HDS 200/HDS 250 HD Scan Tool
for Class 4-8 Diesel, Light and Medium Vehicles

BOSCH

en User guide

Serial No: _____

SW ID: _____

HW Ver: _____

Boot Ver: _____

Prod ID: _____

Board ID: _____

Burn Date: _____

Record the above information about your tool. The information is available at Main Menu --> System Setup --> Tool Information. Provide this information when contacting technical support.

If you have questions or concerns contact Technical Support:

Phone: 1-855-267-2483

E-mail: techsupport.diagnostics@us.bosch.com

The information, specifications and illustrations in this guide are based on the latest information available. Bosch reserves the right to make changes at any time without notice.

Table of Contents

1 Safety Precautions

For your safety, read this manual thoroughly before operating your scan tool. Always refer to and follow safety messages and test procedures provided by the manufacturer of the vehicle or equipment being tested. The safety messages presented below and throughout this user's manual are reminders to the operator to exercise extreme care when using this test instrument.

1.1 Read All Instructions
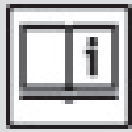
Read and understand the user guide before operating the tool.

Read, understand, and follow all safety messages and instructions in this manual and on the test equipment. Safety messages in this section of the manual contain a signal word with a three-part message and, in some instances, an icon.

1.2 Safety Messages

Safety messages are provided to help prevent personal injury and equipment damage. All safety messages are introduced by a signal word. The signal word indicates the level of the hazard in a situation. The types of safety messages are.

DANGER
Indicates a possible hazardous situation which, if not avoided, will result in death or serious injury to operator or bystanders.

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

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

IMPORTANT
Indicates a condition which, if not avoided, may result in damage to test equipment or vehicle.

2 Important Safety Warnings and Instructions

WARNING

Risk of electric shock.
- Do not exceed voltage limits between inputs indicated in the Specifications.
- Use extreme caution when working with circuits that have voltage greater than 60 volts DC or 24 volts AC.
Electric shock can cause injury.

WARNING

Risk of poisoning.
- Safety goggles and protective clothing must be worn by the operator and any bystanders.
  - Even if everyday glasses have impact resistant lenses, they are NOT safety glasses, and may not provide adequate protection.
- Do not use this scan tool in environments where explosive vapors may collect. These areas include:
  - below-ground pits.
  - confined areas.
  - areas that are less than 18 inches above floor.
- Use this scan tool in locations with mechanical ventilation providing at least 4 air changes per hour.
- Flammable fuel and vapors can ignite.
- Do not smoke, strike a match, or cause a spark in the vicinity of the battery. Battery gases can ignite.
- Avoid making an accidental connection between the battery terminals. Do not place uninsulated metal tools on the battery.
- When removing battery cables, remove the ground cable first.
- Avoid sparks when connecting or disconnecting power leads to the battery.
- Make sure ignition is off, headlights and other accessories are off and vehicle doors are closed before disconnecting the battery cables.
  - This also helps prevent damage to on-board computer systems.
- Always disconnect the battery ground connections before servicing electrical system components.
Explosion can cause injury.

WARNING

Risk of poisoning.

- Use this scan tool in locations with mechanical ventilation providing at least 4 air changes per hour. Engine exhaust contains odorless gas which can be lethal.
- Route the exhaust outside while testing with the engine running.

Poisoning can result in death or serious injury.

WARNING

Battery acid is a highly corrosive sulfuric acid.

- Safety goggles and protective gloves must be worn by the operator and any bystanders.
  - Even if your everyday glasses have impact resistant lenses, they are NOT safety glasses, and may not provide adequate protection.
- Make sure someone can hear you or is close enough to provide aid when working near a battery.
- Have plenty of fresh water and soap nearby.
  - If battery acid contacts skin, clothing, or eyes, flush exposed area with soap and water for 10 minutes. Seek medical help.
- Do not touch eyes while working near battery.

Battery acid can burn eyes and skin.

WARNING

Risk of fire.

- Safety goggles and protective clothing must be worn by the operator and any bystanders.
  - Even if your everyday glasses have impact resistant lenses, they are NOT safety glasses, and may not provide adequate protection.
- Do not position your head directly in front of or over the throttle body.
- Do not pour gasoline down the throttle body when cranking or running the engine, when working with fuel delivery systems or any open fuel line.
  - Engine backfire can occur when the air cleaner is out of position.
- Do not use fuel injector cleaning solvents when performing diagnostic testing.
- Keep cigarettes, sparks, open flame and other sources of ignition away from vehicle.
- Keep a dry chemical (Class B) fire extinguisher rated for gasoline, chemical and electrical fires in work area.

Fire can cause death or serious injury.

WARNING

Risk of flying particles.

- Safety goggles and protective gloves must be worn by the operator and any bystanders while using electrical equipment.
  - Electrical equipment or rotating engine parts can cause flying particles.
  - Even if your everyday glasses have impact resistant lenses, they are NOT safety glasses, and may not provide adequate protection.

Flying particles can cause eye injury.

WARNING

Risk of burns.

- Batteries can produce a short-circuit current high enough to weld jewelry to metal.
  - Remove jewelry such as rings, bracelets and watches before working near batteries.

Short circuits can cause injury.

WARNING

Risk of burns.

- Do not remove radiator cap unless engine is cold.
  - Pressurized engine coolant may be hot.
- Do not touch hot exhaust systems, manifolds, engines, radiators, sample probe.
- Wear insulated gloves when handling hot engine components.
- Tester leads can become hot after extended testing in close proximity to manifolds.

Hot components can cause injury.

WARNING

Risk of expelling fuel, oil vapors, hot steam, hot toxic exhaust gases, acid, refrigerant and other debris.

- Safety goggles and protective clothing must be worn by the operator and any bystanders.
  - Even if your everyday glasses have impact resistant lenses, they are NOT safety glasses, and may not provide adequate protection.
- Engine systems can malfunction, expelling fuel, oil vapors, hot steam, hot toxic exhaust gases, acid, refrigerant and other debris.

Fuel, oil vapors, hot steam, hot toxic exhaust gases, acid, refrigerant and other debris can cause serious injury.

