) indicates the PWM input to the LCD display relative to either the headlamp switch position or the ambient light sensor. The percentage of time that the pulsing signal is on determines dimming.

**HVAC MODE**
**Range: ______ see description**

Displays the commanded state of the HVAC system. The modes available vary, depending on the vehicle make and model year. The options are:

- MAX A/C
- INTERMED
- BI-LEVEL
- HEATER
- OFF
- NORM PURG, COLD PURG
- DEFROST
- RECIRC
- B-LVL A/C, B-LVL DEF
- A/C PURGE
- FIXED DEF
- FIX HEAT
- FIX B-LVL
- DEF PURGE
- FORCE DEF, FORCE LOW, FORCED UP
- FRC B-LVL, FRT DEFOG
- A/C

**HVAC SET(°F)**
**Range: ______ 0 to 210°F**
**HVAC SET(°C)**
**Range: ______ 18 to 99°C**

Displays the temperature requested on the climate control panel by the driver.

**IGN CYCLES**
**Range: ______ 0 to 50**

Displays the number of on-off cycles of the ignition switch since the last trouble code change on some late model vehicles. The counter resets to zero under any of the following conditions:

- A new trouble code occurs.
- Trouble codes are cleared.
- Battery power is disconnected.
- 50 ignition cycles occur with no other code changes.

After 50 ignition cycles occur with no change in trouble codes, the PCM erases all codes in memory and resets the counter to zero.

**IGNITION 0**
**Range: ______ ON/OFF**

Displays the input to the control module from the ignition switch indicating the ignition position. Displays ON when ignition 0 switch circuit is closed. Ignition 0 switch closed positions are:

- UNLOCK
- ACC
- ON (Run)
- START

**IGNITION 1**
**Range: ______ ON/OFF**

Displays the input to the control module from the ignition switch indicating the Ignition 1 position. Displays ON when ignition 1 switch is closed. Ignition 1 switch closed positions are:

- ON (Run)
- START

**IGNITION 1(V)**
**Range: ______ 0.0 to 16.3 V**

Displays the voltage measured by the control module at the ignition on input. On 1990–91 Corvette, indicates the voltage present at the ignition start/run input.

**IGNITION 3**
**Range: ______ ON/OFF**

Displays the input to the control module from the ignition switch indicating the Ignition 3 position. Displays ON when ignition 3 switch is closed, in the ON (Run) position only.

**IGNITION ACCESSORY**
**Range: ______ ACTIVE/INACTIVE**

Displays the input to the control module from the ignition switch accessory circuit. This is used to determine power mode. The reading is ACTIVE when ignition accessory switch circuit is closed, which would be when the switch is in the ACC or ON position.

**INADVERTENT POWER RELAY**
**Range: ______ ON/OFF**

Displays the state of the inadvertent power battery rundown protection feature of the BCM. OFF is displayed when all inadvertent power circuits are functioning normally.

**INCAN DIM(%)**
**Range: ______ 0 to 100%**

Displays the intensity of the incandescent lamp in the instrument panel as a percentage.

**IN-CAR(°F)**
**Range: ______ 0 to 210°F**
**IN-CAR(°C)**
**Range: ______ –18 to 99°C**

Displays the inside temperature on models with an automatic temperature control system. Reading is based on the signal of a sensor in the instrument panel.

**INDICATOR DIMMING**
**Range: ______ 0-100%**

Displays the duty cycle of the pulse width modulated (PWM) signal distributed by the BCM to the PWM controlled IP backlighting based on the position of the IP switch (rheostat). The reading is 1.2% when the headlamp switch is in the Full Dim position, and 100% when either the head lamps or park lamps are activated and the IP dimmer switch is in the Full Bright position.

**INTERIOR LAMP DEFEAT**
**Range: ______ ON/OFF**

Displays the position of the courtesy/dome lamp override switch. The reading is ON when the switch is activated, requesting the BCM to override the normal interior lamp activation inputs and deactivating the interior lighting.

**I/P LAMP DIM(%)**
**I/P LCD DIM(%)**
**Range: ______ 0 to 100%**

Displays the pulse-width modulated input signal to the instrument panel cluster (IPC) for the speedometer, LCD illumination, and instrument panel illumination on 1990–91 Corvettes only.

A reading of 100% indicates maximum intensity.

**KEY IN IGNITION**
**Range: ______ YES/NO**

Displays the input from ignition switch indicating that the ignition key is inserted into the ignition switch, reads YES with key in ignition switch.

**L-TURN SIGNAL**
**R-TURN SIGNAL**
**Range: ______ ON/OFF**

Displays the turn signal status on 1987–91 Cadillac Allante.

**LCD BLANKING**
**LCD BLANKNG FBK**
**Range: ______ ON/OFF**

Displays the LCD status on the 1990–91 Corvettes only. The LCD blanking circuit allows all LCD segments to be simultaneously turned off. The parameters are the command signal to the display, and the feedback (FBK), or the actual state of the LCD display.

**LEFT FRONT SOLAR SNSR(V)**
**LIGHT SENSOR(V)**
**R FRONT SOLAR SENSOR(V)**
**Range:** ______ **0 to 5 V**

Displays the output voltage of the applicable ambient light sensor based on the intensity of light detected. As the light intensity increases, the sensor voltages decreases. In the Light state, a low voltage of more than 1.75 volts is present and the day-time running lights (DRL) will be on. In the Dark state, a high voltage of up to 4.9 volts is present and the head lamps will be on.

**LO WASHER FLUID**
**Range:** ______ **YES/NO**

Displays the status of a switch located in the fluid reservoir that monitors washer fluid level.

**LOW A/C PRESS**
**Range:** ______ **YES/NO**

Displays the status of an A/C pressure switch on some vehicles. The switch opens if the refrigerant pressure drops below a minimum. It reads:

- YES if the PCM disables the compressor clutch to prevent damage.
- NO under normal conditions.

**LOW BEAM DUTY CYCLE(%)**
**Range:** ______ **0 to 100%**

Displays the duty cycle percentage of the pulse width modulated (PWM) ground signal controlling the headlamp driver module (HDM). The BCM uses this feature to signal the HDM to operate the low beam head lamps in low beam headlamp mode at full intensity (100%) or in DRL mode at a reduced intensity (81%).

**LOW BOOST VAC**
**Range:** ______ **YES/NO**

Indicates whether there is low vacuum at the power brake booster on some 1990 and earlier Buick models. Reads YES if vacuum is low.

**LOW BRAKE FLUID**
**Range:** ______ **YES/NO**

Indicates whether the level switch in the brake fluid reservoir is set to “low”, reads YES if low.

**LOW CLNT LEVEL**
**Range:** ______ **YES/NO**

Indicates whether the low coolant switch has been activated, reads YES if activated.

**LOW OIL LEVEL**
**Range:** ______ **YES/NO**

Indicates engine oil level based in the signal from a sensor in the engine crankcase sump.

**MIX DOOR DIREC**
**Range:** ______ **WARM/COOL**

Displays the direction that the air mix door last moved.

**OIL PRESS(psi)**
**OIL PRESS(KPA)**
**Range:** ______ **0 to 999**

Displays the PCM calculated engine oil pressure on some vehicles, such as Cadillac Allante and Corvette LT5. An oil pressure transducer provides a voltage signal to the PCM, the PCM calculates oil pressure from the voltage system.

**OUTSIDE(°F)**
**Range: -40 to 418°F**
**OUTSIDE(°C)**
**Range: -40 to 215°C**

Displays outside temperature as determined by a thermistor mounted at the front of the vehicle. The displayed unfiltered value may vary slightly from the filtered value displayed on the driver instrument panel.

**PARK BRAKE SWITCH**
**Range: RELEASE/SET**

Displays the position of the park brake pedal. Reads SET when the park brake is engaged, closing the switch. The BCM uses this data in controlling the operation of the park brake indicator, the reminder chime feature and the DRL system.

**PARK LAMP SWITCH**
**Range: ON/OFF**

The BCM monitors the park lamp switch signal circuit. A closed switch is displayed as ON.

**PARK LAMP SW**
**Range: ON/OFF**

Displays the status of the parking lamp switch. Reads ON when the switch is on.

**PORT THROT REQU**
**Range: YES/NO**

Displays the PCM command to the secondary intake throttles in the cylinder head ports on the ZR1 Corvette with an LT5 engine:

- YES indicates the PCM is commanding the port throttles to open—The engine must be warm, in closed loop, and operating with certain combinations of speed, throttle opening, and load before the port throttles open.
- NO indicates the engine is running at idle.

**PRNDL SW**
**Range: see description**

Displays the gear presently selected according to the PRNDL switch. Readings are LOW, 2ND, 3RD, 4TH, and P/N. On some vehicles, it may be D1, D2, D3, D4, NEUT, REV, and PARK. If the transmission is between gears or the switch sends an invalid signal then "????" displays.

**QDM 1 FAULT**
**QDM 2 FAULT**
**Range: YES/NO**

Indicates whether a quad driver fault was detected, and reads YES if there is a fault. Quad drivers are output power devices used to control solenoids and other high current components. Each quad driver powers up to four circuits.

**REAR FOG LAMP SW**
**Range: ON/OFF**

Displays the position of the rear fog lamp switch. Reads ON when the rear fog lamp switch is activated with the park lamps or low beam head lamps on.

**RECIRC AIR**
**Range: ____ YES/NO**
**AIR INLET VLV**
**Range: ____ VAC/VENT**

Displays the status of the recirculation and air inlet doors. Air recirculation is controlled by the air inlet door, which is controlled by a vacuum-actuated valve.

When vacuum is applied to the actuator, the door moves up and blocks most of the outside air, allowing about 80% of the passenger compartment air drawn in by the blower to be recirculated. When no vacuum is applied, the door is down, which blocks the recirculated air and allows only outside air to enter the blower.

**RR DEFOG CMD**
**RR DEFOG FBK**
**RR DEFOG KEY**
**Range: ____ ON/OFF**

Displays the status of the rear window defroster on 1985–89 Cadillac DeVille and Fleetwood and 1990–91 Corvette:

- RR DEFOG CMD is the commanded state of the relay.
- RR DEFOG FBK is the actual state of the defogger.
- RR DEFOG KEY shows the status of the momentary switch on the instrument panel used to turn on the rear defogger.

**SUNLOAD TEMP(°F)**
**Range: ____ -40 to 419°F**
**SUNLOAD TEMP(°C)**
**Range: ____ -40 to 215°C**

Displays the load that the sun puts on the A/C system based on the signal of a sensor in the instrument panel. The BCM uses the signal of this sensor for automatic temperature control.

**STEERING WHEEL CONTROL(V)**
**STEERING WHEEL SW PWR**
**Range: ____ 0 to 5 V**

Displays the voltage being supplied to the steering wheel controls.

**SWITCH BATT(V)**
**Range: ____ 0.0 to 16.3 V**

Displays the system voltage distributed by the control module on 1990–91 Corvette. Normally this voltage is lower than the Ignition 1 voltage parameter reading.

**THEFT ALARM**
**Range: ____ ON/OFF**

Displays the status of the theft alarm system on Cadillac Allante.

**TW ENABLE SW**
**Range: ____ YES/NO**
**TW/SENT RELAY**
**Range: ____ ON/OFF**
**TW DELAY POT(%)**
**TW PHOTOCELL(%)**
**Range: ____ 0 to 100%**

Displays the status of various twilight (TW) sentinel inputs and outputs, which provides automatic ON/OFF control of the headlamps and taillamps in response to ambient light. The sentinel also keeps the lights turned on for a preset time after the key is turned off.

A photocell sensor mounted under the left front speaker grille monitors the ambient light. The position of the twilight sentinel slide switch adjusts the time that the lights remain on after the key is turned off. This ranges from a few seconds to about 3 minutes. The headlamp switch must be turned off and the Twilight Sentinel switch must be on for the system to operate.

TW ENABLE SW shows the status of the on/off switch.

TW/SENT RELAY is the command signal from the BCM to the relay circuit on the Buick Riviera only, which controls several twilight relays through one circuit.

TW DELAY POT(%) displays how long the lights remain on after the key is switched off:

- 0% = minimum delay time
- 100% = maximum delay time

TW PHOTOCELL(%) displays the amount of ambient light being sensed by the photocell:

- 0% = daylight
- 100% = total darkness

**UP/DOWN DOOR**
**Range: ______ UP/DOWN**
**UP/DOWN DOOR**
**Range: ______ VAC/VENT**

Displays the status of the up/down door, which is a part of the air distribution system that directs air to either the heater outlet assembly or up through the air distributor to the A/C outlets or windshield defroster. The door is controlled by a vacuum actuator, and readings indicate the vacuum actuator and door position:

- UP or VENT when air is flowing to the heater outlet assembly
- DOWN or VAC when air flow is up through the air distributor

**VAT FUEL CUTOFF**
**Range: ______ YES/NO**

Indicates whether the vehicle antitheft system (VATS) has cut off, or inhibited, fuel delivery.

**VATS KEY**
**Range: ______ 0 to 255**

Displays the code on the key inserted into the ignition switch on 1990–91 Corvette only. The vehicle antitheft system (VATS) compares this code to the code required to enable fuel delivery.

**VEH SPEED**
**Range: ______ 0 to 98 MPH**

Displays the vehicle speed as calculated by the ECM based on input pulses from the vehicle speed sensor (VSS). Use it to check TCC lock-up speed or speedometer accuracy.

**VF DIMMING(%)**
**Range: ______ 0 to 100%**

Displays the duty cycle of the vacuum fluorescent (VF) display dimming circuit to the climate control panel, fuel data center, digital instrument panel, and radio. The PWM input to the VF display is relative to the headlamp switch position or the Twilight Sentinel photocell sensor.

# Tire Pressure Monitor and Tire Inflation Monitor Parameters

This section defines data parameters that are available from the Tire Pressure Monitor system (TPM) or Tire Inflation Monitor (TIM) systems on General Motors vehicles. These systems do not utilize a dedicated module, but a combination of modules or circuits to determine inflation pressure loss in an individual tire. This may be done by detecting a sudden steady change in a wheel's rotational speed or by a radio frequency signal transmitted from a pressure transducer in the tire/wheel assembly. To find the description of a specific parameter, locate the parameter name in the Index, then go to the listed page.

**AUTO LRN ACTIVE**
**Range:** ____________ **YES/NO**

Indicates whether the TPM system is learning the tire pressure calibrations for the speed range the vehicle is in. Reads YES when learning, and NO if the TPM has already learned the tire pressure calibrations for the speed range the vehicle is in.

**CURRENT POWER MODE**
**Range:** ____________ **see below**

Displays the current power mode. The BCM determines ignition switch position from its ignition inputs. Possible readings are:

- INVALID STATE
- OFF BATT SAVE
- OFF ASLEEP
- OFF AWAKE
- UNLOCK
- RAP UNLOCK
- ACCESSORY
- RUN
- CRANK
- RETAINED POWER

This ignition switch information is sent on the serial data line to systems that rely on this information to perform certain functions.

**LF PRESSURE SENSOR ID**
**LR PRESSURE SENSOR ID**
**RF PRESSURE SENSOR ID**
**RR PRESSURE SENSOR ID**
**Range:** ____________ **xxxxxxxx, ***

Displays the unique identification code of the indicated tire pressure sensor that has been learned by the PDM. An asterisk (*) indicates that the sensors ID code has not been learned.

**LF PRESSURE SENSOR MODE**
**LR PRESSURE SENSOR MODE**
**RF PRESSURE SENSOR MODE**
**RR PRESSURE SENSOR MODE**
**Range:** ____________ **see below**

Displays the mode contained in the last transmission received from the tire pressure sensors.

- INVALID indicates the sensor is in a mode not supported by the scan tool.
- LEARN indicates the sensor has been activated by a low frequency (LF) signal.

- STATIONARY indicates the sensors internal roll switch is opened and the sensor has made its stationary transmission which only occurs once every 60 minutes from the last stationary transmission.
- RE-MEASURE indicates the sensor has detected a 11kPa(1.6psi) change in pressure. This mode occurs to decrease the time between pressure change occurrence and PDM receipt.
- WAKE indicates the sensor is in transition to drive mode. In this mode the sensor has detected an initial roll switch closure.
- LOW BATTERY indicates the internal sensor battery charge level is low.
- DRIVE indicates vehicle speed is greater than 32km/h (20mph). In this mode the initial roll switch of the sensor has been closed for at least 10 seconds and the sensor is transmitting once every 60 seconds.

**LF TIRE PRESSURE**
**LR TIRE PRESSURE**
**RF TIRE PRESSURE**
**RR TIRE PRESSURE**
**Range: ____ 0-100 psi, 0-689 kPa**

Displays the actual pressure of the indicated tire.

**LF TIRE PRESSURE SENSOR BATTERY STATUS**
**LR TIRE PRESSURE SENSOR BATTERY STATUS**
**RF TIRE PRESSURE SENSOR BATTERY STATUS**
**RR TIRE PRESSURE SENSOR BATTERY STATUS**
**Range: ____ OK/LOW**

Displays the internal battery status of the indicated tire pressure sensor. Reads OK if the battery charge level is good, and LOW if the charge level is low.

**LF TIRE PRESSURE SENSOR**
**LR TIRE PRESSURE SENSOR**
**RF TIRE PRESSURE SENSOR**
**RR TIRE PRESSURE SENSOR**
**Range: ____ 0-344 kPa, 0-51 psi**

Displays the actual pressure of the indicated tire.