WARNING

Engine compartment contains electrical connections and hot or moving parts.
- Keep yourself, test leads, clothing and other objects clear of electrical connections and hot or moving engine parts.
- Do not wear watches, rings, or loose fitting clothing when working in an engine compartment.
- Do not place tools or test equipment on fenders or other places in engine compartment.
- Barriers are recommended to help identify danger zones in test area.
- Prevent personnel from walking through test area.

Contacting electrical connections and hot or moving parts can cause injury.

WARNING

Risk of injury.
- The scan tool should be operated by qualified personnel only.
- Use the scan tool only as described in the user's manual.
- Use only manufacturer's recommended attachments.
- Do not operate the scan tool with damaged cables.
- Do not operate the scan tool if it has been dropped or damaged, until examined by a qualified service representative.

Operation of the scan tool by anyone other than qualified personnel may result in injury.

WARNING

Risk of unexpected vehicle movement.
- Block drive wheels before performing a test with engine running.
- Unless instructed otherwise:
  - set parking brake
  - put gear selector in neutral for manual transmissions
  - put gear selector in park for automatic transmissions
  - disconnect release mechanism on the automatic parking brake release for testing and reconnect when testing is completed.
- Do not leave a running engine unattended.

A moving vehicle can cause injury.

CAUTION

Risk of equipment or circuit damage.
- Unless specifically directed by manufacturer, make sure ignition is off before connecting or disconnecting connectors or any vehicle electrical terminals.
- Do not create a short between battery terminals with a jumper wire or tools.

Improper equipment use can cause equipment or circuit damage.

CAUTION

Misdiagnosis may lead to incorrect or improper repair and/or adjustment.
- Do not rely on erratic, questionable, or obviously erroneous test information or results.
  - If test information or results are erratic, questionable, or obviously erroneous, make sure all connections and data entry information are correct and test procedures were performed correctly.
  - If test information or results are still suspicious, do not use them for diagnosis.

Improper repair and/or adjustment may cause vehicle or equipment damage or unsafe operation.

DANGER

Some vehicles are equipped with air bags.
- Follow service manual warnings when working around air bag components or wiring.
  - If service manual instructions are not followed, an air bag may deploy unexpectedly, resulting in injury.
  - Note an air bag can still deploy several minutes after ignition key is off (or even if vehicle battery is disconnected) because of a special energy reserve module.

An air bag opening can cause injury.

3 Getting Started

3.1 Introduction

The scan tool was developed by experts in the Heavy Duty Diesel and automotive service industry to help diagnose vehicles and assist in troubleshooting procedures.

The scan tool monitors vehicle events and retrieves codes from the vehicle's control modules to help pinpoint problem areas.

All information, illustrations and specifications contained in this manual are based on the latest information available from industry sources at the time of publication.

No warranty (expressed or implied) can be made for its accuracy or completeness, nor is any responsibility assumed by the manufacturer or anyone connected with it for loss or damages suffered through reliance on any information contained in this manual or misuse of accompanying product. The manufacturer reserves the right to make changes at any time to this manual or accompanying product without obligation to notify any person or organization of such changes.

3.2 Download Scanning Suite

- Download the Scanning Suite PC application here:
  - https://www.boschdiagnostics.com/pro/products/Bosch-HDS-200
  - https://www.boschdiagnostics.com/pro/products/Bosch-HDS-250
- Scanning Suite is NOT required to operate the Scan Tool.
- Install the downloaded Scanning Suite application prior to connecting the Scan Tool to the PC.
- Some of the items included in Scanning Suite are:
  - Tool update software
  - Print Capture
- To be able to use Scanning Suite the PC must meet the following minimum requirements:
  - Microsoft Windows 7, 8, and 10.
  - Adobe Acrobat Reader
  - Screen Resolution of 800 x 600
  - If screen resolution is 800 x 600, in Display Properties, Settings Tab, set Font Size to Small Fonts.
- Use Scanning Suite to determine if any updates are available for your tool by clicking Check for Update button.
- You can also configure the Scanning Suite Frequency (SS Frequency) to automatically check every xx minutes. The default frequency is 30 minutes.
- Find instructions on how to install Scanning Suite and Tool updates here:
  - https://www.boschdiagnostics.com/pro/products/Bosch-HDS-200
  - https://www.boschdiagnostics.com/pro/products/Bosch-HDS-250

3.3 Introduction to On-Board Diagnostics

SAE J1587/J1708

SAE J1587 is a diagnostic protocol standard developed by the Society of Automotive Engineers (SAE) for heavy-duty and most medium-duty vehicles built after 1985. Up to 1995, individual OEMs used their own connectors. From 1996 to 2001, the 6-pin Deutsch was standard. Beginning in 2001, most OEMs converted to the 9-pin Deutsch. Some OEMs still use the 6-pin Deutsch.

SAE J1708 is an SAE physical specification developed for heavy duty vehicles (trucks and busses). The protocol promoted a standard for serial communication between modules with microcontrollers. J1708 describes the physical and data link layer. Almost always used in conjunction with the application layer protocol SAE J1587.

SAE J1939

In the early 90's, the SAE Truck and Bus Control and Communications Sub-committee started the development of a CAN-based application profile for in-vehicle communication in trucks. In 1998, the SAE published the J1939 set of specifications. A J1939 network connects electronic control units (ECU) within a truck and trailer system. The J1939 specification - with its engine, transmission, and brake message definitions - is dedicated to diesel engine applications.

SAE J1939 has been adopted widely by diesel engine manufacturers. One driving force behind this is the increasing adoption of the engine Electronic Control Unit (ECU), which provides one method of controlling exhaust gas emissions within US and European standards. Consequently, SAE J1939 can now be found in a range of diesel-powered applications: vehicles (on- and off-road), marine propulsion, power generation, and industrial pumping.

OBD II

On-Board Diagnostics version II (OBD II) is a system that the Society of Automotive Engineers (SAE) developed to standardize automotive electronic diagnosis.

Beginning in 1996, most new vehicles sold in the United States were fully OBD II compliant.

Technicians can now use the same tool to test any OBD II compliant vehicle without special adapters. SAE established guidelines that provide:

- A universal OBD II data link connector, called the DLC, with dedicated pin assignments.
- Diagnostics with vehicle modules involved in emissions controls such as ECM/PCM & transmission.
- A standard location for the DLC, visible under the dash on driver's side.
- A standard list of diagnostic trouble codes (DTCs) used by all manufacturers.
- A standard list of parameter identification (PID) data used by all manufacturers.