**LF TIRE PRESSURE SENSOR STATUS**
**LR TIRE PRESSURE SENSOR STATUS**
**RF TIRE PRESSURE SENSOR STATUS**
**RR TIRE PRESSURE SENSOR STATUS**
**Range: ____ NORMAL/FAILED**

Displays whether the indicated tire pressure sensor is in drive mode. Reads FAILED when the pressure sensor is in stationary mode.

**LF TIRE PRESSURE TRANSMITTER**
**LR TIRE PRESSURE TRANSMITTER**
**RF TIRE PRESSURE TRANSMITTER**
**RR TIRE PRESSURE TRANSMITTER**
**Range: ____ NORMAL/FAILED**

Indicates whether the remote controlled door lock receiver (RCDLR) is receiving tire pressure data transmissions from the indicated tire pressure sensor. A FAILED reading indicates that the RCDLR is not receiving data transmissions from the sensor.

**LF TIRE STATUS**
**LR TIRE STATUS**
**RF TIRE STATUS**
**RR TIRE STATUS**
**Range: ______ DATA PENDING/OK**

Displays the status of the indicated tire pressure sensor. Reads OK if the sensor is in drive mode, and DATA PENDING if in stationary mode.

**LOW TIRE PRESS**
**Range: ______ YES/NO**

Indicates whether the TPM system has detected a low tire pressure and the tire pressures should be inspected. Reads YES if pressure is low, and NO if pressures are within specification.

**MANUAL TIRE PROGRAMMING**
**Range: ______ ACTIVE/INACTIVE**

Indicates whether the tire pressure monitor (TPM) system is currently in the sensor programming mode. Displays ACTIVE when in sensor programming mode and INACTIVE if not.

**MODE 1 ACTIVE**
**Range: ______ YES/NO**

Indicates whether the TPM system is beginning to learn the initial half of the calibration process. A YES reading means learning has begun and there is no tire pressure detection capability for the speed range the vehicle is in. A NO reading indicates the TPM system has partially completed the calibration process and has limited tire pressure detection capability for the speed range the vehicle is in.

**MODE 2 ACTIVE**
**Range: ______ YES/NO**

Indicates whether the TPM system has completed the calibration process and has full tire pressure detection capability for the speed range the vehicle is in, and reads YES if so. a NO reading indicates the TPM system has only partially learned the final half of the tire pressure calibration and has limited tire pressure detection capability for the speed range the vehicle is in.

**SENSOR LEARN MODE**
**Range: ______ ACTIVE/INACTIVE**

Indicates the tire pressure monitor (TPM) learn status. Displays ACTIVE when the TPM system is in sensor programming mode, and INACTIVE if the system is not in programming mode.

**TIM EQUIPPED**
**Range: ______ YES/NO**

Indicates whether the vehicle is equipped with a tire inflation monitoring (TIM) system. Reads YES if so equipped, NO if not.

**TIM FAILED**
**Range: ______ YES/NO**

Indicates whether the TPM system is disabled due to a malfunction detected within the system. Reads YES if there is a malfunction and NO if the system is operating properly.

**TIRE PRESSURE PROGRAM MODE**
**Range: ______ ACTIVE/INACTIVE**

Indicates whether the tire pressure monitor (TPM) system is in sensor programming mode. Reads ACTIVE when in sensor programming mode and INACTIVE if not.

**TIRE PRESSURE SENSOR ID**
**Range: ______ VALID/INVALID**

Displays tire pressure identification validity. a VALID reading indicates all of the tire pressure sensor identification codes are valid, INVALID indicates at least one of the codes is not valid.

**TIRE SENSOR LEARN**
**Range: ______ ACTIVE/INACTIVE**

Indicates whether the tire pressure monitor (TPM) system tire pressure sensor learn mode is active and able to learn all 4 sensor identification codes. Reads ACTIVE if system is able to learn the sensor codes, and INACTIVE if not able to learn the codes.

# Vehicle Theft Deterrent (VTD) Parameters

This section defines the data parameters available from the Vehicle Theft Deterrent (VTD) control module (ECM).

**A/C REQUEST**
**A/C ENABLED**
**Range: ______ YES/NO**

Indicates the position of the air conditioning switch on the instrument panel or the setting of the A/C request on the automatic climate control panel. The value reads YES if the A/C switch is turned on or the BCM has commanded the A/C system to turn on.

In some cases, the A/C compressor may not turn on even though the switch is closed. Several other switch or sensor signals may prevent the PCM from engaging the A/C compressor clutch. The request means the switch is closed or the PCM has been commanded to turn on the A/C when all other conditions permit. Refer to the A/C Clutch parameter description for information on the A/C compressor clutch feedback signal.

**DASH LIGHT**
**Range: ______ 0 to 16.3**

Displays the output voltage of the instrument panel illumination dimming dashpot.

**DRL OPTION**
**Range: ______ YES/NO**

Indicates whether the vehicle has daytime running lights (DRL) installed, reads YES if equipped.

**LOW BEAM(V)**
**Range: ______ 0 to 16.3 V**

Displays the voltage being applied to the low beam circuit of the headlamps.

**PARKING BRAKE**
**Range: ______ ON/OFF**

Displays the status of the parking brake switch and reads ON when the parking brake is applied.

**VTD OPTION**
**Range: ______ YES/NO**

Indicates whether the vehicle has the optional vehicle theft deterrent (VTD) system and reads YES if so equipped.

# Appendix A Troubleshooting

This chapter contains manufacturer-specific information for troubleshooting problems with scan tool-to-vehicle communications. For general troubleshooting information, see the user's manual for your diagnostic tool.

This chapter contains the following main sections:



## A.1 Chrysler Communications Problems

Chrysler control systems have few problems communicating with the scan tool or with entering the self-diagnostic tests, however, a Chrysler electronic control module (ECM) may fail to communicate, or the system may not perform ATM or sensor tests.

If a problem exists with the wiring or other circuit parts on the vehicle, the scan tool may not be able to receive or transmit information. A vehicle failing to perform a test may also be a symptom for diagnosing a driveability problem.

### A.1.1 Common Vehicle Problems

When a "no communication" message displays, it means the scan tool and the vehicle ECM cannot communicate with each other for some reason. Some common problems that may prevent a Chrysler from performing a test or communicating are listed below.

#### Engine (Except LH Models)

The following are common causes of Chrysler engine control system communication problems. See "CCD Systems" on page 708 for LH-models.

- **Vehicle identification**—Check the vehicle identification (ID) entered from the VIN plate. If in doubt, reenter the ID. If vehicle ID is incorrect, the scan tool may be unable to perform certain tests or display data.
- **Loss of power to the PCM**—Use the scan tool Read IGN(+) at DLC test to verify battery voltage is supplied to the PCM with the ignition on. See "Read IGN(+) at DLC" on page 20 for details. The PCM receives battery voltage through one or more fusible links in the wiring harness. Use a wiring diagram to check connections for battery voltage and ground. If a fusible link is open, the PCM cannot communicate with the scan tool. Also check the J1-J2 circuit splice near the PCM.

- **Fuel-injected engines (1988 and earlier): open or shorted ASD relay circuit**—To perform ATM and sensor tests the scan tool must be able to switch the ASD relay. The scan tool cannot cycle the relay if the circuit or relay is open or shorted. The 1989 and later systems do not require the ASD relay to operate for ATM and sensor tests.
- **Carbureted engines: failure to open the idle stop switch**—The idle stop, or ground, switch mounted on the carburetor must be held open to place the ECM in the diagnostic mode. Be sure the throttle stop screw is on the highest step of the fast-idle cam or insert an insulator between the switch contacts. If a carbureted engine does not enter the diagnostic mode with the switch fully open, check for a shorted or open circuit in the switch wiring.
- **Carbureted engines: open or shorted carburetor oxygen feedback solenoid circuit**—To perform ATM and sensor tests the scan tool must be able to switch the carburetor feedback solenoid. If the circuit or solenoid is open or shorted, the scan tool cannot cycle the solenoid. Check a wiring diagram for a specific engine to determine if the solenoid is used for ATM and sensor tests.

## CCD Systems

The following common problems are known to cause communication failure on Chrysler CCD systems. The CCD system includes engine communications on LH-models. All engine and CCD system testing is done through the CCD diagnostic connector under the dash.

A “bus is inactive” message means the scan tool cannot communicate on the CCD data bus for some reason. Typically, this message displays if there is an open or shorted bus circuit, or if the bus bias voltage is too high or too low.

If the screen displays a “no communication” message during engine testing on LH-models, it means the scan tool and the PCM cannot communicate with each other for some reason.

If either the “no communication” or “bus is inactive” message appears, check the vehicle battery state of charge. Also check the continuity of the scan tool data cable as described in the user’s manual for your diagnostic tool.

## Check Malfunction Indicator Lamp (MIL)

Fuel-injected vehicles have a MIL on the instrument panel labeled “power loss,” “power limited,” or “check engine.” It not only signals problems with sensors and actuators, it is also an important device for checking the ability of the PCM to communicate with the scan tool. If the scan tool cannot communicate with the vehicle or perform some tests, disconnect the unit and see if the PCM flashes codes on the MIL.

Turn the ignition on and verify that the MIL lights with the ignition on and the engine off. If the MIL does not light, repair the problem before going further. The cause could be as simple as a burned out bulb or a blown fuse, or it could indicate a PCM system problem. Refer to the Chrysler troubleshooting procedure for the specific vehicle.

If the MIL passes the bulb check, cycle the ignition switch three times (on–off–on–off–on), leaving it on the third time. This is the same switch sequence used to start the engine off functional tests on 1988 and earlier vehicles. On most 1989 and later models, cycling the ignition three times still causes the MIL to flash codes. The scan tool must be disconnected from the vehicle for the PCM to flash codes on the MIL.

The MIL should flash in even pulses to indicate any codes present in the following sequence:

1. The MIL lights for about 2 seconds after the ignition is cycled on the third time, then goes out for 2 to 4 seconds.
2. The MIL flashes any fault codes present in the PCM, each code flashes once.
3. The MIL flashes code 55 (5 flashes—pause—5 flashes).

The last series of MIL flashes, code 55, indicates the “end of fault code transmission.” If the MIL flashes only code 55, there are no other codes present in the PCM.

If the MIL stays lit continuously, if it flickers unevenly, or if it does not flash at least a code 55, the PCM is not entering diagnostic mode. Refer to the Chrysler troubleshooting procedure for the specific vehicle.

**NOTE:**
Vehicles with carbureted engines do not have a MIL.

## Engine Does Not Start and Does Not Perform Diagnostic Tests

If the engine does not start and the vehicle does not display codes on the MIL, perform these basic tests. You need a wiring diagram of the specific vehicle for some of the following checks:

- **Battery**—Check the state of charge and the cranking capacity of the vehicle battery. The scan tool draws very little current and operates on low voltage. Therefore, the scan tool may appear to be operating normally even though the battery does not have enough power to crank the engine or operate the PCM.
- **PCM supply voltage**—The PCM receives battery voltage (B+) through a fusible link. Check a wiring diagram for the location of a fusible link and test for an open circuit. Also check the J1-J2 circuit splice near the PCM.
- **PCM ground**—The PCM is remotely grounded to the engine, which is circuit J9 on most Chrysler vehicles. Use a wiring diagram to identify the location of the ground connection. An open ground may prevent a fuel-injected engine from starting. High-resistance, or a weak ground causes overall poor operation.

An open ground or battery power (B+) circuit on a fuel-injected engine removes power from the PCM and keeps the engine from starting. A carbureted engine may start and run even if the power circuit to the PCM is open. However, it probably runs very poorly because there is no feedback fuel control or spark advance control.

## Engine Runs, But Does Not Perform Tests

The way in which the engine runs may provide a clue to the cause of a test problem.

- If the engine seems to run normally but does not complete a test or display data, the cause may be a diagnostic connector wiring problem that does not affect the rest of the system.
- If the engine runs poorly and does not complete a test, the cause may be a poor control system ground or a voltage problem that affects the PCM or the system.

## A.1.2 Does Not Perform Tests

If the vehicle does not transmit codes and data, and does not perform sensor or ATM tests, check the continuity of the vehicle transmit and receive circuits at the diagnostic connector.

## A.1.3 Testing the Engine Diagnostic Connector

These tests apply to models with an underhood diagnostic connector. Refer to “Bus Communication Problems” on page 711 and “CCD Systems” on page 708 for testing LH-models.

Use the following voltage tests at the engine diagnostic connector to help determine the reason that a vehicle does not perform diagnostic tests. Use a DVOM or a high-impedance digital voltmeter and refer to Figure A-1.

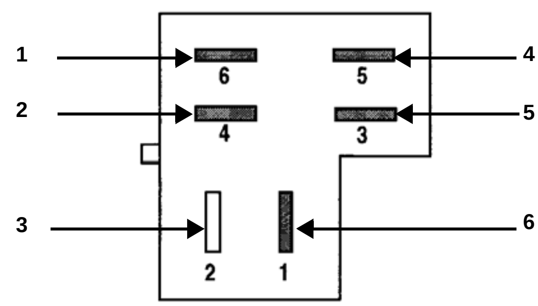


**Figure A-1** *Chrysler engine diagnostic connector through 1995*

**1— Battery voltage (B+)**
**2— Communication receive**
**3— Not used**
**4— Switched ignition (12V)**
**5— Communication transmit**
**6— Ground**

**To test the engine diagnostic connector:**

- **Battery Voltage (B+)**—Battery power is supplied to the diagnostic connector by the ASD relay on fuel-injected engines and by the carburetor solenoid on carbureted engines. Connect the positive (+) voltmeter lead to terminal 6 in the engine diagnostic connector. Connect the negative (-) lead to the battery ground terminal. Then, switch the ignition on:
  - On fuel-injected engines, there should be 0 V on the ASD relay terminal for about 2 to 5 seconds with the ignition switch on. Voltage then rises to open-circuit battery voltage, or about 12 V, as the PCM switches the relay.
  - On carbureted engines, there should be 0 V available on the carburetor solenoid terminal with the ignition switch on. With the engine running, the voltage should switch from about 6 to 9 V as the solenoid modulates.

  If voltage readings differ, check the circuit connections at the relay or solenoid. The engine still runs with an open circuit to the terminal in the connector.

  On 1985–87 models the ASD relay is built into the power module.

- **Ground**—With the ignition on, connect the voltmeter positive (+) lead to the ground terminal in the diagnostic connector. Connect the negative (-) lead directly to the battery negative (-) terminal. Do not connect the meter lead to an engine ground or a chassis ground. This test measures voltage drop across the ground side of the diagnostic connector. An ideal system ground should have a voltage drop of 0.1 V or less.

  If the diagnostic connector or the ground terminal wiring is open, it may not affect engine operation. However, it does affect scan tool operation because the unit uses this terminal as a ground point. To check for an open circuit, connect the voltmeter positive (+) lead to battery positive and the negative lead to the connector ground terminal. The meter should read battery voltage. A reading of zero indicates an open ground terminal.
- **Switched ignition voltage**—Switch the ignition on and connect the voltmeter positive (+) lead to the battery voltage terminal at the diagnostic connector. Connect the negative (-) lead to the battery ground terminal. The meter should read battery voltage. This test checks the battery voltage supply to the PCM. Also check the J1-J2 splice near the PCM.
- **Vehicle communication transmit and receive**—Refer to a wiring diagram and check continuity in the transmit and receive circuits to the diagnostic connector. The scan tool uses these lines to receive data in the Codes and Data mode and for sensor and ATM tests. If either circuit is open, the scan tool is unable to transmit a request to the PCM or receive data from it.

## A.1.4 Bus Communication Problems

Chrysler bus communication systems are a multiplex serial data bus, or network. There are two types: Chrysler Collision Detection (CCD) and Programmable Communication Interface (PCI). A CCD system uses a pair of twisted wires to connect the modules on the network, while a PCI system uses just one wire. Modules on the bus use this network to communicate and exchange data with each other. The number of control modules on the bus varies, depending on the vehicle.

On CCD systems, the scan tool connects to either the CCD connector or the OBD-II data link connector (DLC) to communicate on the bus network. For a PCI system, the scan tool connects only to the OBD-II DLC (Figure A-2).

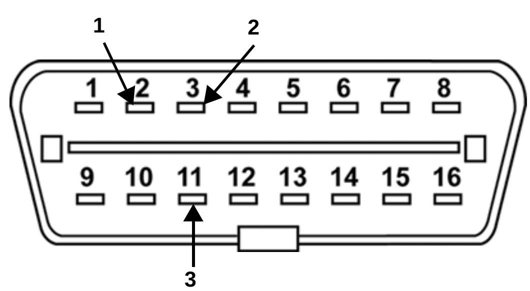


**Figure A-2** *The 16-pin data link connector (DLC) bus terminals*

**1— PCI terminal**

**2— CCD terminal**

**3— CCD terminal**

## Bus System Identification

The scan tool identifies the bus communication system for a specific vehicle. Switch the ignition off and connect the scan tool following the instructions on the screen. Select a bus-supported module, such as the BCM or the ABS module. If the module communicates on a bus system, either a “testing CCD bus” or “testing PCI bus” message displays.

All PCI bus communication systems use only terminal 2 of the OBD-II DLC to communicate with the scan tool. To quickly identify a PCI system, confirm the presence of a metal pin inside DLC terminal 2.

All CCD systems communicate with the scan tool through pins 3 and 11 of the OBD-II DLC. To quickly identify a CCD system, confirm the presence of metal pins inside DLC terminals 3 and 11.

## Troubleshooting CCD Systems

Many CCD problems are quickly and easily diagnosed by correctly interpreting the communication message displayed on the scan tool screen. There are two types of communication message:

- Bus is inactive
- No communication

### *Bus is Inactive*

When CCD system is selected, the scan tool first sends a message out over the CCD bus and waits to hear the message echoed back. If it does not hear the message echoed back, a “bus is inactive” message displays.