- Ability for vehicle systems to record operating conditions when a fault occurs.
- Expanded diagnostic capabilities that records a code whenever a condition occurs that affects vehicle emissions.
- Ability to clear stored codes from the vehicle's memory with a scan tool.

3.4 SAE Publications

SAE has published hundreds of pages of text defining a standard communication protocol that establishes hardware, software, and circuit parameters of OBD II systems. Unfortunately, vehicle manufacturers have different interpretations of this standard communications protocol. As a result, the generic OBD II communications scheme varies, depending on the vehicle. SAE publishes recommendations, not laws, but the Environmental Protection Agency (EPA) and California Air Resources Board (CARB) made many of SAE's recommendations legal requirements that vehicle manufacturers were required to phase in over a three-year period. Beginning in 1994, vehicles with a new engine management computer (about 10% of each manufacturers fleet) were supposed to comply with OBD II standards. For 1995, OBD II systems were to appear on about 40% of the new vehicles sold in the United States. Some of the 1994-1995 OBD II systems were not fully compliant, so the Government granted waivers to give manufacturers time to fine-tune their systems. Beginning in 1996, most of the new vehicles sold in the United States were fully OBD II compliant.

3.5 Data Link Connector (DLC)

The data link connector (DLC) allows the scan tool to communicate with the vehicle's computer(s). Use the proper DLC adapter cable to connect the scan tool to the vehicle. Also, the vehicle's DLC may be found in several different places and have many different configurations.

> **ℹ️ IMPORTANT**
> Power to the tool generally comes from the vehicle. If the tool does not power-up, use the included cigarette lighter cable (7-0135) to power-up the tool.

J1939 Type 2

The J1939 Type 2 is a round 9-pin green DLC adapter cable (HDS 200: 1699200242) (HDS 250: 1699200245). This cable will work on trucks with older J1939 Type 1 and new J1939 Type 2 DLCs.

The vehicle DLC is generally mounted inside the cab. For on road heavy trucks, the connector should be mounted on the driver side. For busses, the vehicle DLC should be mounted within reach of the operators seat. Attach the 9-pin green adapter cable to the extender cable (7-0137) (both supplied with the scan tool) to connect the tool.
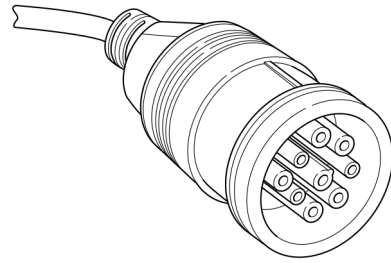
J1708/J1587

The J1708/J1587 connector is a round 6-pin gray DLC adapter cable (HDS 200: 1699200241) (HDS 250: 1699200244).

Attach the 6-pin grey adapter cable to the extender cable (7-0137) (both supplied with the scan tool) to connect the tool.
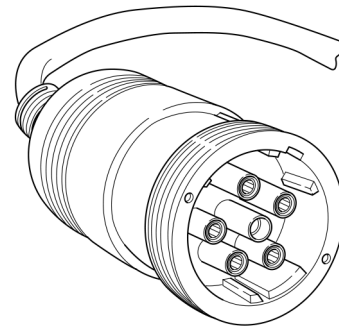
OBD II (J1962)

Beginning in 1996, vehicles sold in the United States use the J1962 (OBD II) DLC, a term taken from a physical and electrical specification number assigned by the SAE (J1962). The DLC should be located under the dashboard on the driver's side of the vehicle. If the DLC is not located under the dashboard as stated, a decal describing its location should be attached to the dashboard in the area the DLC should have been located. For more information on OBD II connectors, go to http://www.obdclearinghouse.com.

Because the OBD II J1962 connector has power and ground, you only need a single cable connection to the tool for both power and vehicle communications. Attach the OBD II adapter cable (HDS 200: 1699200243) (HDS 250: 1699200246) to the extender cable (7-0137) (both supplied with the scan tool), to connect the tool. Certain pins in the connector are reserved.
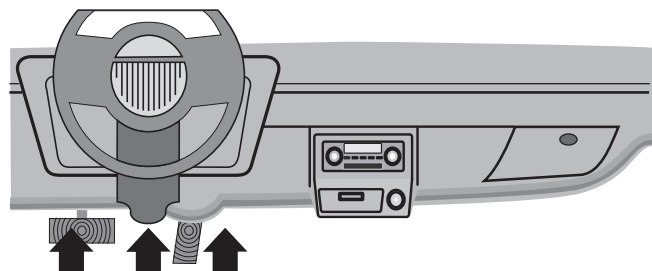
OBD II Data Link Connector (DLC) Pins
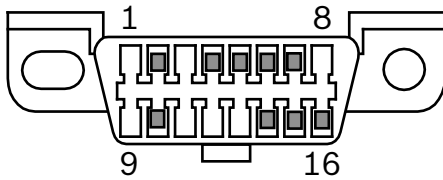
3.6   J1939 Diagnostic Trouble Codes

J1939 DTCs are made up of a Suspect Parameter Number (SPN) and the Failure Mode Identifier (FMI). The SPN identifies the failed component or system. The FMI identifies the type of failure.
J1939 defines a standard set of DTCs. SAE reserves SPNs 0 to 516095. SPNs 516096 to 524287 are reserved for the manufacturer.

3.7   J1587 Diagnostic Trouble Codes

J1587 DTCs are made up of either a Parameter Identification number (PID) or a Subsystem Identification number (SID). It is also made up of a Failure Mode Identifier (FMI). The SID or PID identifies the failed component or system. The FMI identifies the type of failure.

3.8   OBD II Diagnostic Trouble Codes (DTCs)

J2012 and ISO 15031-6 are standards for all DTCs, established by the SAE, International Organization for Standardization (ISO) and other governing bodies.

*   Codes and definitions assigned by these specifications are known as Generic OBD II codes.
*   OBD II requires compliance to these standards for all cars, light trucks, APVs, MPVs, and SUVs sold in the United States.
*   Codes not reserved by the SAE are reserved for the manufacturer and referred to as Manufacturer Specific Codes.

DTCs are used to help determine the cause of a problem or problems with a vehicle.

*   DTCs consist of a five-digit alphanumeric code.
*   The DTCs format and general code types are shown below.
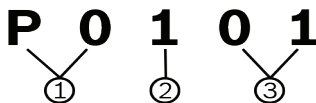
1.   Bx = Body
     Cx = Chassis
     Px = Powertrain
     Ux = Network communication
     x = 0, 1, 2, or 3
2.   Vehicle specific system
3.   Specific fault designation

Example:
P0101 = Mass or volume air flow circuit range/performance problem

Powertrain Codes

Code	Type
P0xxx	Generic (SAE)
P1xxx	Manufacturer specific
P2xxx	Generic (SAE)
P30xx–P33xx	Manufacturer specific
P34xx–P39xx	Generic (SAE)

Chassis Codes

Code	Type
C0xxx	Generic (SAE)
C1xxx	Manufacturer specific
C2xxx	Manufacturer specific
C3xxx	Generic (SAE)

Body Codes

Code	Type
B0xxx	Generic (SAE)
B1xxx	Manufacturer specific
B2xxx	Manufacturer specific
B3xxx	Generic (SAE)

Network Communication Codes

Code	Type
U0xxx	Generic (SAE)
U1xxx	Manufacturer specific
U2xxx	Manufacturer specific
U3xxx	Generic (SAE)

4 Using the Scan Tool

4.1 The Scan Tool

1. USB port - provides USB connection for the computer.
2. ![F1] **F1** and ![F2] **F2** keys are used to perform the specified action on the display directly above the key. If nothing appears on the display directly above the F1 and F2 keys, then the keys are inactive.
3. ◀ **LEFT** and ▶ **RIGHT** arrow keys - selects YES or NO and selects data parameters for custom data list.
4. ![ENTER] **ENTER** key - selects displayed items.
5. ![ON/OFF] **ON/OFF** key - turns power ON or OFF.
6. ![BACK] **BACK** key - goes to the previous screen or level.
7. ▲ **UP** and ▼ **DOWN** arrow keys - moves selection up or down.
8. LCD display (color, backlit, QVGA resolution)
9. DLC cable (not shown) - provides connection for vehicle interface.
10. Serial Number Plate (not shown) - Located inside battery compartment, provides serial number of scan tool.
11. Battery Compartment (on back; not shown) - provides power to the scan tool when reprogramming from a personal computer or off-vehicle reviewing of codes and printing.
12. 12V Power Jack (not shown) - provides power to scan tool when scan tool is conneced to certain Heavy Duty vehicles.

4.2 Specifications

Display	Color, backlit, QVGA resolution
Operating Temperature	0 to 50°C (32 to 122°F)
Storage Temperature	-20 to 70°C (-4 to 158°F)
Internal Power	4-AAA Batteries
Barrel Jack External Power	7 to 16 Volts
DLC Adapter Cable External Power	**HDS 200:** 7 to 16 Volts **HDS 250:** 7 to 36 Volts

A minimum of 8.0 V is required for most control modules to operate properly in a vehicle.

Dimensions

Height	Width	Depth
7 inches	3.75 inches	1.125 inches
178 mm	95 mm	29 mm

Accessories

Part	Description	Part No.
Extender Cable	Cable used to connect vehicle specific adapter cables to scan tool	7-0137
OBD II Cable	Communicates between vehicle and tool	1699200243 (HDS 200) 1699200246 (HDS 250)
Cigarette Lighter Cable	Cable used to power scan tool from cigarette lighter.	7-0135
9-pin Deutsch Cable	Refer to page 8	1699200242 (HDS 200) 1699200245 (HDS 250)
6-Pin Deutsch Cable	Refer to page 8	1699200241 (HDS 200) 1699501129 *formerly 1699200244* (HDS 250)
USB Cable	Cable used to update scan tool firmware and print data to Scanning Suite	0038-000-3430

* Some units were originally shipped with a 6-Pin Deutsch Cable (Part No. 1699200244). When replacing this cable, the 6-Pin Deutsch Cable (Part No. 1699501129) should be purchased.

Optional Accessories

Part	Description	Part No.
Battery Clip Y Adapter Cable	Adapter that allows the Cigarette Lighter Cable to connect directly to vehicle battery cables	7-0136

Replacement parts are available from the manufacturer by contacting customer service at 1-855-267-2483 (8:00-6:00 EST Monday-Friday).

4.3   Display

The display has a large viewing area for displaying messages, instructions, and diagnostic information.

The back-lit liquid crystal display (LCD) is a QVGA pixel display. Display icons used to help operate the scan tool are:

- ⬇ Indicates additional information is available by scrolling down.
- ⬆ Indicates additional information is available by scrolling up.
- 🔋 Indicates the internal batteries need replaced or are not installed.
- √ Indicates selected items in a data list or that data is available for items on the Review Data and Print Data Menu.
- 📈 Indicates graphical viewing of data items is available in View Data and when playing back previously recorded data.

Keypad

The keypad is used to move through the different menus of the scan tool. The scan tool's software is designed for ease in operating and navigating through menus.

⚠️ **CAUTION**
Do not use solvents such as alcohol to clean keypad or display. Use a mild nonabrasive detergent and a soft, cotton cloth.

⚠️ **CAUTION**
Do not soak keypad as water might find its way inside the scan tool.

4.4   Power

Internal Battery Power

- Battery power is not required to use tool.
- Press and hold 🔴 **ON/OFF** key for at least 1 second to turn ON scan tool.
- The scan tool will autmatically turn OFF after a user-selectable period of inactivity when powered from the internal batteries. The default is 2 minutes.
- When powered from the internal batteries, the scan tool will dim display backlighting.
- The scan tool must be attached to the vehicle to perform diagnostic functions. The scan tool disables the diagnostic functions when powered from the internal batteries.
- Each time the scan tool is powered up, voltage of the internal battery is checked. If voltage is low, the Low Battery symbol (🔋) displays on screen. Replace the battery using instruction provided in Battery Replacement.

⚠️ **CAUTION**
If the scan tool will not be used for an extended period of time, remove the batteries to prevent battery leakage from damaging the battery compartment.