This message means one of two things, either the bus is inoperative or the data cable is damaged. If the data cable works on other Chrysler CCD systems, then the bus is probably at fault. The most common cause of an inoperative bus is a control module failure. This could be a body module, a transmission module, or any other module on the CCD bus.

To further isolate this problem, disconnect one of the control modules from the CCD bus, and then attempt to establish communication with the scan tool. Note that each control module connects to the CCD bus with separate connectors. If the bus activates, the disconnected module was most likely causing the problem.

If the bus remains inactive, leave that module disconnected, then continue by disconnecting other modules. Press **Y** to recheck the bus after each module is disconnected. If the bus activates when a module is disconnected, that module is probably defective. To confirm, reconnect other modules and see if the bus still responds. If so, connect the bad module to see if the bus becomes inactive. If the problem cannot be isolated to a module, there is likely another problem on the bus.

### *No Communication*

Chrysler CCD tests require the scan tool to be connected to the CCD connector and communicating with the selected module. If these conditions are not met, a “no communication” message displays.

The following circumstances cause a no communication message:

- The ignition is not switched on
- Engine was selected rather than a CCD module test
- The vehicle does not have the selected CCD module
- The selected CCD module is not responding

In any case, this message means that the CCD bus itself is operational.

### Troubleshooting PCI Systems

Many PCI problems are quickly and easily diagnosed by interpreting the “no communication” message displayed on the screen.

Chrysler PCI testing requires that the scan tool be connected to the OBD-II DLC connector and communicating with the vehicle. If the scan tool sends out a command to a PCI control module and the module does not reply correctly or at all, a “no communication” displays.

Check that the data cable is not damaged by using it on another vehicle or system. A no communication message does not necessarily mean the scan tool cannot communicate with all PCI modules.

After receiving a no communication message, try communicating with other PCI control modules, such as ABS, any of the body systems, or the transmission. If the scan tool communicates with at least one module on the PCI bus, suspect that the PCI bus has an open circuit associated with each module that does not communicate.

If the scan tool fails to communicate with all of the PCI control modules, then suspect that the PCI bus has a short or an open in the circuit. See “Testing the 16-pin Data Link Connector (DLC)” on page 715 for additional test information.

## A.1.5 Testing the CCD Diagnostic Connector

Use the following voltage tests at the CCD diagnostic connector to help determine the reason that a vehicle does not perform diagnostic tests. Use a high-impedance digital voltmeter and refer to Figure A-3.

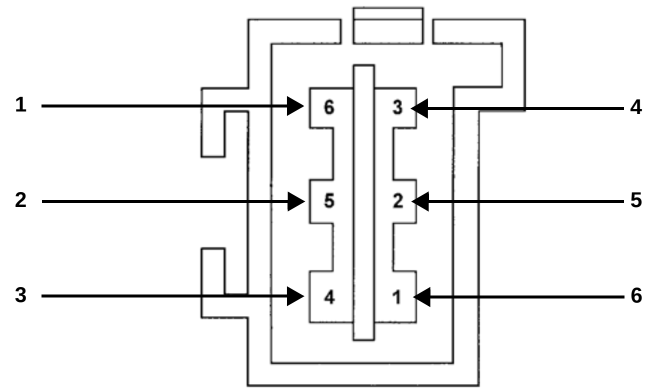


**Figure A-3** *The CCD diagnostic connector*

**1— Ground**

**2— Engine data receive (LH-body only)**

**3— Bus (+)**

**4— Bus (–)**

**5— Battery (B+)**

**6— Engine data transmit (LH-body only)**

**To test the CCD diagnostic connector:**

- **Ground**—Connect the positive (+) voltmeter lead to the diagnostic connector ground terminal, and connect the negative (-) voltmeter lead directly to the negative battery terminal. Do not connect the meter lead to an engine or chassis ground. This measures voltage drop across the ground side of the diagnostic connector. An ideal ground has a voltage drop of 0.1 V or less.

  If the diagnostic connector ground terminal wiring, or the connector itself, is open, it may not affect engine operation. However, it does affect the display because the scan tool uses this terminal as a ground point. To check for an open circuit, connect the positive (+) meter lead to battery positive and the negative lead to the ground terminal of the connector. The meter should read battery voltage.
- **Battery voltage**—Connect the positive (+) voltmeter lead to the battery voltage terminal at the diagnostic connector. Connect the negative (-) meter lead directly to the battery ground terminal. The meter should read battery voltage. This tests the voltage supply to the PCM.
- **Bus bias voltage**—Connect the positive (+) voltmeter lead to either of the bias terminals in the diagnostic connector. Connect the negative (-) lead to the diagnostic connector ground terminal. The bias voltage should be in the 2.1 to 2.6 V range. Check the other bias terminal of the diagnostic connector the same way.
- **Engine data transmit and receive (LH-models)**—Refer to a wiring diagram and check continuity in the engine control module transmit and receive circuits to the diagnostic connector with an ohmmeter. The scan tool uses these circuits to receive codes and data and to activate sensor and ATM tests. If either circuit is open, the scan tool cannot request PCM tests or receive data.

## A.1.6 Testing the 16-pin Data Link Connector (DLC)

The following checks of the 16-pin DLC are used to determine the reason that a vehicle does not perform diagnostic tests (Figure A-4). Use a DVOM or a high-impedance digital voltmeter to perform the tests.

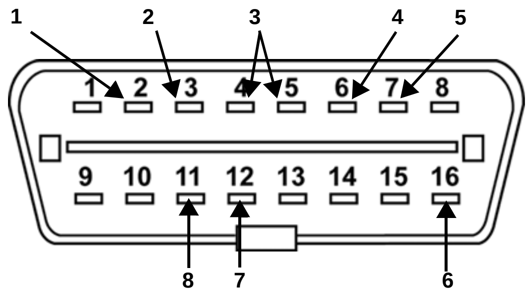


**Figure A-4** *The 16-pin data link connector (DLC)*

**1— PCI bus**

**2— CCD Bus (+)**

**3— Chassis ground**

**4— Engine data receive**

**5— Engine data transmit**

**6— Battery voltage**

**7— Engine data transmit**

**8— CCD bus**

**To test the 16-pin DLC:**

- **Ground**—Connect the positive (+) voltmeter lead to the ground terminal in the DLC. Connect the negative (-) lead directly to the negative battery terminal. Do not connect the voltmeter negative lead to an engine or chassis ground. This measures voltage drop across the DLC ground, which should be 0.1 V or less.

  If the wiring is open to the ground terminal of the DLC, or at the DLC itself, it may not affect engine operation. However, it does affect the display because the scan tool uses this terminal as a ground point.

  To check for an open at the DLC ground terminal, connect the positive (+) voltmeter lead to battery positive and the negative lead to the DLC ground. The meter should read battery voltage. A zero reading means the terminal is open.
- **Battery voltage**—Connect the positive (+) voltmeter lead to the battery voltage terminal at the DLC. Connect the negative (-) lead to the battery ground terminal. The meter should read battery voltage. This tests PCM supply voltage.
- **Engine data transmit and receive**—Refer to a wiring diagram and check continuity in the PCM transmit and receive circuits to the DLC. The scan tool uses these circuits to receive codes and data and for activating tests. If either circuit is open, the scan tool cannot communicate with the PCM.
- **CCD bus communication**—Verify an active CCD bus by checking the voltage at DLC terminals 3 and 11. Connect the negative (-) voltmeter lead to ground, then switch the ignition on and probe DLC terminal 3 (CCD BUS +) and DLC terminal 11 (CCD BUS -) with the positive meter lead. Expect to see about 2.5 V on each terminal.

- **PCI bus communication**—Use an oscilloscope to verify an active PCI bus. Connect the positive scope lead to terminal 2. Connect the negative lead to DLC terminal 4, which is chassis ground. Adjust the scope to a 50 mS timebase and 14 V range. Switch the ignition on and look for a series of voltage spikes in the 7 V range. This indicates that the PCI bus is active, and not shorted.

  Since each PCI module supplies its own voltage, the bus continues to operate if a module circuit is open. However, an open between the DLC and the bus hub prevents communication. If some of the PCI modules, but not others, communicate with the scan tool, suspect open circuits associated with any modules that fail to communicate. Isolate the open circuit by removing each module and checking scan tool communication status.

### A.1.7 Identifying 1987 Models that use 1986 Logic Modules

The following vehicles are 1987 models that use 1986 logic modules and may have problems communicating with the scan tool or performing diagnostic tests:

- Some 1987 Sundance and Shadow models with the 2.2L turbocharged engine (P-body)
- Some 1987 Omni, Horizon, and Charger models (L-body)

**To identify 1987 models that use 1986 logic modules:**

- Follow the procedure in “Manual Identification” on page 5 but enter 1986 as the model year (enter the tenth VIN character “G” for 1986, rather than “H” for 1987).

**To identify a 1986 or 1987 logic module:**

- Locate the MAP sensor.
  - A 1986 logic module has the MAP sensor mounted on the module case.
  - A 1987 logic module uses a MAP sensor that is remotely mounted in the engine compartment.

## A.2 Ford Communications Problems

The following section provides information for troubleshooting common problems on Ford vehicles.

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


- “Ford Operations” on page 52
- “Ford Testing” on page 68
- “Ford Data Parameters” on page 311


### A.2.1 Common Symptoms

The following list identifies some common symptoms of Ford self-test failures with references to sections of this appendix for troubleshooting. In addition to these points, also check the items listed in “Checklist, Check These Points First” on page 717.

1. The “tests initiated - wait for codes” message displays indefinitely after starting a test, check:

   Ignition key and **Y** button sequence. See Checklist items 2 and 3 and “Starting EEC-IV and MCU Self-Tests” on page 720.

   Vehicle ground or wiring fault. See Checklist items 5, 6, and 7 and “Testing the Self-Test Connector” on page 723.

2. Solenoids or relays do not click when starting a KOEO self-test, or engine speed does not change during a KOER self-test, check:

   Ignition key and **Y** button sequence. See Checklist items 2, 3, and 4 and “Testing the Self-Test Connector” on page 723.

3. Display shuts off when the ignition key switches on, check:

   Ground terminal at self-test connector. See Checklist items 5 and 6 and “Testing the Self-Test Connector” on page 726.

4. No codes received, but the engine seems to self-test, check:

   Check self-test output (STO) line. See “Testing the Self-Test Connector” on page 726. Also check the data cable.

## A.2.2 Checklist, Check These Points First

Begin by determining if the scan tool is working. If it works on other vehicles, particularly other Ford models, the problem is likely in the vehicle, not the scan tool. Failure to run a key-on, engine-off (KOEO) or a key-on, engine-running (KOER) test may be due to the way in which the test is initiated. Check these points first:

1. Be sure the ignition is off when connecting the data cable.
2. To begin a KOEO test, press **Y** to start the test; then turn the ignition on. See “Starting a KOEO Test” on page 721.
3. To begin a KOER test, turn the ignition off for a full 10 seconds. Then, start the engine and press **Y** to begin. See “Starting a KOER Test” on page 722 for more information.
4. Determine if solenoids and relays click when a KOEO test starts or if engine speed changes during a KOER test. See “Starting a KOEO Test” on page 721 and “Starting a KOER Test” on page 722 for more information. The MECS self-tests do not activate solenoids or relays.
5. Check for an ECM main ground problem at the battery ground cable single-wire connector. A bad ground at this point may also cause a no-start condition or prevent closed-loop operation.
6. Check the oxygen sensor (O2S) ground. On early EEC-IV systems the O2S ground is an orange wire between the PCM and cylinder head. The engine may run but not self-test if the O2S ground is weak.
7. Check for voltage and ground at the self-test connector. See “Testing the Self-Test Connector” on page 723 for procedures.
8. Depending on whether the engine starts and runs or does not start, refer to the appropriate section in this appendix for more instructions.

## A.2.3 Ford Troubleshooting Sequence

Ford procedures are very specific about the order in which self-tests are performed and codes are diagnosed and serviced. Figure A-5 provides a troubleshooting flowchart for EEC-IV, and Figure A-6 for EEC-V.

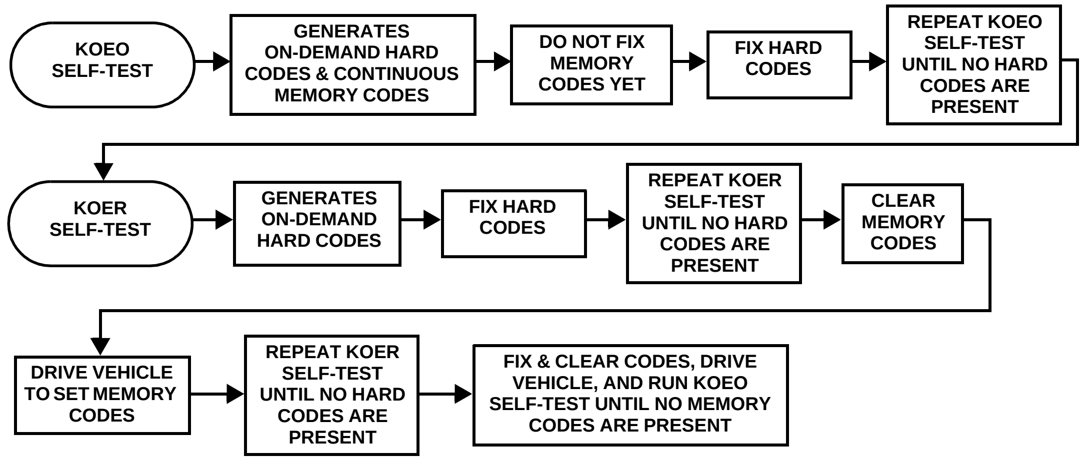


**Figure A-5** *Ford EEC-IV recommended troubleshooting sequence*

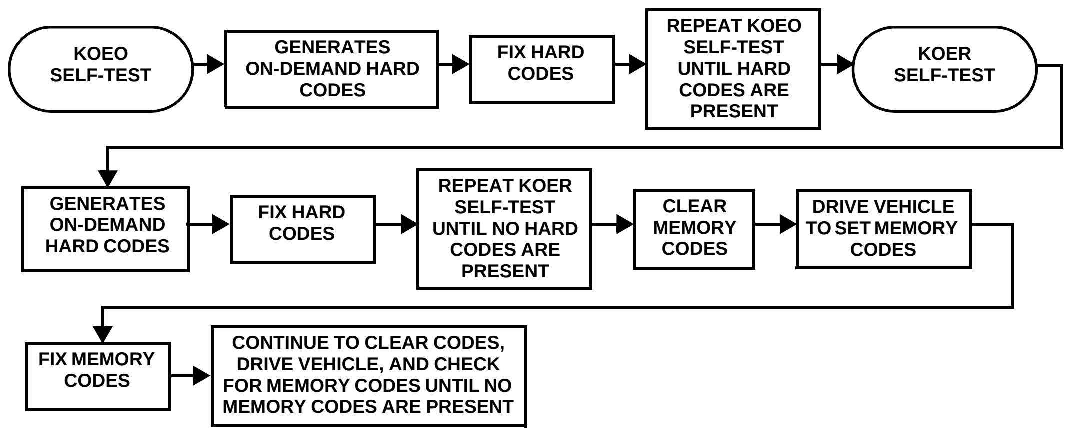


**Figure A-6** *Ford EEC-IV recommended troubleshooting sequence*

Troubleshoot Ford DTCs in the order in which they are listed on the screen. After fixing a problem, repeat the self-tests to be sure the DTC does not reset. Some codes may be present as both on-demand and continuous memory codes. Fixing the on-demand codes may also correct problems that caused the continuous memory codes.

Ford EEC and MCU systems control a variety of engine functions, but basic fuel, ignition, and electrical tests should be made before, or along with, control system testing. Be sure that the following systems and components are in good working order:

- Fuel delivery
- Battery, electrical connectors, and wiring harnesses
- Ignition primary and secondary circuits
- Vacuum lines and connectors
- Cooling system
- General engine mechanical condition

## A.2.4 EEC-III Systems

An EEC-III system performs a KOER self-test only. On-demand codes present at the time of testing display after the KOER test. The screen displays a KOEO self-test checklist for these systems, however, it is not programmed into the vehicle ECM as other Ford self-tests are. This is a series of checks based on Ford recommendations. Use it to troubleshoot no-start problems or a failure to perform a KOER test.