Vehicle Power

When the scan tool is connected to the vehicle's DLC, the tool is powered by the vehicle and will automatically turn on once connected. If you use the cigarette lighter adapter cable, be aware that some vehicle cigarette lighters are not powered when the ignition is in the OFF position. Therefore, you may wish to use the optional battery clip adapters (7-0136).

USB Power

When the tool is connected to a PC via a USB cable, the tool will automatically power up. Refer to "7.2   Scan Tool Does Not Power Up" on page 41 if there are problems.

4.5   System Setup

System Setup allows:

- Measurement units to be changed.
- Auto-Power off time to be changed.
- Printer Header to be turned ON or OFF.
- Scan tool information to be viewed.
- Display to be checked.
- Operation of the keypad to be checked.
- Memory of the tool to be checked.
- Scan tool to be upgraded.
- Language to be changed.
- Quick Test to be turned ON, OFF, or set to the desired method.
- Long PID/SPN names to be turned ON or OFF.
- Change the number of Pre-Trigger frames when recording data.

From the **Main Menu, Heavy Duty Standard** menu, **HD OBD**, or **Global Automotive OBDII** menu:

1. Select **System Setup**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **System Setup** is highlighted.
   - Press ENTER.

```
        Main Menu
HD SAE (J1708/J1587, J1939)
HD OBD (ISO 15765-4)
Global Automotive OBDII
Review Data
Print Data
System Setup
```
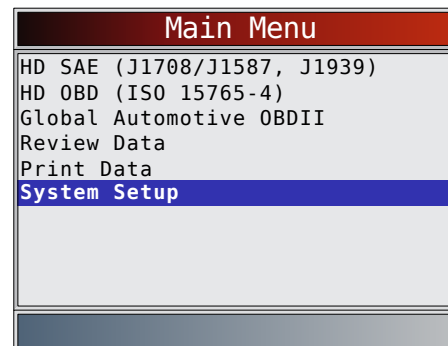
Changing Measurement Units

English is the default measurement unit. Measurement units can be changed in **View and Record Data**.

From **System Setup menu**:
1. Select **English/Metric**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **English/Metric** is highlighted.
   - Press ENTER.

```
        System Setup
 English/Metric
 Auto-Power Off
 Quick Test
 Print Header
 Language Setup
 Long PID/SPN Names
 Pre-Trigger Setup
 Tool Information
 Display Test
                    ⬇
```
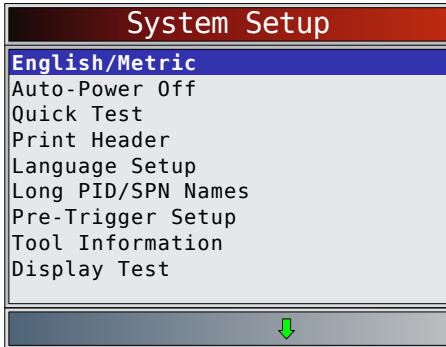
2. Select desired measurement unit.
   - Use the ▲ **UP** and ▼ **DOWN** keys until the desired unit is highlighted.
   - Press ENTER.

```
       Measurement Units
 English
 Metric
```
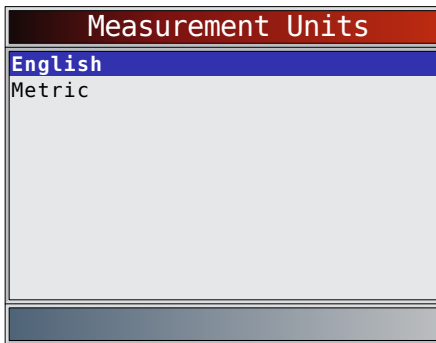
3. Save measurement setting.
   - Press ENTER.

Changing Auto-Power Off

The Auto-Power Off feature allows the tool to turn off automatically after a selected amount of time when tool is not being used. The Auto-Power Off feature will only turn the tool off when it is operating on battery power.

From **System Setup menu**:
1. Select **Auto-Power Off**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Auto-Power Off** is highlighted.
   - Press ENTER.

```
        System Setup
 English/Metric
 Auto-Power Off
 Quick Test
 Print Header
 Language Setup
 Long PID/SPN Names
 Pre-Trigger Setup
 Tool Information
 Display Test
                    ⬇
```
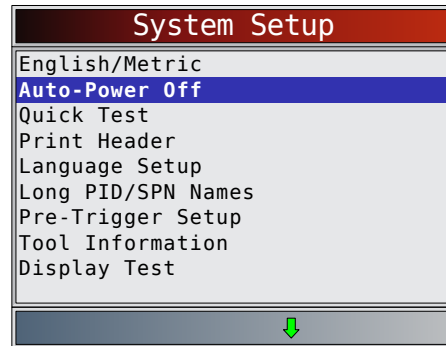
2. Increase or Decrease **Auto-Power Off** time.
   - Use the ▲ **UP** key to increase time.
   - Use the ▼ **DOWN** key to decrease time.
   - Press ENTER.

```
        Auto-Power Off

        2 minute(s)

       ▲ Increase time
       ▼ Decrease time

     Press ENTER to continue
```
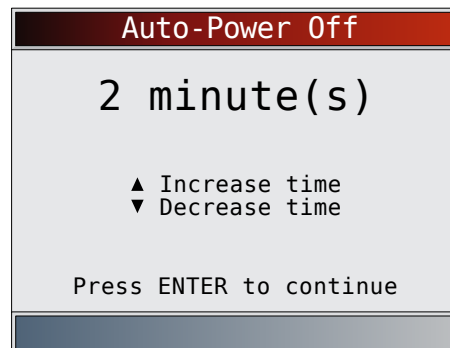
3. Save **Auto-Power Off** time.
   - Press ENTER.

Quick Test

Quick Test is a feature of the tool that occurs the first time the tool establishes communication with the vehicle after vehicle selection. Quick Test will display the results of I/M Monitors (Global Automotive OBDII and HD OBDII only) and Read Codes.

From **System Setup menu**:
1. Select **Quick Test**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Quick Test** is highlighted.
   - Press ENTER.

```
        System Setup
 English/Metric
 Auto-Power Off
 Quick Test
 Print Header
 Language Setup
 Long PID/SPN Names
 Pre-Trigger Setup
 Tool Information
 Display Test
                    ⬇
```
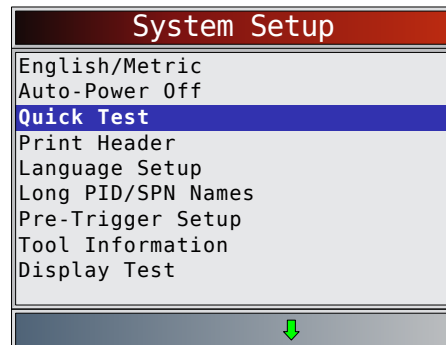
2. Select desired **Quick Test** choice.
   - Use the ▲ **UP** and ▼ **DOWN** keys until desired choice is highlighted.

- Select **Read All Codes** to view results of all codes. This selection is enabled by default.

```
        Quick Test
Disabled
Read All Codes
```

3. Save **Quick Test** setting.
   - Press ENTER.

Print Header

Print Header selection allows the user to turn off the scan tool printing the currently-selected vehicle prior to the retrieved vehicle data when selecting items from the **Print Data** menu.

From **System Setup menu**:

1. Select **Print Header**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Print Header** is highlighted.
   - Press ENTER.

```
        System Setup
English/Metric
Auto-Power Off
Quick Test
Print Header
Language Setup
Long PID/SPN Names
Pre-Trigger Setup
Tool Information
Display Test
                ⇩
```
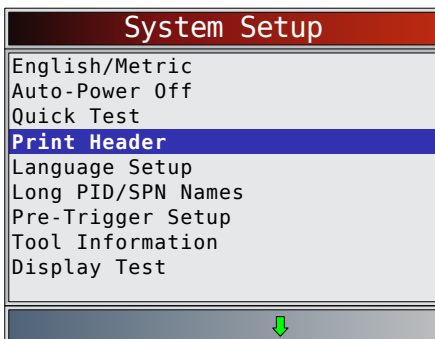
2. Select desired **Print Header** choice.
   - Use the ▲ **UP** and ▼ **DOWN** keys until desired choice is highlighted.

```
        Print Header
ON
OFF
```
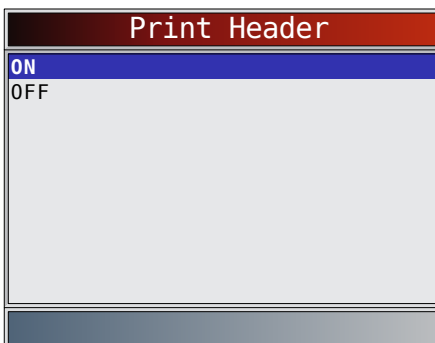
3. Save **Print Header** setting.
   - Press ENTER.

Language Setup

Language Setup selection allows the user to change the language used by the tool. English is the default language.

From **System Setup menu**:

1. Select **Language Setup**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Language Setup** is highlighted.
   - Press ENTER.

```
        System Setup
English/Metric
Auto-Power Off
Quick Test
Print Header
Language Setup
Long PID/SPN Names
Pre-Trigger Setup
Tool Information
Display Test
                ⇩
```
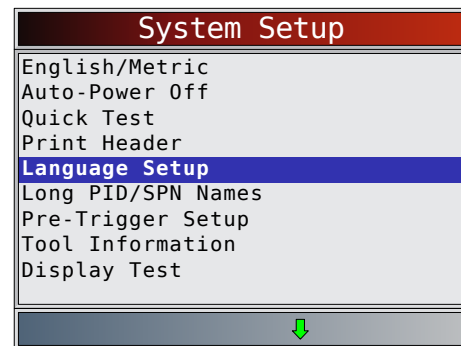
2. Select desired **Language Setup** choice.
   - Use the ▲ **UP** and ▼ **DOWN** keys until the desired language is highlighted.

```
        Language Setup
English
Español
Francais
```
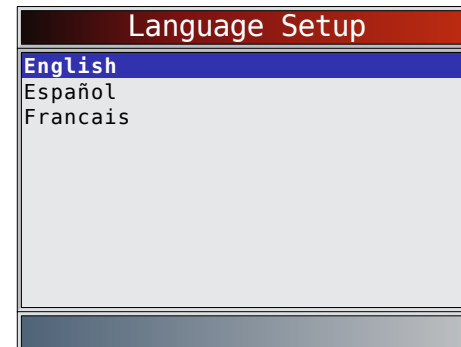
3. Save **Language Setup** setting.
   - Press ENTER.

NOTE: When Spanish or French translation is not known, English will be shown.

Long PID/SPN Names

Long PID/SPN Names allows the user to enable/disable the tool scrolling the complete PID name on the bottom line of the display while viewing Live Data or viewing Freeze Data. From **System Setup menu**:

1. Select **Long PID/SPN Names**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Long PID/SPN Names** is highlighted.
   - Press ENTER.

```
          System Setup
English/Metric
Auto-Power Off
Quick Test
Print Header
Language Setup
Long PID/SPN Names
Pre-Trigger Setup
Tool Information
Display Test
                         ⬇
```
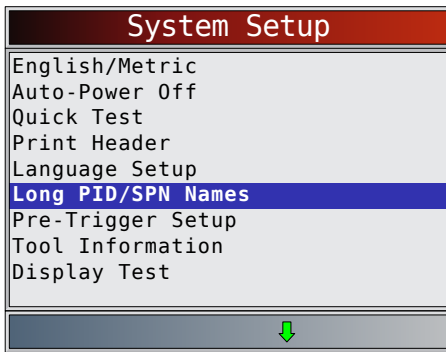
2. Select **ON** or **OFF**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until the desired option is highlighted.
   - Press ENTER.

```
        Long PID/SPN Names
ON
OFF
```
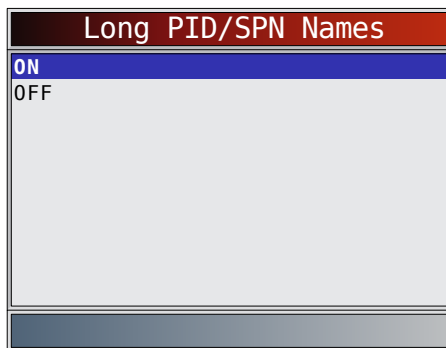
3. Save **Long PID/SPN Names** setting.
   - Press ENTER.