### EEC-III Does Not Perform Self-Test

An EEC-III KOER self-test is started by applying vacuum to the vent port of the barometric and manifold absolute pressure (BMAP) sensor, holding it for 8 seconds, and then releasing it on all models except 1983 5.0L trucks (engine code F). Releasing the vacuum sends a voltage spike that signals the ECM to start the test. Several problems may prevent the test from running. Check these points:

- **BMAP sensor ground**—A high-resistance ground for the BMAP sensor prevents the voltage spike from rising high enough to start the test. Measure voltage drop across the BMAP sensor ground, black wire at the sensor connector, with a digital voltmeter. An ideal ground has a voltage drop of about 0.1 V or less.
- **BMAP sensor reference voltage**—EEC-III systems operate with a 9 V, rather than 5 V, reference. Measure reference voltage at the BMAP sensor, orange wire at the sensor connector, with a digital voltmeter. It should be about 9 V. Low voltage causes the engine to run poorly and prevents self-test activation.
- **BMAP sensor signal voltage**—Backprobe the dark blue wire of the BMAP sensor connector to connect a digital voltmeter. Monitor the signal voltage while applying and releasing vacuum. With about 22 inHg of vacuum applied to the vent port, the signal should be below 3 V. Hold vacuum for 8 to 10 seconds and voltage should remain steady. Release the vacuum and voltage should quickly rise to about 9 V. The ECM requires a voltage signal that is over 6 V to start the test. Signal voltage that does not rise high enough or quickly enough prevents the self-test from activating. Several problems prevent the test from running and cause driveability complaints. These include incorrect sensor reference voltage, a ground circuit problem, and a defective BMAP sensor.
- **Listen to the engine**—As the EEC-III system runs its self-test, engine speed changes and air injection pulses can be heard from the air pump muffler. If there is not a noticeable change in engine operation, the self-test did not run. The entire test procedure should take no more than 2 to 3 minutes.
- **Check the TAB and TAD solenoids**—EEC-III systems transmit codes by pulsing the air injection thermactor air bypass (TAB) and thermactor air divert (TAD) solenoids. Connect a pair of voltmeters or probe lights to either the solenoids or TAB and TAD terminals of the self-test connector. Activate the self-test and the voltmeters or probe lights pulse to indicate fault code digits. Similarly, a pair of vacuum gauges teed into the small vacuum lines at the TAB and TAD solenoids also pulse codes. As a quick check, touch the solenoids to determine if they are clicking code pulses at the end of the test. If the system appears to run the test correctly but does not transmit at least a code 11, no faults, check for open circuits to the TAB and TAD solenoids or to the self-test connector terminals.

### *1983 Trucks with a 5.0L Engine and 2-Barrel Carburetor*

This EEC-III system activates self-test by grounding the STI connector, which is located next to the EEC connector (Figure A-7). If the system does not perform the self test, check for voltage at the STI connector terminal with the ignition on. Also check for good continuity at the ground terminal of the self-test connector.

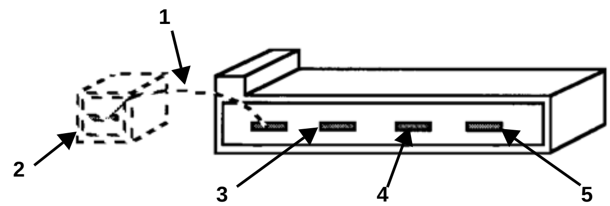


**Figure A-7** *1983 truck with 5.0L engine and 2-barrel carburetor*

**1— Jump wire**
**2— STI connector (1983 5.0L truck)**
**3— Ground**
**4— TAD solenoid**
**5— TAB solenoid**

## A.2.5 EEC-IV and MCU Systems

The EEC-IV and MCU systems perform both a KOEO self-test and a KOER self-test. The self-tests can be triggered manually.

**NOTE:**
For EEC-IV systems, programs to perform the Ford self-tests are built into the Ford electronic control module (ECM). If a problem exists with the wiring or other circuit parts on the vehicle, the scan tool may not be able to switch the self-test circuit in order to start the test.

### Starting EEC-IV and MCU Self-Tests

The self-tests can be manually triggered on EEC-IV and MCU systems. Codes display as needle sweeps on an analog voltmeter connected to the self-test connector. Connect the meter leads as shown in Figure A-8.

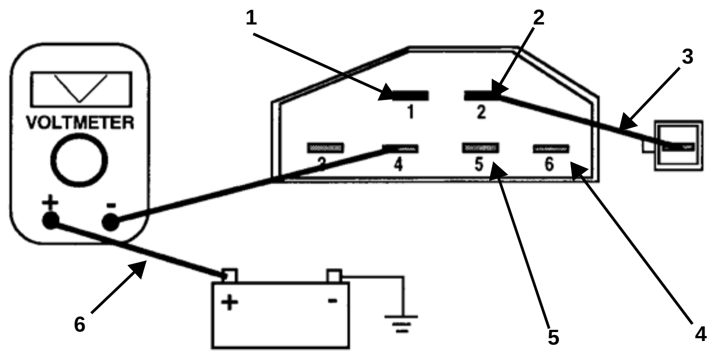


**Figure A-8** *Analog voltmeter connection for manual self-tests*

**1— STO**
Connect the negative lead here.

**2— Ground**

**3— Jump wire**

**4— STI (EEC-IV)**

**5— STI (MCU)**

**6— Positive (+) lead**
Connect to the battery positive terminal

Alternately, connect a test lamp between the STO terminal and battery voltage. Then, connect a jump wire from the self-test input (STI) terminal to the ground terminal in the self-test connector. Finally, switch the ignition on. Grounding the STI terminal starts the KOEO self-test for all EEC-IV and MCU systems.

For a KOEO test, the voltmeter should show some uniform voltage pulses or the test light should flash evenly after 45 to 60 seconds if the ECM ran the self-test and is transmitting codes. If the ECM now runs the self-test and transmits codes, the communication problem is probably in either the scan tool, data cable, test adapter, or connections. Check data cable continuity from pin to pin between the D-shaped connectors at the cable ends with an ohmmeter. If the ECM fails to run the self-test with a jumper wire, read the following sections to locate and repair the cause.

### *Starting a KOEO Test*

When an EEC-IV or MCU system starts a KOEO self-test on most Ford engines, you should hear solenoids and relays click as the self-test begins. The idle speed control motor may also operate. However, a few engines are completely silent during the KOEO test. If you do not hear any of the solenoids and relays operate on most engines, it may be an immediate sign that the test did not start. The KOEO test takes about one minute or less to complete.

**NOTE:**
For reliable test operation on EEC-IV and MCU systems, first press the **Y** button to start the test; then switch the ignition on.

To start the KOEO self-test, the ECM reads the voltage change on the STI line as the self-test input (STI) circuit switches to ground. Many ECMs for carbureted MCU systems only check the STI signal level once when the ignition is switched on. Therefore, if the ignition is switched on before **Y** is pressed to start a KOEO self-test, the ECM never sees a voltage change and does not start the test. Most, but not all, EEC-IV systems monitor STI voltage continuously, so the self-test may run if the ignition is switched on before **Y** is pressed to start the test.

### *Starting a KOER Test*

The signal for the ECM to start a KOER self-test is also grounding of the STI circuit. There is a noticeable increase in engine RPM for most systems when a KOER self-test runs. If the test runs properly, engine RPM changes several times as the ECM operates the idle speed control, the EGR valve, and other system actuators. Exceptions are MCU systems on 4-cylinder and 6-cylinder carbureted engines. These require that you raise engine speed to 2500 RPM within 10 seconds of starting the test. This speed is then held steady throughout the test.

The entire KOER self-test may take from one to three minutes, depending on the system and the number of codes that are output.

An EEC-V system goes directly from a KOEO test to a KOER test, but most Ford systems do not go directly from a KOEO to a KOER test with the ignition on. These systems allow only one self-test per ignition cycle. Turn the key off after finishing a KOEO test; then turn it back on to begin the KOER test. Leave the key off for ten seconds between tests. On many models a timed relay keeps ECM power on a few seconds after the key is turned off. Some carbureted and central-fuel injection (CFI) systems must reset the idle speed control motor before performing another self-test.

Many 1987 and later Ford systems do not perform a KOER test if there are any on-demand faults detected during a KOEO test. In this case, the ECM transmits either a code 98 or 998 before it transmits the cylinder identification code, and the test is aborted. Code 98 or 998 is a notice to repair all engine-off on-demand faults first, before performing an engine-running test. Ford test procedures require KOEO on-demand faults be repaired first, before KOER codes.

## Engine Does Not Start or Starts and Runs Poorly

Fuel-injected engines that do not start may not perform a KOEO self-test. Carbureted engines may start but run poorly due to a lack of feedback fuel or ECM spark advance control, and do not perform a self-test. If an EEC-IV or MCU vehicle has either of these symptoms, begin with the following basic checks. Have a wiring diagram of the vehicle available.

1. **Check battery state of charge and capacity**. The scan tool draws little current and operates with voltage as low as 7.5 V. The display may appear to operate normally even if the battery does not have enough power to crank the engine or operate the ECM.
2. **Check the EEC power relay and fuel pump relay**. The ECM receives battery voltage (B+) through a main EEC power relay. If the relay does not close, the ECM cannot operate. The power relay usually has either a brown cover with a black top or a black cover with a white top. It may be located in the engine compartment or under the dash. For a no-start problem, check the fuel pump relay. The fuel pump should run for about 2 seconds as the ignition is switched on. If it does not, the relay might not be closing. The fuel pump relay usually has a green plastic cover with a black top. Location varies by model, it may located be in the engine compartment, under the dash, or in the trunk. The ECM uses power from the EEC power relay to energize the fuel pump relay.

   The fuel pump inertia switch is a convenient place to check fuel pump relay voltage on many models. Also make sure that the inertia switch is not open.

3. **Check ECM supply voltage**. The ECM receives battery voltage (B+) through a fusible link in the wiring harness on most Ford vehicles. Some receive B+ voltage through a fuse. Check a wiring diagram for the location of a fusible link or fuse and test for an open circuit. A quick way to check for ECM supply voltage is to check for voltage at the self-test input (STI) terminal as described in “Testing the Self-Test Connector” on page 723.
4. **Check the ECM ground (signal return)**. The ECM on most systems is grounded remotely through a circuit in the main ECM harness. Use a wiring diagram to identify the ground circuit. An open ground prevents a fuel-injected engine from starting, while a high-resistance ground causes poor overall operation. A common problem area is the bullet connector in the pigtail on the battery ground cable.

## Engine Runs But Does Not Perform Self-Tests

The way the engine runs is helpful for identifying the cause of a self-test failure. If the engine seems to run normally but the system does not complete a self-test, the cause may be a fault in the self-test connector wiring that has no affect on the rest of the system. If the engine runs poorly, the cause might be an ECM voltage problem that affects the entire system, a poor EEC system ground, or an open ground at the oxygen sensor (O2S). For example, the 1.9L Escort engine does not perform a self-test if the O2S ground is open.

Radio frequency interference (RFI) may also prevent or interfere with a self-test. If a KOER self-test fails halfway through the test, or if code output is erratic or invalid, use a scope to check for ignition RFI.

## Testing the Self-Test Connector

Make the following voltage tests at the vehicle self-test connector to help determine why an EEC-IV or MCU system does not perform a self-test. Use a digital voltmeter and refer to Figure A-9 and Figure A-10.

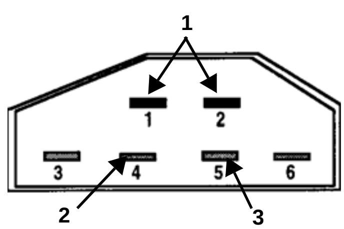


**Figure A-9** *The MCU self-test connector*

**1— Ground**
**2— STO**
**3— STI**

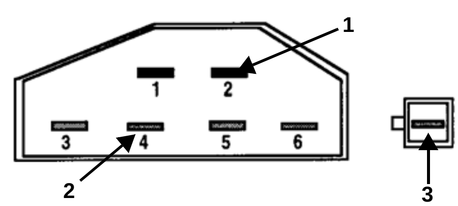


**Figure A-10** *The EEC-IV self-test connector*

**1— Ground**
**2— STO**
**3— STI**

**To check:**

- **Self-test input (STI)**—Switch the ignition on. Connect the positive (+) voltmeter lead to the STI terminal and the negative (–) lead to the battery negative (–) terminal. There should be either 12 V or 5 V on the STI terminal with the key on. If the STI is open, the ECM cannot receive the self-test start signal. However, the vehicle still runs normally with an open circuit to the STI terminal.

- **Ground**—With the ignition switched on, connect the positive (+) voltmeter lead to the ground terminal in the self-test connector. Connect the negative (–) lead directly to the battery negative (–) terminal. Do not connect the meter to an engine or chassis ground. This test measures voltage drop across the ground side of the connector, the ECM, and most sensors. The ground voltage-drop test is important for several reasons.

  A high-resistance ground prevents the self-test from running. This is particularly true on vehicles with a 5 V STI signal. The display may operate normally, but not enough signal voltage drops on the STI line when it is grounded.

  Ford specifications may allow up to a 0.5 V drop on the system ground. However, in many cases this is too high and may prevent a self-test from running or cause poor performance. Ideally, there should be a voltage drop of 0.1 V or less on the ground circuit. A common source of high-resistance is the bullet connector in the pigtail on the battery ground cable.

  The self-test connector ground terminal is a convenient place to check the ECM ground, as well as the ground reference for most sensors. A high-resistance ground causes the engine to run poorly, prevents the self-test from running, or both. For example, a 0.5 V drop on this ground produces a 10% error in sensor signals. Depending on self-test programs and sensor calibrations, a high-resistance system ground may or may not produce fault codes.
- **Open Ground**—If the circuit wiring is open to the ground terminal in the self-test connector, or the connector itself is open, it might not affect engine operation. However, this does affect the display because the scan tool uses this terminal as a ground point. If the display seems to operate normally and then goes blank when the ignition is switched on, suspect an open ground circuit. If the ground circuit is open, the scan tool finds an alternate ground path through the STO terminal, which is at low voltage with the ignition off. When the ignition is switched on, STO voltage goes high, and the display goes off.

  To check for an open circuit at the self-test connector ground terminal connect the positive (+) voltmeter lead to battery positive and the negative (–) lead to the ground terminal. The voltmeter should indicate battery voltage. If the voltmeter reads zero, the ground terminal is open. An alternate method is to jump battery ground to the backside of the Ford harness pin 2. If the display powers up, there is an open ground circuit.
- **Self-test output (STO)**—An open STO circuit prevents self-test completion even if voltage at the STI lead is correct and the system ground is good. After running a self-test, the ECM transmits codes as voltage pulses on the STO line. If the STO line is open, the ECM cannot transmit codes.

  To check STO continuity, turn the ignition switch on and connect the positive (+) meter lead to the STO terminal at the self-test connector. Connect the negative (-) lead to the battery negative terminal. On 1987 and earlier models, the meter should indicate battery voltage. On 1988 and later models, the meter should read 0.0 V until the self-test activates. If the meter reading is incorrect, trace and repair the open circuit to the STO terminal, then retest. An open STO circuit should not affect engine operation.

## A.2.6 EEC-IV DCL and EEC-V Systems

Ford EEC-IV DCL and EEC-V systems transmit data parameters and codes on the serial data steam. Common problems that prevent these systems from communicating are discussed here.

### No Communication Message

Some common problems that prevent communication are listed below:

- **Vehicle identification**—Check the vehicle ID entered from the VIN plate. Answer all questions correctly. The scan tool must know exactly what year and model PCM it is connected to. If the scan tool is programmed to receive data from one vehicle and it is connected to another, it does not communicate at all or displays incorrect data readings. Always enter a new vehicle ID when testing a different vehicle, even if the two are exactly the same year and model with the same engine.
- **Cable connections**—Make sure the data cable, test adapter, and connection are in good shape and properly connected.
- **Loss of power to the PCM**—The PCM receives battery voltage through one or more fuses or fusible links. Use a wiring diagram to check PCM connections for battery voltage and ground. If a fuse or fusible link is open, the PCM cannot communicate. If the display does not power up when connected to an OBD-II vehicle, check the fuses. Many vehicles use the cigarette lighter fuse to protect the DLC circuits. Suspect a bad fuse if battery power is not available on pin 16 of the DLC.
- **Ignition off when connecting cables**—Be sure the ignition is switched off when connecting and disconnecting the data cable and test adapter. If the ignition is on when connections are made or broken, the scan tool memory may be disrupted. Reenter the vehicle ID if this occurs.

### *Common No Communication Symptoms*

The following sections address common symptoms that often accompany a “No Communication” message. A model-specific wiring diagram and Ford test procedures may be needed for some of the checks. When testing vehicles with the 16-pin connector, make sure the correct Personality Key™ device is installed in the adapter.

### *Engine Does Not Start and Does Not Communicate*

If the engine does not start and the PCM does not communicate with the ignition on, make these basic tests:

- **Battery**—Check the battery state of charge and cranking capacity. The scan tool draws very little current and operates with voltage as low as 7.5 V. Therefore, the scan tool may appear to operate normally even if the battery does not have enough power to crank the engine or operate the vehicle ECM.
- **PCM supply voltage**—Check a wiring diagram for the location of the PCM fuses or fusible links and test for an open circuit.
- **PCM ground**—Use a wiring diagram to identify the location of the ground connection. An open ground may prevent the engine from starting and high ground resistance causes poor overall operation.

### *Engine Runs But Does Not Communicate*

The way an engine runs may offer clues as to the cause of a test problem. If the engine seems to run normally but the PCM does not communicate with the scan tool, select “Data” with the key on and the engine off. Start the engine after communication is established. If the vehicle still fails to communicate, the cause may be a wiring problem to the vehicle connector that does not affect the rest of the system. If the engine runs poorly, the cause may be a poor system ground or a voltage problem that affects the PCM or the entire control system. Refer to “Check the DLC Connector” on page 737 for further instructions.

## Testing the Self-Test Connector

Use the following diagnostic connector voltage tests to help determine the cause of EEC-IV DCL or EEC-V communication problems. Always test with a high-impedance digital voltmeter. Refer to Figure A-11 and Figure A-12 for test locations.