Pre-Trigger Setup

This function is used to configure how many Pre-Trigger frames are stored prior to beginning a recording. Pre-Trigger frames are the negative frames when you are playing back a recording.

From **System Setup** screen:

1. Select **Pre-Trigger Setup**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Pre-Trigger Setup** is highlighted.
   - Press ENTER.

```
          System Setup
English/Metric
Auto-Power Off
Quick Test
Print Header
Language Setup
Long PID/SPN Names
Pre-Trigger Setup
Tool Information
Display Test
                         ⬇
```
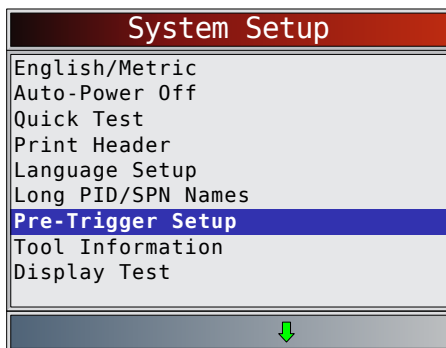
2. Increase or Decrease Pre-Trigger Frames.
   - Use the ▲ **UP** key to increase frames.
   - Use the ▼ **DOWN** key to decrease frames.
   - Press ENTER.

```
        Pre-Trigger Frames

        5 frame(s)

        ▲ Increase frame

        ▼ Decrease frame


     Press ENTER to continue
```
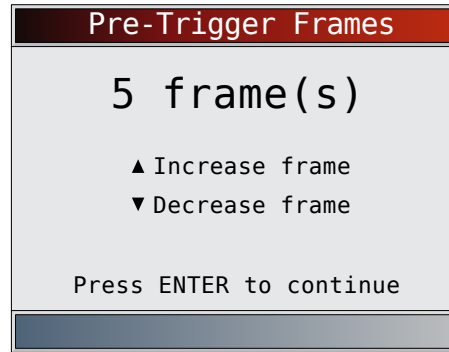
3. Save **Pre-Trigger** frames setting.
   - Press ENTER.

Tool Information

Tool Information allows the user to view specific tool information that may be needed when contacting customer service.

From **System Setup menu**:

1. Select **Tool Information**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Tool Information** is highlighted.
   - Press ENTER.

```
          System Setup
English/Metric
Auto-Power Off
Quick Test
Print Header
Language Setup
Long PID/SPN Names
Pre-Trigger Setup
Tool Information
Display Test
                         ⬇
```
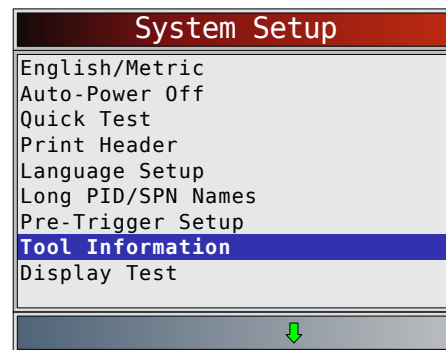
2. View information.
   - Serial Number (Serial No:)
   - Software ID (SW ID:)
   - Hardware Version (HW Ver:)
   - Boot Version (Boot Ver:)
   - Product ID (Prod ID:)
   - Board ID (Board ID:)
   - Burn Date (Burn Date:)
   - Burn Location (Burn Loc:)

```
         Tool Information
Serial No              1284168
SW ID                     5126
HW Ver                      01
Boot Ver                    02
Prod ID                     21
Board ID                    33
Burn Date             12/04/14
Burn Loc                    04
```
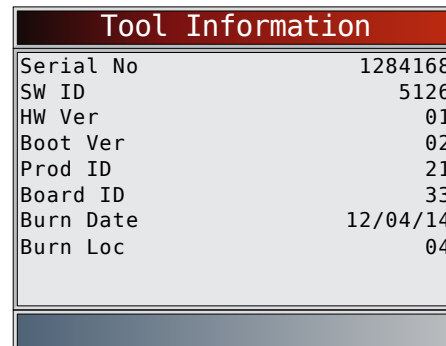
3. Record **Tool Information**.

- Space is provided inside the front cover of this manual to write down the scan tool information.
4. Return to **System Setup** menu.
   - Press [BACK]

   or

   - Press [ENTER].

Display Test

The **Display Test** is used to check the display. The test fills every pixel of the display with a solid color.

From **System Setup menu**:

1. Select **Display Test**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Display Test** is highlighted.
   - Press [ENTER].

```
┌─────────────────────────────┐
│        System Setup         │
├─────────────────────────────┤
│ English/Metric              │
│ Auto-Power Off              │
│ Quick Test                  │
│ Print Header                │
│ Language Setup              │
│ Long PID/SPN Names          │
│ Pre-Trigger Setup           │
│ Tool Information            │
│ Display Test                │
├─────────────────────────────┤
│                    ⇩        │
└─────────────────────────────┘
```
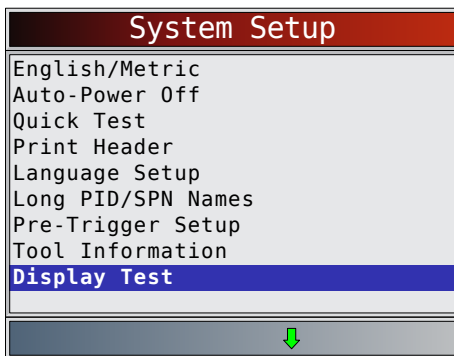
2. Start **Display Test**.
   - Press [ENTER].
3. Look for missing spots.
   - The first screen displayed says, "Check for missing spots in the display."

```
┌─────────────────────────────┐
│        Display Test         │
├─────────────────────────────┤
│             🛈               │
│                             │
│   Check for spots in the    │
│           display           │
│                             │
│     Press BACK to exit      │
├─────────────────────────────┤
│                             │
└─────────────────────────────┘
```