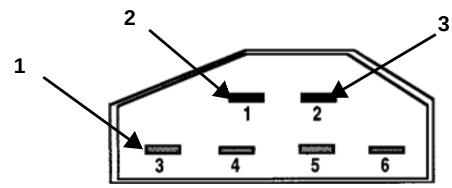


**Figure A-11** *The EEC-IV DCL self-test connector*

**1— Bus (+)**
**2— Bus (–)**
**3— Ground**

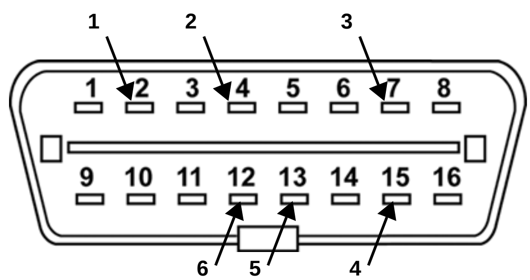


**Figure A-12** *The EEC-V DLC—1994–95*

**1— Vehicle power (+)**
**2— Flash eprom supply**
**3— Data (–)**
**4— Data (+)**
**5— Case ground**
**6— Power ground**

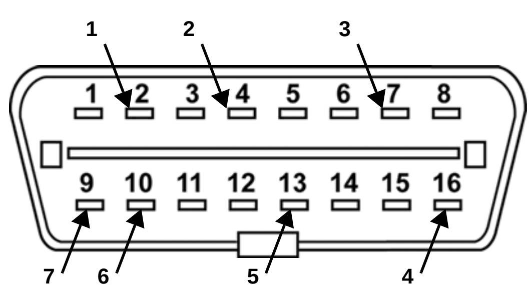


**Figure A-13** *The EEC-V DLC—1996–2002 early model without UBP*

**1— Data bus (+)**
**2— Case ground**
**3— Power ground**

**4— Battery (+)**
**5— Module programming signal**
**6— Data bus (–)**
**7— ABS (Villager only)**

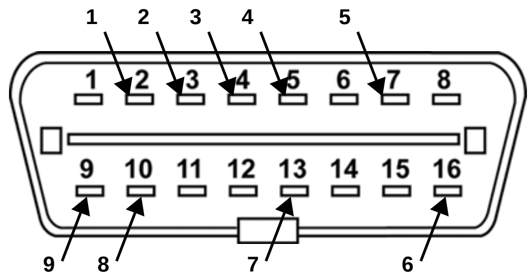


**Figure A-14** *The EEC-V DLC—2002 and later model with UBP*

**1— SCP bus (+)**
**2— UBP**
**3— Case ground**
**4— Power ground**
**5— ISO K-line**
**6— Battery (+)**
**7— Module programming signal**
**8— SCP bus (+)**
**9— ABS (Villager only)**

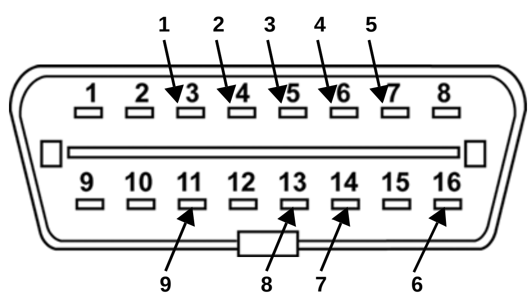


**Figure A-15** *EEC-V data link connector—2003 and later model with CAN*

**1— CAN medium speed (+)**
**2— Case ground**
**3— Power ground**
**4— CAN high speed (+)**
**5— ISO K-line**
**6— Battery B(+)**
**7— CAN high speed (–)**
**8— Module programming signal**
**9— CAN medium speed (–)**

**To test the self-test connector:**

- **Ground**—Connect the positive (+) voltmeter lead to the diagnostic connector ground terminal, and connect the negative (-) lead directly to the battery negative terminal. Do not connect the negative lead to an engine or chassis ground. This measures the voltage drop across the ground side of the diagnostic connector. An ideal ground has a voltage drop of 0.1 V or less.

  If the diagnostic connector ground terminal circuit is open it may not affect engine operation. However, it does affect the display because the scan tool uses this terminal as a ground.

  To check for an open circuit, connect the positive (+) voltmeter lead to battery positive and the negative lead to the diagnostic connector ground terminal. The voltmeter should read battery voltage. If the meter reads zero, the ground terminal is open.
- **Battery voltage (16-pin only)**—Connect the positive (+) voltmeter lead to the diagnostic connector battery voltage (B+) terminal, and connect the negative (-) lead to the battery ground terminal. The voltmeter should read battery voltage. This tests the ECM voltage supply. No power may be caused by a blown lighter fuse.
- **Bus bias voltage**—Connect the positive (+) voltmeter lead to either of the diagnostic connector bias terminals, and connect the negative (-) meter lead to the ground terminal. With the ignition key on and no bus activity, nominal voltage should be as follows:

**Table A-1** *Nominal voltage for EEC-IV and EEC-V DLCs*

| CONNECTOR | BUS + | BUS – |
|---|---|---|
| EEC-IV DLC | 5 V | 0 V |
| EEC-V DLC | 0 V | 5 V |

With an active bus, these readings vary from 0 to 5 V, depending on the amount of bus activity. Check both bus terminals in the connector.

## A.2.7 ABS System Does Not Transmit Codes

Certain ABS control modules do not transmit a “pass” code if there are no codes in the system. If the scan tool does not receive a code within 45 seconds and the ABS warning and brake indicator lamps are both off, there are no codes in the ABS ECM memory.

If the amber ABS warning lamp is on, and codes cannot be gathered with a self-test, check for proper power and ground to the ABS control module. If the control module does not receive power, it cannot store trouble codes. Remember: if the ABS warning lamp is on it means the ABS system is disabled, not that trouble codes are stored.

### ABS Self-Test Connector

For models with ISO or SCP style ABS communication, see the section for checking EEC-V connectors. For others, make the following voltage tests at the ABS self-test connector to determine why a self-test does not run. Use a digital voltmeter and refer to Figure A-16.

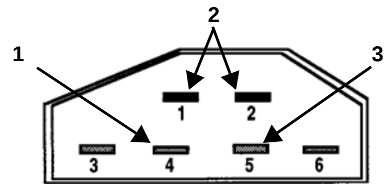


**Figure A-16** *The ABS self-test connector*

**1— STO**

**2— Ground**

**3— STI**

**To test the ABS self-test connector:**

- **Self-test input (STI)**—Switch the ignition on. Connect the positive (+) voltmeter lead to the STI terminal and the negative (–) meter lead to the negative battery terminal. Battery voltage (12 V) or signal voltage (5 V) should be present on the STI terminal with the key on. If the STI is open, the ABS ECM cannot receive the self-test signal from the scan tool. However, the system still operates normally with an open STI circuit.
- **Ground**—With the ignition switched on, connect the positive (+) voltmeter lead to the ground terminal in the self-test connector, and connect the negative (–) lead to the negative battery terminal. Do not connect the meter to an engine or chassis ground. This test measures voltage drop on the self-test connector ground circuit, the ABS control module, and most sensors. This voltage-drop test is important for several reasons.

  The scan tool grounds the STI circuit at the self-test connector to initiate the self-test. If there is too much resistance in the circuit, the self-test does not run. The display may appear to operate normally, but there is not enough voltage drop to start the test when the STI grounds.

  Ford specifications may allow up to a 0.5 V drop on the system ground. However, this is too high in many cases. Ground circuit problems cause poor performance and prevent self-test operation. An ideal system ground has a voltage drop of 0.1 V or less.
- **Open Ground (Display Shuts Down)**—If the ground circuit of the self-test connector is open, it may not affect the ABS. However, it does affect the display because the scan tool uses this terminal as a ground point. If the display operates normally then goes blank when the ignition is switched on, suspect an open ground circuit. The scan tool finds an alternate ground through the STO terminal, which is at low voltage with the key off. When the key switches on, STO voltage goes high, which causes the display to go blank.

  To check for an open circuit at the self-test connector ground terminal, connect the positive (+) voltmeter lead to battery positive and the negative (–) voltmeter lead to the ground terminal. The meter should read battery voltage. If the meter reads zero, the ground terminal is open.
- **Self-test output (STO)**—The ABS control module may not run a self-test if the STO circuit is open, even when STI terminal voltage is correct and the system ground is good. The ABS module transmits codes as voltage pulses on the STO line. If the STO line is open, the system cannot transmit fault codes to the scan tool.

  To check STO continuity, switch the ignition on and connect the positive (+) meter lead to the self-test connector STO terminal. Connect the negative (-) lead to the negative battery terminal. When the ABS warning lamp is on, the meter should read 0 V. When the ABS lamp is off, the meter should read battery voltage, about 12.0 V. If the voltmeter reading is incorrect, trace and repair the open circuit to the STO terminal. Also check the ABS warning lamp, ABS power relay, and self-test connector wiring.

# A.3 GM Communications Problems

If a GM system fails to communicate with the scan tool, a problem may exist in the wiring or other circuit parts on the vehicle; or the vehicle identification may be incorrect. A vehicle failing to communicate is itself an important symptom for diagnosing some driveability problems.

If the scan tool works properly on other GM vehicles, particularly other models with the same control system, the problem is most likely in the vehicle, not the scan tool.

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


- “GM Operations” on page 155
- “GM Testing” on page 162
- “GM Data Parameters” on page 451


## A.3.1 Common Communication Problems

Some of the more common problems that prevent a GM vehicle from performing a test or communicating with the scan tool are listed below. Always check these points first.

- **Vehicle identification**—Check the vehicle identification (ID) entered from the characters on the VIN plate. GM control modules do not all transmit the same amount of data at the same speed. Nor do they all transmit the same data or information in the same order. Additionally, the scan tool must address, or “question,” certain GM modules to establish communication. Therefore, the scan tool must know the exact year and model of the ECM it is connected to. If the scan tool is set to receive data from one vehicle and it is actually connected to another, it either does not communicate or displays some data readings that are clearly incorrect. Always enter a new vehicle ID when testing a new vehicle, even when two vehicles are exactly the same model with the same engine.
- **Scan tool connections**—See “Check Scan Tool Connection and Operation” on page 732 for information on scan tool cables and connections.
- **Loss of power to a control module**—The ECM receives battery voltage through one or more fuses or fusible links in the wiring harness. Use a wiring diagram to locate and check the ECM battery voltage and ground connections. If a fuse or fusible link is open, the ECM cannot communicate with the scan tool.
- **Carbureted engines and 1982–85 DFI Cadillac: “Check Engine” lamp circuit fault**—All carbureted engines, as well as the 1982–85 digital fuel injection (DFI) Cadillac engine, transmit data on the check engine lamp circuit to ALDL connector pin D, or pin B on a 5-pin connector. Any fault in that circuit results in a “no communication” message on the scan tool. See “Check the Check Engine Lamp (Except OBD-II)” on page 733 and “Check the ALDL Connector” on page 735 for more information.
- **Ignition off when connecting scan tool**—Be sure the ignition switch is off when connecting and disconnecting the scan tool. If the ignition is on, scan tool memory may be disrupted. Erase and reenter vehicle ID if this occurs.
- **Class 2 serial data circuit fault**—Many GM vehicles have multiple modules communicating with each other on the class 2 serial data circuit. A faulty module may cause communication problems. These modules may include, but are not limited to:
  - Body Control Module (BCM)
  - Powertrain Control Module (PCM)
  - Automatic Transfer Case (ATC)

- Electronic Brake Control Module (EBCM)
- Electronic Brake Traction Control Module (EBTCM)
- Inflatable Restraint Sensing and Diagnostic Module (SDM)
- Instrument Panel Cluster (IPC)
- Suspension Control Module (SCM)
- HVAC Control Module
- Automatic Transmission Control Module (TCM)
- Driver Information Center (DIC)
- Memory Mirror Control Module (MMM)
- Memory Seat Control Module (MSM)
- OnStar® Cellular Phone Module

An open or short on the class 2 serial data circuit may also cause problems. See “Check the DLC Connector” on page 737.

## A.3.2 Common No Communication Symptoms

The following sections discuss some of the common symptoms that often accompany a “no communication” message. An accurate wiring diagram for the specific vehicle and GM troubleshooting procedures may be needed for some of the following checks.

### No Start and No Communication

If the engine does not start and the ECM does not communicate with the ignition on, follow the instructions in “Check the Check Engine Lamp (Except OBD-II)” on page 733 to see if the vehicle can display codes on the instrument panel lamp. Also perform these basic tests:

- **Battery**—Check the battery state of charge and cranking capacity. The scan tool draws very little current and operates on as little as 7.5 V. Therefore, the scan tool may appear to be operating normally even if the battery does not have enough power to crank the engine or operate the ECM.
- **ECM supply voltage**—Check a wiring diagram for the location of the ECM fuses or fusible links and test for an open circuit.
- **ECM ground**—Use a wiring diagram to locate the ECM ground connection. An open ECM ground may prevent a fuel-injected engine from starting, while a high-resistance ground may cause overall poor operation.

An open ECM ground or power (B+) circuit removes power from the ECM and keeps a fuel-injected engine from starting. A carbureted engine may start and run if the power circuit to the ECM is open. However, it is likely to run very poorly because it is running without feedback fuel or spark advance control.

### Engine Runs But Does Not Communicate

The way the engine runs may offer a clue to the cause of a test problem. If the engine seems to run normal but the ECM does not communicate with the scan tool, the cause may be a wiring problem to the ALDL connector that does not affect the rest of the system. If the engine is running poorly, the cause may be a poor system ground or a voltage problem that affects the PCM or the entire system.

Refer to “Check the Check Engine Lamp (Except OBD-II)” on page 733 and “Check the ALDL Connector” on page 735 for further instructions.

### Scan Tool Does Not Operate

The scan tool grounds through the ALDL or DLC. An open ALDL or DCL ground circuit prevents the scan tool from operating.

If the scan tool does not operate when connected to the vehicle, test the ground terminal of the onboard diagnostic connector as explained in “Check the ALDL Connector” on page 735 or “Check the DLC Connector” on page 737. Also check the following points:

- Measure data cable continuity from pin to pin on the D-shaped connectors at each end of the cable with an ohmmeter.
- See if the scan tool operates on a different vehicle, preferably a GM model with the same type of control system.
- On vehicles with the 16-pin DLC connector, make sure the correct Personality Key™ device is inserted into the test adapter.

### Interrupted Communication

If communication is interrupted during testing, but the scan tool remains connected to power, the “no communication” message displays. This might happen, for example, if the ALDL connector is loosened or the ignition switch is turned off.

If the scan tool reestablishes communication, the main menu for the selected ECM displays. If it does not, check the vehicle ID and correct it if necessary. If the ID is correct, disconnect the scan tool and check the vehicle connector for damaged terminals and open wiring.

The “no communication” message means the scan tool is not receiving data from the selected ECM. The cause may be as simple as incorrect vehicle ID, a blown fuse, or a wiring fault on the vehicle. In some cases, a lack of communication indicates there is an ECM problem. However, other causes are more common.

## A.3.3 Check Scan Tool Connection and Operation

To begin troubleshooting the test or communication problem, first determine if the scan tool is working normally. If the scan tool works properly on other vehicles, particularly other GM products, the problem is most likely in the vehicle, not the scan tool. If the screen is blank or if the readings are unsteady, the scan tool may be at fault or there may be a power problem on the vehicle.

If the scan tool intermittently resets or goes blank, there may be a wire opening intermittently in the data cable or the adapter. Use an ohmmeter to check continuity of the data cable from pin to pin between the D-shaped connectors at either end of the cable.

### A.3.4 Check the Check Engine Lamp (Except OBD-II)

All pre-OBD-II GM vehicles with diagnostic capabilities have a check engine lamp on the instrument panel. The lamp on the vehicle may be labeled “Service Engine Now,” or “Service Engine Soon.” Regardless of the label, they are all referred to as the check engine lamp here.

The check engine lamp not only signals problems with system sensors and actuators, it also is a device for checking the ability of the ECM to transmit data to the scan tool. If the scan tool does not communicate with the vehicle, disconnect the data cable and see if the ECM flashes diagnostic trouble codes (DTCs) on the check engine lamp.

Turn the ignition on and verify that the check engine lamp lights with the ignition on and the engine off. If it does not, first troubleshoot and repair the problem before going further. The cause could be as simple as a burned-out lamp bulb or a blown fuse.

When working on models with a carbureted engine or a 1982–85 Cadillac with DFI, remember that the ECM transmits the serial data stream on the check engine lamp circuit. If the check engine lamp does not light, the scan tool cannot communicate with the ECM.

Refer to the GM procedure for troubleshooting the check engine lamp on the test vehicle. Common check engine lamp circuit problems include:

- A blown circuit fuse (gauges or other lamp fuse)
- A burned-out lamp bulb
- A wiring or connector problem
- A defective lamp driver
- An ALDL connector problem

If the check engine lamp passes the bulb check, place the ECM into the “field service” mode. For field service mode, switch the ignition on and install a jumper wire as follows:

- Between pin A and pin B of the 12-pin ALDL connector
- Between pin D and pin E of the 5-pin ALDL
- Between pin 4 and pin 6. of the 16-pin connector

**NOTE:**
Some 1994 and later GM vehicles do not offer “field service “mode. To determine if a vehicle does offer field service, select functional tests from the vehicle main menu, if it offers field service, it is listed on the functional test menu.

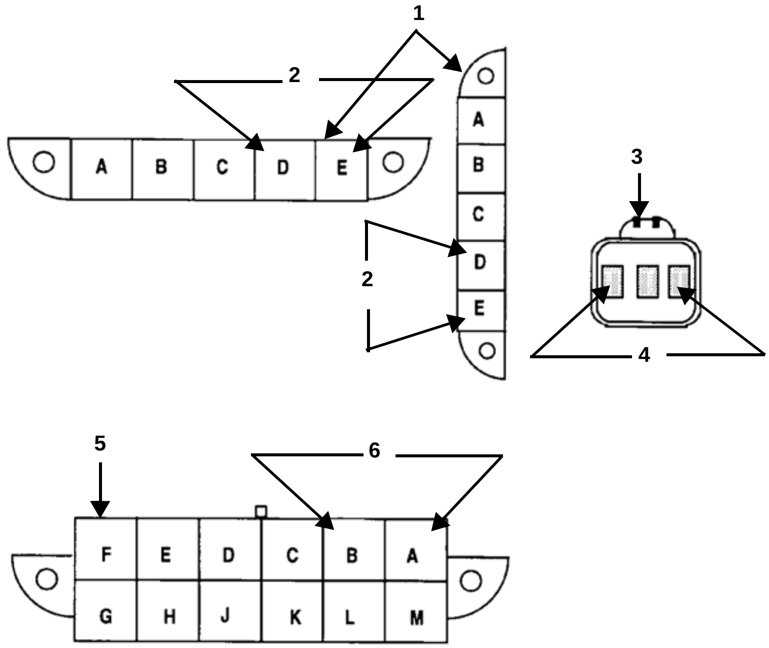


**Figure A-17** *Jump pins as shown to flash codes on check engine lamp*

**1— 5-pin ALDL connector, 1981–82**

**2— Jump pin D to E for Field Service**

**3— 3-pin ALDL connector for Spectrum and Storm**

**4— Jump pins for Field Service**

**5— 12-pin ALDL connector, from 1982 to present**

**6— Jump pin B to A for Field Service**

For the 16-pin DLC for 1994–95 OBD-I models, jump pin 4 to pin 6 for Field Service.

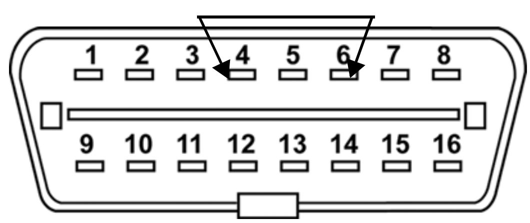


**Figure A-18** *16-pin DLC for 1994–95 OBD-I*

**NOTE:**
Some 1994–95 vehicles have a 16-pin DLC, but are not OBD-II compliant. The field service mode is available on some, but not all, of these vehicles.

Several different symptoms and problems may occur at this point:

- If the check engine lamp lights for a bulb check but stays out and does not flash any codes, check the continuity of pins A and B in the ALDL connector, pins D and E on the 5-pin connector, or pins 4 and 6 on the 16-pin connector. See "Check the ALDL Connector" on page 735 for voltage readings on the ALDL pins.

- If the check engine lamp flashes rapidly with no code pattern check the ECM. Verify that there is a PROM installed. Refer to the GM procedure for troubleshooting the specific test vehicle.
- If the check engine lamp lights steadily and does not flash at all with the pins jumped, refer to GM procedures for troubleshooting this symptom on the specific vehicle.
- Watch for a code 51 or other 50-series code that indicates a PROM or ECM problem. Code 51 means a PROM failure or a missing PROM. Many carbureted engines do not transmit a code 51 on the serial data stream; and these systems do not communicate with the scan tool if the PROM is missing. Some ECMs flash code 51 on the check engine lamp in this case.

If the system is operating normally, the check engine lamp should flash code 12 three times. It then flashes any other codes that are present in ECM memory, or it flashes code 12 again. Code 12 appears on the check engine lamp as shown in Figure A-19.

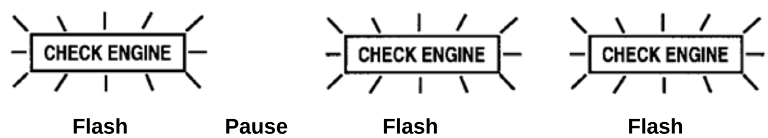


**Figure A-19** *Code 12 on the check engine lamp*

### Carbureted Engines or a 1982–85 DFI Cadillac

When the scan tool is in Codes and Data mode on a carbureted engine or a 1982-85 DFI Cadillac, the check engine lamp flickers dimly. This indicates there is serial data transmission on the check engine lamp circuit. If the lamp is lit steadily or does not flicker, a problem may exist in the check engine lamp circuitry. See “Check the ALDL Connector” below for voltage tests at the ALDL.

## A.3.5 Check the ALDL Connector

See “Check the DLC Connector” on page 737 for information on how to check the 16-pin DLC on OBD-II vehicles. If the check engine lamp does not flash code 12, or if it does but no data is received by the scan tool, the next step is to check the ALDL connector. Figure A-21 on page 736 shows the 12-pin, Figure A-22 on page 737 the 5-pin, and Figure A-23 on page 737 the 3-pin ALDL connectors. Pin identification is not the same on all three connectors.

**Use a DVOM to check as follows:**

1. Check ground continuity. Connect the positive (+) meter lead to ALDL pin A on a 12-pin or pin E on a 5-pin connector. Connect the negative (-) meter lead to the negative battery terminal. Use jumper wires as needed. Do not connect to a body or chassis ground; go directly to the battery. With the ignition on, voltage drop across the ground terminal should be 0.1 V or less. A ground circuit problem prevents the ECM from entering diagnostic mode.

   To test for an open ground, turn the ignition on and jump pin B to pin A in a 12-pin ALDL connector, or pin D to pin E on a 5-pin connector. Connect the positive meter lead to the jump wire and the negative lead to a known good ground (Figure A-20). On a good ground, the meter should read 50 millivolts (0.050V) or less. Higher readings indicate high resistance in the ALDL ground connection. A 5 V reading indicates an open circuit.

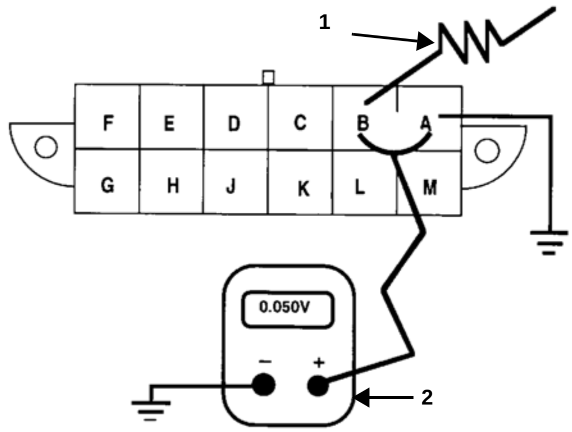


**Figure A-20** *Testing ground continuity on the ALDL connector*

**1— 10K ohm resistor inside ECM, in series with pin B**

**2— Voltmeter**

2. Check voltage on the test terminal, pin B on the ALDL, or pin D on the 5-pin connector. Connect the positive meter lead to ALDL pin B, or D, and the negative lead to either the ALDL ground pin or a known good ground. With the ignition on, the meter should read 5 V. If the circuit is open, a 160-baud ECM cannot enter diagnostic mode.
3. Check voltage on the check engine lamp circuit for any carbureted engine or an early DFI Cadillac. Use pin D on the 12-pin ALDL or use pin B on the 5-pin connector. Connect the positive meter lead to pin D or B and the negative lead to the ground pin or a known good ground. With the ignition on and engine off the voltmeter should read less than 1 V. The meter reading should rise to battery voltage when the lamp goes off with the engine running. If the circuit is open, the ECM cannot transmit data to the scan tool.
4. Check voltage on either pin E, L, or M on the 12-pin connector for a fuel-injected engine. The ECM transmits data on one of these three pins. Connect the positive meter lead to the serial data transmission pin and the negative lead to pin A or a known good ground. With the ignition on, the meter should read either 5 V, or fluctuate between 3.5 and 5.0 V. If the data transmission circuit is open, the ECM cannot transmit data.

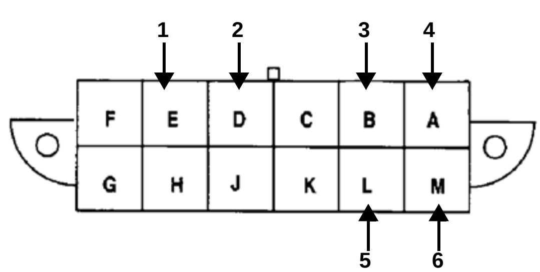


**Figure A-21** *12-pin ALDL connector*

**1— Serial data for most EFI engines**

**2— Check Engine Light (CEL)**
Serial data for carbureted engines and some DFI Cadillacs.

**3— Test or Diagnostic Enable**
Turn on self-diagnostics.

**4— Ground**

**5— Serial data**
BCM Multiplex Link on Cadillacs.

**6— Serial Data**
BCM Serial Data on Cadillacs.

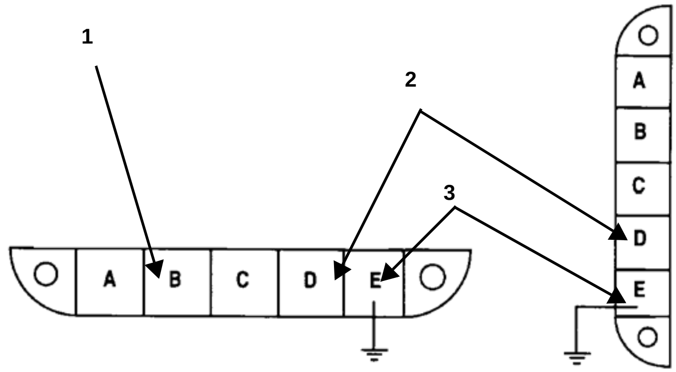


**Figure A-22** *5-pin ALDL connector—1981–82*

**1— Check Engine Light (CEL), Serial Data**

**2— Test or Diagnostic Enable**
Turn on self-diagnostics.

**3— Ground**

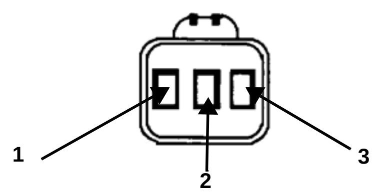


**Figure A-23** *3-pin ALDL connector—Spectrum and Storm*

**1— Test or Diagnostic Enable**

**2— Check Engine Light (CEL)**

**3— Ground**

Most communication problems between the scan tool and the ECM are found and corrected by checking the points just discussed. In a few cases, communication failure may be due to ECM failure. In all cases, check and verify all the circuits and parts involved in data communication before condemning the ECM.

## A.3.6 Check the DLC Connector

This section provides general information to check the 16-pin OBD-II style data link connector (DLC) available on some 1994 and later models.

## Some 1994–95 Vehicles

If the scan tool does not power up, or if it does but it does not receive data, the next step is to check the 16-pin DLC (Figure A-24).

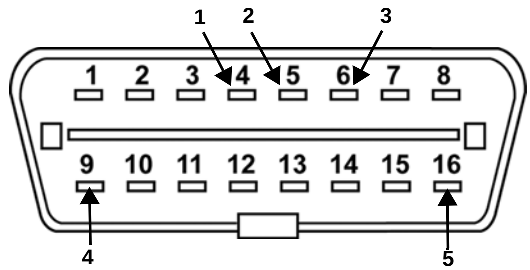


**Figure A-24** *Pin identification on some 1994–95 OBD-II style DLC*

**1— Chassis ground**
**2— Signal ground**
**3— Diagnostic enable**
**4— Serial data**
**5— Battery (B+)**

**Use a digital voltmeter to check the DLC connector:**

1. Check ground continuity. Connect the positive (+) meter lead to DLC pin 4. Connect the negative (-) meter lead to the negative battery terminal. Use jumper wires as needed. Do not connect to a body or chassis ground; go directly to the battery terminal if at all possible.

   With the ignition on, voltage drop across the ground terminal should be 0.1 V or less. An open circuit or high resistance prevents the ECM from entering diagnostic mode.

   To test for an open ground at DLC pin 4, switch the ignition on and jump pin 4 to pin 6 in the DLC. Connect the positive voltmeter lead to the jump wire and the negative lead to a known good ground, use the battery ground terminal if possible. Readings should be 50 millivolts (0.050 V) or less. If the reading is higher, there is high resistance on the DLC ground circuit. If the voltmeter reads 5 V, the ground for DLC pin 4 is open.
2. Check voltage on pin 6. Connect the positive (+) voltmeter lead to DLC pin 6 and the negative (–) lead to the DLC ground pin or a known good ground. With the ignition on, voltage on pin 6 should be 5 V. If the circuit is open, the ECM cannot enter diagnostic mode.
3. Check voltage on pin 9 of the DLC. The PCM transmits data on this pin. Connect the positive voltmeter lead to the data transmission pin and the negative lead to either pin 4 or a known good ground. With the ignition on, voltage on the data transmission pin should be 5 V or fluctuating between 3.5 and 5.0 V. If the circuit is open, the ECM cannot transmit data to the scan tool.

Most communication problems between the scan tool and the ECM are found and corrected by checking the points discussed. In a few cases, though, communication failure may be due to an ECM problem. In all cases, check and verify all circuits and parts involved in data communication before condemning the ECM.

## 1995 and Later OBD-II Vehicles

If the scan tool does not receive data from an OBD-II vehicle, check the 16-pin DLC (Figure A-25).

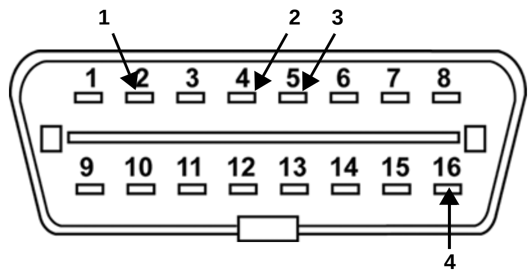


**Figure A-25** *Pin identification on the OBD-II DLC*

**1— Class 2 serial data**
**2— Chassis ground**
**3— Signal ground**
**4— Battery (B+)**

**Use a digital voltmeter to check the DLC connector:**

1. Check ground continuity. Connect the positive (+) meter lead to DLC pin 4. Connect the negative (-) meter lead to the negative battery terminal. Use jumper wires as needed. Do not connect to a body or chassis ground; go directly to the battery terminal if at all possible.

   With the ignition on, voltage drop across the ground terminal should be 0.1 V or less. Repeat for DLC pin 5. An open circuit or high ground resistance prevents the ECM from entering diagnostic mode.
2. Check voltage on pin 2 of the DLC. The PCM transmits data on this pin. Connect the positive voltmeter lead to the class 2 serial data pin and the negative lead to either pin 4, pin 5, or a known good ground. With the ignition on, voltage on the class 2 serial data pin should be either 5 V or fluctuating between 3.5 and 5.0 V. If the circuit is open, the ECM cannot transmit data to the scan tool.

## A.3.7 General ABS Communication Problem Check

The ALDL, or DLC 16-pin, connector is also used for ABS testing. In addition to the communication problem checks described earlier, check the following points for ABS communication problems.

- Do not use the GM-3 adapter; it is not used for ABS testing.
- On vehicles with the 16-pin DLC connector, make sure the correct Personality Key™ device is installed in the adapter.
- On many models, ABS is optional. In these cases, the scan tool may offer ABS testing, but ABS hardware may not be installed on the test vehicle.
- Several different ABS systems are used on GM vehicles. Although there are operating similarities, all systems are tested differently. Always open and read the “Read this First” selection available from the ABS main menu before performing ABS tests. This contains instructions and important information about system identification, vehicle communication, and reading and clearing codes.
- Some systems require switching the ignition off before selecting a test from the ABS menu.
- Teves II ABS and early RWAL systems do not communicate with the scan tool.

### A.3.8 Special Cases—Specific Vehicles

The vehicles listed in the following paragraphs are specific models with certain control systems, that often have problems communicating with the scan tool.

- **1981–87 Chevette**—A blown ignition fuse prevents the ECM from communicating. If the fuse is not located in the fuse panel, it is usually in-line in the instrument panel harness behind the radio. Check for pinched, broken, or burned engine harness wiring at the MC solenoid on the carburetor under the air cleaner. Also check for damaged wiring to the air management valve, which is located on the exhaust manifold. Damaged wiring to the solenoid or valve prevents the ECM from communicating. It is common for the MC solenoid wires to be pinched from improper air cleaner installation.
- **1981–84 368-cid (6.0L) V8-6-4 Cadillac**—These engines do not communicate with the scan tool if the ignition is on and the engine is off. The engine must be running to communicate.
- **1980–84 vehicles with early style coolant temperature sensor (CTS)**—The early style CTS, identified by a round connector, may leak and allow coolant to travel up the wire harness to the ECM. This causes ECM damage and prevents data communication.
- **1983–86 G-series van**—Water damage to the canister purge solenoid may cause a short in the solenoid that may lead to subsequent ECM damage. Check purge solenoid resistance; it should be 20 ohms or more. If the solenoid is shorted and the ECM damaged, replace and relocate the solenoid to the evaporator or heater housing. Install a moisture shield to prevent future damage.
- **1982–84 S10 and S15 truck with 2.8L V6**—A wiring harness burnt by the passenger side exhaust manifold may blow the ECM ignition fuse. This in-line fuse is in the AIR management valve harness, which is behind the brake booster or master cylinder.
- **1985–88 Spectrum with 1.5L 4-cylinder**—A loose ground may cause communication problems. The ALDL ground circuit terminates at a common ground on top of the intake manifold, toward the passenger side. Tighten the ground bolt as needed.
- **1990–95 models with body control module (BCM)**—On some models, such as a VIN E or K Cadillac, The scan tool communicates with the ECM on the same network as the BCM. scan tool to ECM communication prevents the BCM from functioning properly. Irregularities like the following may occur:
  - Defrost blower fans turn on
  - Digital instrument panel lamps dim
  - Climate control head displays only three dashes
  - Coolant fans switch off.

  These irregularities cease once the scan tool stops communicating with the ECM. False body codes may also set. Clear these BCM false codes, then immediately disconnect the scan tool before switching off the ignition.

## A.4 Jeep Communications Problems

Jeep control systems have few problems in communicating with the scan tool. However, a powertrain control module (PCM) may fail to communicate, or the system may not perform ATM or sensor tests.

If a problem exists with the vehicle wiring or any other circuit parts, the scan tool may not be able to establish a communication link with the vehicle. The failure of a vehicle to perform a test may also be a symptom for diagnosing a driveability problem.

Common problems that may prevent PCM communication are listed below. Always check these points first:

- **Vehicle identification**—Check the vehicle ID entered from the VIN plate. If in doubt, reenter it. If vehicle ID is incorrect, the scan tool may be unable to perform certain ATM or sensor tests or display data.
- **Scan tool connections**—Check the scan tool data cable, test adapter, and connections.
- **Ignition off when connecting to the vehicle**—Be sure the ignition is off when connecting and disconnecting the data cable and adapter. If the ignition is on when making or breaking the connection, scan tool memory may be disrupted. Reenter the vehicle ID if this occurs.
- **Loss of power to the ECM**—The ECM receives battery voltage through one or more fusible links in the wiring harness. Use a wiring diagram to check connections for battery voltage and ground. If a fusible link is open, the ECM cannot communicate.

  For 1991–95 Jeep models, use the scan tool Read IGN(+) at DLC test (see “Read IGN (+) at DLC” on page 217) to check battery voltage being supplied to the ECM with the ignition on.
- **1991 models with ABS**—These vehicles have two similar looking diagnostic connectors under the hood; one near the left fender for engine tests, and another near the right fender for ABS tests. If the scan tool is connected to the wrong connector for the selected test, it cannot communicate.
- **1984–86 GM Delco control system check engine lamp circuit**—These vehicles transmit data on the check engine lamp circuit, which is D2 diagnostic connector pin 1. Any fault in that circuit results in a no communication message. Refer to the appropriate “Check the Check Engine Lamp” on page 742 and “Testing the Diagnostic Connector” on page 744 information.

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

- “Jeep Operations” on page 208
- “Jeep Testing” on page 215
- “Chrysler and Jeep Data Parameters” on page 235

## A.4.1 No Communication

If the scan tool displays a no communication message, it means that the vehicle ECM and the scan tool cannot communicate with each other for some reason.

If this message appears, first check the vehicle battery state of charge. Then check the scan tool data cable. Check continuity of the data cable from pin to pin between the D-shaped connectors at either end of the cable with an ohmmeter.

## A.4.2 Check Scan Tool Operation

If the scan tool operates on other vehicles, particularly other Jeep models, the problem is most likely in the vehicle, not in the tool. If the screen is blank or if the readings are unsteady, the scan tool may be at fault. If the scan tool intermittently resets or goes blank, a wire may be opening intermittently in the data cable or in the test adapter. Use an ohmmeter to check continuity of the data cable from pin to pin between the D-shaped connectors at either end of the cable.

## A.4.3 Engine Runs but Does Not Perform Tests

The way in which the engine runs may be a clue to the cause of a test problem. If the engine seems to run normally but does not complete a test or display data, the cause may be a wiring problem to the diagnostic connector that does not affect the rest of the system. If the engine runs poorly, the cause may be a ground or voltage problem that affects the entire system.

## A.4.4 Scan Tool Does Not Operate

The scan tool grounds through the diagnostic connector. An open diagnostic connector ground circuit prevents tool operation.

## A.4.5 Engine Does Not Start or Perform Tests

If the engine does not start, and the vehicle does not display codes on the instrument panel lamp, perform these basic tests. A wiring diagram of the specific vehicle is needed for some checks.

- **Battery**—Check the state of charge and the cranking capacity of the vehicle battery. The scan tool draws very little current and is able to operate with voltage as low as 7.5 V. Therefore, the scan tool may appear to operate normally even when the battery does not have enough power to crank and start the engine or operate the ECM.
- **ECM supply voltage**—The ECM receives battery voltage (B+) through a fuse or fusible link. Check for an open circuit.
- **ECM ground**—On 1991 and later models, the ECM grounds to a remote engine ground. Use a wiring diagram to locate and check the ground connection. An open circuit keeps the engine from starting, and high ground resistance causes overall poor operation.

An open ground or power (B+) circuit on a fuel-injected engine removes power from the ECM and prevents the engine from starting. A carbureted engine may start and run even though the ECM power circuit is open. However, the engine usually runs very poorly because it is operating without feedback fuel or spark advance control.

## A.4.6 Check the Check Engine Lamp

For 1991–95 vehicles with fuel injection, the check engine lamp not only signals problems with sensors and actuators, it is also used for checking the ability of the ECM to communicate with the scan tool. If the scan tool cannot communicate with the vehicle or perform some tests, disconnect the data cable and see if DTCs flash on the lamp.

Switch the ignition on without starting the engine to verify the check engine lamp lights. If it does not, troubleshoot and repair the problem before going further. Refer to the Jeep troubleshooting procedure for the specific vehicle being tested.

On 1991–95 models, cycling the ignition three times causes the check engine lamp to flash codes in this sequence:

1. On for about 2 seconds after the ignition is cycled to on the third time.
2. It goes out for about 2 to 4 seconds.
3. Flashes any ECM fault codes. The lamp flashes each code once.
4. Flashes code 55—5 flashes, pause, 5 flashes—at the end.

The last series of flashes, code 55, indicates the end of the fault code transmission. If only code 55 flashes, no other codes are present.

If the lamp stays lit continuously, flickers unevenly, or does not flash at least a code 55, the ECM is not entering the diagnostic mode. Refer to the Jeep troubleshooting procedure for the specific test vehicle.

Most Jeep vehicles with carbureted engines do not have an instrument panel malfunction indicator lamp (MIL). However, 1984–86 California models with a 2.8 liter V6 engine and GM Delco control system do.

## Check the GM Delco Check Engine

If the scan tool does communicate with the vehicle, disconnect the data cable to see if the ECM flashes codes on the check engine lamp.

Switch the ignition on without starting the engine to verify that the check engine lamp lights. If it does not, troubleshoot and repair the problem before going further. The ECM transmits serial data on the check engine lamp circuit, if the check engine lamp does not light, the ECM cannot transmit data to the scan tool.

Common causes of check engine lamp circuit problems include:

- A blown circuit fuse
- A burned-out lamp bulb
- A wiring or connector problem
- A defective lamp driver
- A vehicle connector problem

To manually flash codes, switch the ignition on and install a jump wire between pin 6 and pin 7 in the diagnostic connector D2 (Figure A-26).

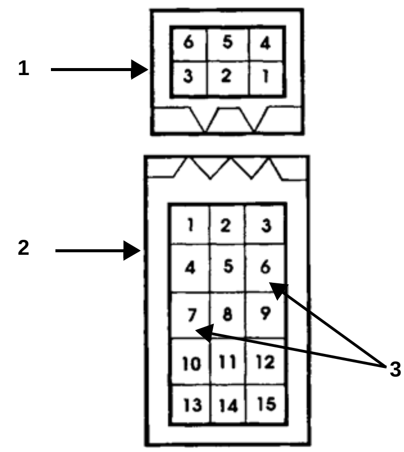


**Figure A-26** *Flash codes on the D2 connector on models with a GM Delco system*

**1— Connector D1**

**2— Connector D2**

**3— Jump pin 6 to pin 7**

The check engine lamp begins the code display by flashing code 12 three times (Figure A-27). It then flashes any other codes in PCM memory. If there are no codes in memory, code 12 flashes once again.

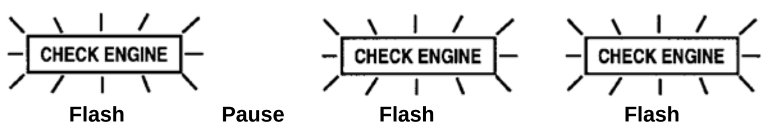


**Figure A-27** *Code 12 display on the check engine lamp*

Several different symptoms and problems may occur at this point:

- If the lamp lights for a bulb check but does not flash any codes, check for continuity between pins 6 and 7 in the D2 connector.
- If the check engine lamp flashes rapidly with no code pattern, check the ECM. Verify that a PROM is installed, and refer to Jeep troubleshooting procedures for the specific model.
- If the check engine lamp lights steadily and does not flash at all with pins 6 and 7 jumped, refer to Jeep diagnostic procedures.

### *Codes and Data Mode*

When the scan tool is in Codes and Data mode on these vehicles, the check engine lamp should flicker dimly. This indicates serial data transmission on the lamp circuit. If the lamp is lit steadily or does not flicker at all, a circuit problem may exist. Perform diagnostic connector voltage tests as explained later in this Appendix.

## A.4.7 Testing the Diagnostic Connector

A number of different diagnostic connectors are used on Jeep vehicles. These include:

- Chrysler engine diagnostic connector
- Jeep engine diagnostic connector
- OBD-II data link connector (DLC)
- Chrysler CCD diagnostic connector

## Chrysler Engine Diagnostic Connector

Use the following diagnostic connector voltage tests to help determine the reason that a 1991–95 vehicle with a Chrysler system does not perform tests. Use a high-impedance digital voltmeter and refer to Figure A-28.

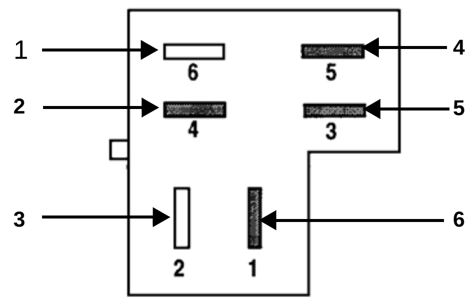


**Figure A-28** *Chrysler engine diagnostic connector*

**1— Not used**
**2— Data receive**
**3— Not used**
**4— Switched ignition voltage**
**5— Data transmit**
**6— Ground**

**To test a Chrysler engine diagnostic connector:**

- **Ground**—With the ignition on, connect the positive (+) voltmeter lead to the ground terminal in the diagnostic connector. Connect the negative (-) lead directly to the battery negative (-) terminal. Do not connect the lead to an engine or chassis ground. This test measures voltage drop across the ground side of the diagnostic connector. An ideal system ground drops 0.1 V or less.

  If the wiring is open to the ground terminal or at the connector itself, it may not affect engine operation. However, it affects scan tool operation because this terminal grounds the tool.

  To check for an open diagnostic connector ground circuit, connect the positive (+) voltmeter lead to battery positive and the negative lead to the connector ground terminal. The meter should read battery voltage. A 0 V reading means the circuit is open.
- **Switched ignition voltage**—With the ignition on, connect the positive (+) voltmeter lead to the battery voltage terminal of the diagnostic connector. Connect the negative (-) meter lead to the battery ground terminal. The meter should read battery voltage.

  This tests the voltage supply to the ECM. Alternately, use the scan tool Read IGN(+) at DLC test (see “Read IGN (+) at DLC” on page 217).
- **Vehicle communication transmit and receive**—Use a wiring diagram and an ohmmeter to check continuity in the diagnostic connector transmit and receive circuits. The scan tool uses

these circuits to receive ECM data in the Codes and Data mode, as well as for sensor and ATM tests. If either circuit is open, communication is prevented.

## Jeep Engine Diagnostic Connector

All 1984–86 models with a 2.8L carbureted V6 engine and California emissions use a GM Delco control system. They communicate on the Jeep D2 diagnostic connector in the engine compartment (Figure A-29).

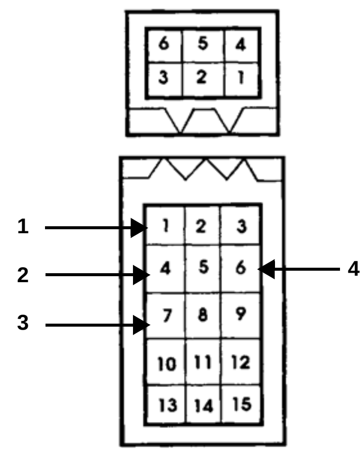


**Figure A-29** *Jeep engine diagnostic connector on GM Delco systems*

**1— Serial Data**

**2— Switched battery voltage**

**3— Ground**

**4— Test or Diagnostic enable**

If the check engine lamp does not flash code 12, or if it does but the scan tool does not receive data, check the diagnostic connector.

**Use a digital voltmeter to check the diagnostic connector:**

1. **Check ground continuity**—Connect the positive (+) voltmeter lead to D2 pin 7, and connect the negative (-) lead to the battery negative terminal. Do not connect to a body or chassis ground; go directly to the battery. With the ignition on, voltage drop should be 0.1 V or less. High resistance keeps the ECM from entering diagnostic mode.

   To test for an open ground at D2 pin 7, turn the ignition on and jump D2 pin 6 to D2 pin 7. Connect the positive voltmeter lead to the jump wire and the negative lead to a known good ground, use the negative battery terminal if possible. A reading of 50 millivolts (0.050 V) or less indicates a good ground. Higher readings indicate high resistance. If the meter reads 5 V, the connector ground for pin A is open.
2. **Check voltage on D2 pin 6**—Connect the positive voltmeter lead to D2 pin 6 and the negative lead to D2 pin 7 or a known good ground. With the ignition on, voltage on D2 pin 6 should be 5 V. If the circuit to D2 pin 6 is open, the ECM cannot enter diagnostic mode.
3. **Check voltage on D2 pin 1**—Connect the positive meter lead to D2 pin 1 and the negative lead to the D2 pin 7, or a known good ground. With the ignition on and engine off, voltage should be less than 1 V, about 0.7 to 0.8 V, when the lamp is on. The reading should rise to

battery voltage when the lamp goes off with the engine running. If the circuit is open, the ECM cannot transmit data.

Most communication problems on a GM Delco ECM are found and corrected by checking points just discussed. In a few cases, communication failure may be due to ECM failure. Check and verify all data communication circuits and parts before condemning the ECM.

## OBD-II Data Link Connector

Use the following voltage tests at the data link connector (DLC) to help determine the reason a 1996 or later OBD-II vehicle does not perform diagnostic tests. Use a high-impedance digital voltmeter for testing and refer to Figure A-30.

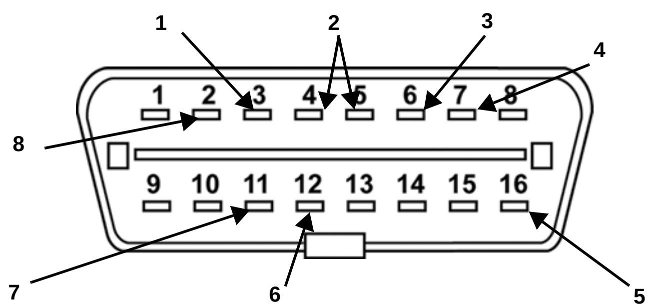


**Figure A-30** *OBD-II data link connector (DLC)*

**1— CCD Bus (+)**

**2— Chassis ground**

**3— Engine data receive**

**4— Engine data transmit**

**5— Battery voltage**

**6— Engine data transmit**

**7— CCD bus (–)**

**8— PCI bus**

**To test the 16-pin DLC:**

- **Ground**—Connect the positive (+) voltmeter lead to the diagnostic connector ground terminal. Connect the negative (-) lead directly to the negative (-) battery terminal. Do not connect the lead to an engine or chassis ground. This measures voltage drop across the diagnostic connector ground, which should be 0.1 V or less.

  An open circuit may not affect engine operation. However, it does affect scan tool operation because the display uses this terminal as a ground point.

  To check for an open circuit at the DLC ground terminal, connect the positive (+) voltmeter lead to battery positive and the negative lead to the connector ground terminal. The meter should read battery voltage. If it reads zero, the ground terminal is open.
- **Battery voltage**—Connect the positive (+) voltmeter lead to the battery voltage terminal at the diagnostic connector. Connect the negative (-) meter lead to the battery ground terminal. The meter should read battery voltage.
- **Engine data transmit and receive**—Use a wiring diagram and ohmmeter to check continuity in the PCM transmit and receive circuits to the DLC. The scan tool receives data on these

circuits. The scan tool cannot receive data from or transmit a request to the PCM if either circuit is open.

- **CCD bus communication**—Verify an active CCD bus by checking voltage at CCD connector terminals 3 and 11. To check, connect the negative (-) voltmeter lead to a known good ground. Turn the ignition switch on and alternately probe terminals 3 (CCD BUS +) and 11 (CCD BUS -) with the positive (+) lead. For both terminals, the voltmeter readings should be about 2.5 V.
- **PCI bus communication**—Verify an active PCI bus by connecting the positive lead of a lab scope to terminal 2. Connect the negative scope lead to terminal 4, which is chassis ground. Adjust the scope to a 50 mS timebase and 14 V range. Turn the ignition switch on. A series of voltage spikes in the 7 V range indicate that the PCI bus is not shorted.

  Each PCI module supplies its own voltage, so the bus system continues to operate with an open module circuit. However, an open between the DLC and the bus hub prevents the bus from communicating. When the scan tool communicates with some PCI-supported control modules, but not others, suspect open bus circuits associated with the module that does not communicate. Isolate the open circuit by removing each module, then checking for scan tool communication.

## The Chrysler Collision Detection (CCD) Diagnostic Connector

Use the following voltage tests at the Chrysler Collision Detection (CCD) diagnostic connector to help determine the reason that a vehicle does not perform diagnostic tests. Test with a high-impedance digital voltmeter and refer to Figure A-31.

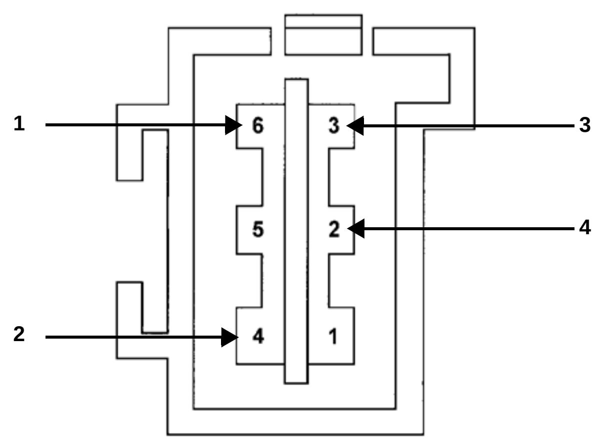


**Figure A-31** *Chrysler CCD diagnostic connector*

**1— Ground**
**2— Bus (+)**
**3— Bus (–)**
**4— Battery (B+)**

**To test the CCD diagnostic connector:**

- **Ground**—Connect the positive (+) voltmeter lead to the diagnostic connector ground terminal, and connect the negative (-) meter lead directly to the negative (-) battery terminal. Do not connect to an engine or chassis ground. This measures voltage drop across the diagnostic connector ground, which should be 0.1 V or less.

An open CCD ground circuit may not affect engine operation. However, it does affect the display because the scan tool uses this terminal as a ground point. To check for an open circuit at the CCD connector ground, connect the positive (+) voltmeter lead to battery positive and the negative lead to the connector ground terminal. The meter should read battery voltage. If the meter reads zero, the ground terminal is open.

- **Battery voltage**—Connect the positive (+) voltmeter lead to the diagnostic connector battery voltage terminal, and connect the negative (-) meter lead to the battery ground terminal. The meter should read battery voltage.
- **Bus bias voltage**—Connect the positive (+) voltmeter lead to either CCD connector bias terminal, and connect the negative (-) meter lead to the CCD connector ground terminal. The bias voltage should be 2.1 to 2.6 V DC. Repeat for the other bias terminal.

## A.4.8 Jeep Bus Communication Problems

Jeep systems communicate on a multiplex serial data bus, or network. There are two types: Chrysler Collision Detection (CCD) and Programmable Communication Interface (PCI).

The CCD system uses a pair of twisted wires to interconnect modules on the network, while a PCI system uses just one wire. Each module on the bus uses this network to communicate and exchange data with the other modules. The number of modules vary, depending on the vehicle.

On CCD a system, the scan tool communicates on the bus network through either the CCD connector or the 16-pin OBD-II data link connector (DLC). On PCI systems, the scan tool communicates through the OBD-II DLC only.

### Bus Communication System Identification

Identify the bus communication system using the scan tool. Connect the scan tool and select a bus-supported module such as the body control module (BCM) or ABS module. A “testing bus” message displays if the module communicates on a bus.

A PCI bus system uses only terminal 2 of the DLC to communicate with the scan tool (Figure A-30 on page 747). To recognize a PCI system, confirm the presence of a metal pin inside terminal 2 of the DLC.

A CCD bus system uses both pin 3 and pin 11 of the DLC to communicate with the scan tool. To identify a CCD system, look for metal pins inside terminals 3 and 11 of the DLC. If pins are present in both terminals, it is a CCD system.

### CCD Bus System Troubleshooting

Many CCD problems are quickly and easily be diagnosed by correctly interpreting the message displayed on the scan tool. There are two types of communication message:

- Bus is inactive
- No communication

### *Bus Is Inactive*

When the CCD system is selected, the scan tool first sends a message out over the CCD bus and waits for the message to be echoed back. If the message does not echo back, a bus inactive message displays.

This indicates either a faulty bus or a damaged data cable. If the data cable works on other Jeep CCD vehicles, then the bus is probably faulty. The most common cause of a bus failure is a defective control module.

To further isolate the problem, unhook one of the control modules from the CCD bus. Then attempt to establish bus communication with the scan tool. Each control module connects to the bus through separate circuits. If the bus becomes active, the disconnected module was most likely causing the problem.

If the CCD bus remains inactive, leave the module disconnected and continue disconnecting other modules. Press **Y** to check the bus after each module is disconnected. If the bus becomes active, that module is probably defective. To confirm, connect any other disconnected modules to see if the bus still responds. Then reconnect the faulty module to see if the bus becomes inactive. If the problem cannot be isolated to a module, expect a problem in the bus circuitry.

### *No Communication*

For Jeep CCD tests the scan tool must be connected to the CCD connector and communicating with the selected module. If not, a no communication message displays. This message appears under the following circumstances:

- The ignition is not on
- Engine was selected rather than a CCD module test
- The vehicle does not have the selected CCD module
- The selected CCD module is not responding

In any case, this message means that the CCD bus itself is operational.

## PCI Bus System Troubleshooting

Many PCI bus problems are quickly and easily diagnosed by correctly interpreting the message displayed on the scan tool. For PCI systems, there is just one “no communication” message.

Testing the PCI system requires the scan tool to be connected to the OBD-II DLC and communicating with the PCM. If the scan tool sends out a command to a PCI module and the module does not reply correctly or at all, the no communication message displays.

If this message displays, check the data cable. If the data cable is not damaged, the message does not necessarily mean that the scan tool cannot communicate with all PCI modules. The message only indicates the scan tool cannot communicate with the PCM.

Try communicating with other PCI control modules, such as ABS, any of the body systems, or the automatic transmission. If the scan tool communicates with at least one module on the bus, suspect open PCI bus circuits associated with each non-communicative module.

If the scan tool fails to communicate with all of the PCI control modules, then suspect that the PCI bus has a shorted or open circuit. Test as described in “OBD-II Data Link Connector” on page 747.

# Glossary

## Numerics

**4EAT**
4-speed Electronic Automatic Transmission.

**4WAL**
4-wheel Antilock.

## A

**A/C**
Air Conditioning.

**ABS**
Antilock Brake System.

**ABS/TC**
Antilock Brake System and Traction Control.

**ACCS**
Air Conditioning Cycle Switch.

**ACP**
Air Conditioning Pressure.

**ACT**
Actual.

**AH**
Active Handling.

**AIS**
Automatic Idle Speed.

**ALM**
Adaptive Learn Matrix.

**AP**
Accelerator Pedal.

**APP**
Accelerator Pedal Position.

**APPS**
Accelerator Pedal Position Sensor.

**ARC**
Automatic Ride Control.

**AS**
Air Suspension.

**ASARC**
Air Suspension Automatic Ride Control.

**ASD**
Auto Shutdown.

**ASR**
Automatic Slip Reduction.

**ATC**
Automatic Transfer Case.

**ATF**
Automatic Transmission Fluid.

**ATM**
Actuator Test Mode.

**AWD**
All Wheel Drive.

## B

**BARO**
Barometric pressure. Pertaining to atmospheric pressure or the results obtained by using a barometer.

**BCM**
Body Control Module.

**BLM**
Block Learn Multiplier.

**B-LVL**
Bilevel

**BMAP**
Barometric and Manifold Absolute Pressure.

**BOO**
Brake On/Off.

**BP**
Barometric Pressure.

**BPMV**
Brake Pressure Modulator Valve.

## C

**CAB**
Controller Antilock Brake.

**CANP**
Canister Purge.

**CAT**
Catalytic Converter.

**CC**
Cruise Control.

**CCD**
Chrysler Collision Detection.

**CCP**
Charcoal canister purge

**CCRM**
Constant Control Relay Module.

**CCT**
Cylinder Contribution Test.

**CCW**
Counterclockwise.

**CEC**
Computerized Emission Control.

**CHTIL**
Cylinder Head Temperature Indicator Lamp.

**CID**
Cylinder Identification.

**CKP**
Crankshaft Position.

**CL**
Closed Loop.

**CMD**
Command.

**CMP**
Camshaft Position.

**CMS**
Catalyst Monitor Sensors.

**CPI**
Central Point Injection.

**CPP**
Clutch Pedal Position.

**CTM**
Central Timer Module.

**CTS**
Coolant Temperature Sensor.

**CVI**
Clutch Volume Index.

**CW**
Clockwise.

## D

**DBC**
Delphi Brake Controller.

**DCL**
Data Communication Link.

**DFI**
Digital Fuel Injection.

**DFPS**
Dual Function Pressure Switch.

**DIC**
Driver Information Center.

**DIS**
Direct Ignition System.

**DLC**
Data Link Connector.

**DMM**
Digital Multimeter.

**DPFE**
Differential Pressure Feedback EGR.

**DRAC**
Digital Ratio Adapter Controller.

**DRB**
Diagnostic Readout Box.

**DRL**
Daytime Running Lights.

**DRP**
Dynamic Rear Proportion

**DTC**
Diagnostic Trouble Code.

**DTR**
Digital Transmission Range.

**DVOM**
Digital Volt Ohmmeter.

## E

**EBCM**
Electronic Brake Control Module.

**EBTCM**
Electronic Brake Traction Control Module.

**ECA**
Electronic Control Assembly.

**ECL**
Engine Coolant Level.

**ECM**
Engine Control Module or Electronic Control Module.

**ECN**
Engine Control Node.

**ECS**
Electronic Crash Sensor.

**ECT**
Engine Coolant Temperature.

**EEC**
Electronic Engine Control.

**EF**
Electronic Feedback.

**EFE**
Early Fuel Evaporation

**EFI**
Electronic Fuel Injection.

**EGR**
Exhaust Gas Recirculation.

**EIC**
Electronic Instrument Cluster.

**EMB**
Electromagnetic Brake.

**EMCC**
Electronically-Modulated Converter Clutch.

**EMI**
Electromotive Induction.

**EMR**
Emission Maintenance Reminder.

**EOP**
Engine Oil Pressure.

**EOT**
Engine Oil Temperature.

**EPC**
Electronic Control Pressure.

**EPR**
Exhaust Pressure Regulator.

**ESC**
Electronic Spark Control.

**ESO**
Electronic Shutoff Solenoid.

**EST**
Electronic Spark Timing.

**ETC**
Electronic Temperature and Compass.

**ETS**
Enhanced Traction System.

**EVIC**
Electronic Vehicle Information Center.

**EVO**
Electronic Variable Orifice.

**EVP**
EGR Valve Position.

**EVR**
EGR Vacuum Regulator.

**EWMA**
Exponentially Weighted Moving Average.

## F

**FBK**
Feedback.

**FDCS**
Fuel Delivery Command Signal.

**FEM**
Front Electronic Module.

**FICM**
Fuel Injector Control Module.

**FPCM**
Fuel Pump Control Module.

**FRC**
Forced

**FRP**
Fuel Rail Pressure.

**FSV**
Fuel Solenoid Valve.

## G

**GEM**
Generic Electronic Module.

**GPC**
Glow Plug Control.

## H

**HCU**
Hydraulic Control Unit.

**HEC**
Hybrid Electronic Cluster.

**HO**
High Output.

**HO2S**
Heated Oxygen Sensor.

**HTRX1**
Upstream Oxygen Sensor Heater.

**HTRX2**
Downstream Oxygen Sensor Heater.

**HVAC**
Heating Ventilation Air Conditioner.

**HWPS**
Hand Wheel Position Sensor.

**Hz**
Hertz.

## I

**IABM**
Integrated Airbag Module.

**IAC**
Idle Air Control.

**IC**
Ignition Control.

**ICCS**
Integrated Chassis Control System.

**ICM**
Instrument Cluster Module.

**ICP**
Injector Control Pressure.

**IDM**
Injector Drive Module.

**IDX**
Index.

**IFS**
Inertia Fuel Switch.

**ILC**
Idle Load Compensator.

**IMS**
Internal Mode Switch.

**INJ**
Injector.

**IPC**
Instrument Panel Cluster.

**IRCM**
Integrated Relay Control Module.

**ISS**
Input Shaft Speed.

**IVS**
Idle Validation Switch.

**IVSC**
Integrated Vehicle Speed Control.

## J

**JTEC**
Jeep/Truck Engine Controller.

## K

**KOEO**
Key On, Engine Off.

**KOER**
Key On, Engine Running.

**kPa**
Kilopascals.

**KS**
Knock Sensor.

## L

**LHS**
Luxury High-performance Sedan.

**LMP**
Lamp.

## M

**MAF**
Mass Airflow

**MAP**
Manifold Absolute Pressure.

**MCU**
Microprocessor Control Unit.

**MECS**
Mazda Electronic Control System.

**MFDES**
Mass Fuel Desired.

**MGP**
Manifold Gauge Pressure.

**MIC**
Electromechanical Instrument Cluster.

**MIL**
Malfunction Indicator Lamp.

**MLP**
Manual Lever Position.

**mm3**
Cubic Millimeters.

**MMM**
Memory Mirror Control Module.

**MPa**
Megapascal.

**mS**
Milliseconds.

**MSM**
Memory Seat Control Module.

**MSVA**
Magnetic Steering Variable Assist (Magnasteer).

**MTV**
Manifold Tuning Valve.

**mV**
Millivolts.

**MVLP**
Manual Valve Lever Position.

## N

**ND**
Non-Drive.

**NGC**
Next Generation Controller.

**NVLD**
Natural Vacuum Leak Detection.

## O

**O2S**
Oxygen Sensor.

**OBD**
On Board Diagnostics.

**ODM**
Output Driver.

**OL**
Open Loop.

**OSS**
Output Shaft Speed.

## P

**PATS**
Passive Anti-Theft System.

**PCI**
Programmable Communication Interface.

**PCM**
Powertrain Control Module.

**PCS**
Pressure Control Solenoid.

**PCV**
Positive Crankcase Ventilation.

**PFE**
Pressure Feedback EGR.

**piezoelectric**
Functioning by means of electricity or electric polarity due to pressure.

**PIP**
Profile Ignition Pickup.

**POT**
Potentiometer.

**psi**
Pounds per square inch.

**PSP**
Power Steering Pressure.

**PTO**
Power Take Off.

**PWM**
Pulse-Width Modulation.

## Q

**QDM**
Quad Driver Module.

## R

**RABS**
Rear-only Antilock Brake System.

**RCL**
Reverse Control Lamp.

**RCM**
Restraint Control Module.

**REM**
Rear Electronic Module.

**RKE**
Remote Keyless Entry.

**RLY**
Relay.

**RWAL**
Rear Wheel Antilock.

## S

**S/C**
Speed Control.

**SASBT**
Standalone Serial Bus Traveler.

**SBEC**
Single Board Engine Controller.

**SBT**
Serial Bus Traveler.

**SCC**
Spark Control Computer.

**SCCS**
Speed Control Command Switch.

**SCLM**
Steering Column Lighting Module.

**SCM**
Suspension Control Module.

**SDL**
Serial Data Line.

**SDM**
Inflatable Restraint Sensing and Diagnostic Module.

**SIR**
Supplemental Inflatable Restraint.

**SMCC**
Stepper Motor Cruise Control.

**SMEC**
Single Module Engine Controller.

**SRI**
Service Reminder Indicator.

**SRS**
Supplemental Restraint System.

**SS**
Steady State.

**SSS**
Speed Sensitive Steering.

**STI**
Self-Test Input.

**STL**
Service Transmission Lamp.

**STO**
Self-Test Output.

**STS**
Service Throttle Soon.

**SUP**
Supplemental Inflatable Restraint.

**SVS**
Service Vehicle Soon.

**SWPS**
Steering Wheel Position Sensor.

## T

**TAC**
Throttle Actuator Control.

**TAP**
Transmission Adaptive Pressure.

**TC**
Traction Control.

**TCC**
Torque Converter Clutch.

**TCCA**
Torque Converter Clutch Actual.

**TCIL**
Transmission Control Indicator Lamp.

**TCM**
Transmission Control Module.

**TCS**
Traction Control System.

**TEC**
Transmission Electronic Control.

**TFP**
Transmission Fluid Pressure.

**TFT**
Transmission Fluid Temperature.

**TIM**
Tire Inflation Monitor.

**TIP**
Throttle Inlet Pressure.

**TOT**
Transmission Oil Temperature.

**TP**
Throttle Position.

**TPCT**
Throttle Position Closed Throttle.

**TPS**
Throttle Position Sensor.

**TR**
Transmission Range.

**TRS**
Transmission Range Sensor.

**TSS**
Turbine Shaft Speed.

Turbine Speed Sensor.

**TV**
Throttle Valve.

**TW**
Twilight.

**TWC**
Three-Way Converter.

## U

**UBP**
UART-Based Protocol.

## V

**V**
Volts.

**V6**
6-cylinder V-type engine.

**V8**
8-cylinder V-type engine.

**VATS**
Vehicle Anti-theft System.

**VCC**
Viscous Converter Clutch.

**VCM**
Vehicle Control Module.

**VCT**
Variable Camshaft Timing

**VECI**
Vehicle Emission Control Information.

**VES**
Variable Effort Steering.

**VF**
Vacuum Florescent.

**VFD**
Vacuum Florescent Display.

**VFDES**
Volume of Fuel Desired.

**VGT**
Variable Geometry Turbo.

**VIC**
Virtual Image Cluster.

**VIN**
Vehicle Identification Number.

**VLV**
Valve.

**VNT**
Variable-Nozzle Turbo.

**VSES**
Vehicle Stability Enhancement System.

**VSS**
Vehicle Speed Sensor.

**VTA**
Vehicle Theft Alarm.

**VTSS**
Vehicle Theft Security System.

## W

**W/U**
Warm-up.

**WOT**
Wide Open Throttle. ,

# Index

## Numerics



## A



## B



## C

## D



## E



## F



## G