- Solid red, green, and blue screens are displayed.
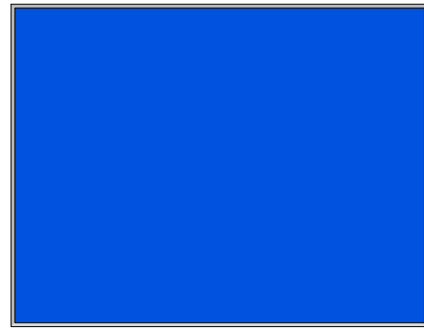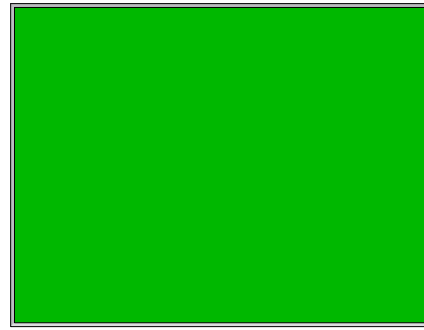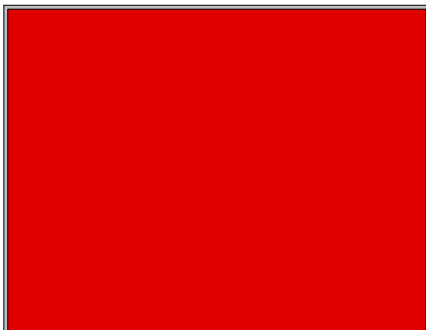
- These four screens will continue in succession until [BACK] is pressed.
4. Press [BACK] to exit the test and return to the **System Setup** menu.

Keypad Test

The **Keypad Test** is used to verify that the keys are working correctly.

From **System Setup menu**:

1. Select **Keypad Test**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Keypad Test** is highlighted.
   - Press [ENTER].

```
┌─────────────────────────────┐
│        System Setup         │
├─────────────────────────────┤
│ Quick Test                  │
│ Print Header                │
│ Language Setup              │
│ Long PID/SPN Names          │
│ Pre-Trigger Setup           │
│ Tool Information            │
│ Display Test                │
│ Keypad Test                 │
│ Memory Test                 │
├─────────────────────────────┤
│          ⇧         ⇩        │
└─────────────────────────────┘
```
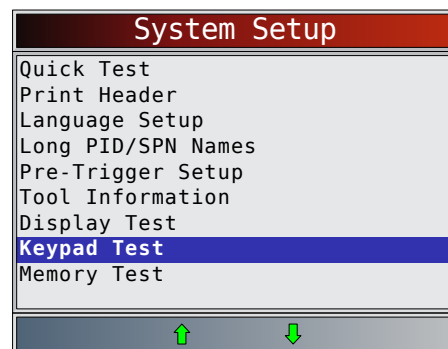
2. Press a key.
   - Key name or scroll direction should inverse colors on display.
   - [BACK] will return the tool to the **System Setup** screen. If **System Setup** screen does not return, [BACK] is not working correctly.

```
┌─────────────────────────────────┐
│         Keypad Test             │
│                                 │
│    ┌────┐  ┌───┐  ┌──────┐       │
│    │ F1 │  │ ▲ │  │  F2  │       │
│    └────┘  └───┘  └──────┘       │
│   ┌────┐          ┌──────┐       │
│   │ ◄  │          │  ►   │       │
│   │BACK│          │ENTER │       │
│   └────┘  ┌───┐   └──────┘       │
│           │ ▼ │                  │
│           └───┘                  │
│           ┌───┐                  │
│           │ ⏻ │                  │
│           └───┘                  │
│                                 │
│       Press BACK to exit        │
│                                 │
└─────────────────────────────────┘
```

Memory Test

The **Memory Test** will test RAM and Flash ROM. Run the **Memory Test** if the tool has trouble:

• Playing back recorded data.
• Displaying trouble code definitions.

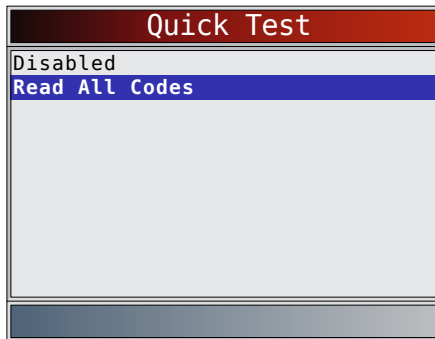From **System Setup menu**:

1. Select **Memory Test**.
   • Use the ▲ **UP** and ▼ **DOWN** keys until **Memory Test** is highlighted.
   • Press `ENTER`.

```
┌─────────────────────────────────┐
│         System Setup            │
│ Print Header                    │
│ Language Setup                  │
│ Long PID/SPN Names              │
│ Pre-Trigger Setup               │
│ Tool Information                │
│ Display Test                    │
│ Keypad Test                     │
│ Memory Test                     │
│ Program Mode                    │
│                                 │
│              ⬆                  │
└─────────────────────────────────┘
```
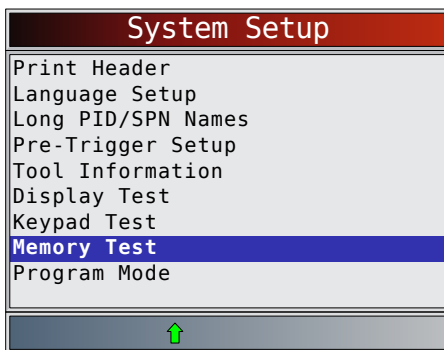
• **Memory Test** may take several minutes to complete.
• **Memory Test** results display:
   – If no problems were detected, then "Pass" is displayed.
   – If RAM fails, an error message is shown.
   – If FLASH fails, a checksum is shown.

```
┌─────────────────────────────────┐
│         Memory Test             │
│ INT RAM               Passed    │
│ INT FLASH               10ca    │
│                                 │
│                                 │
│                                 │
│       Press BACK to exit        │
│                                 │
└─────────────────────────────────┘
```
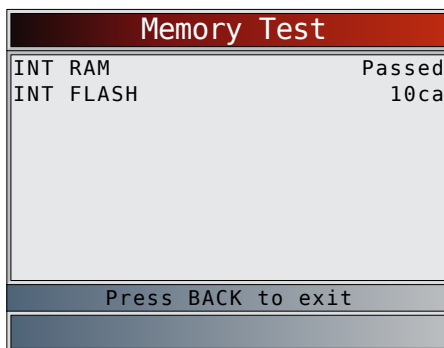
2. Return to **System Setup** menu.
   • Press `BACK`.

Program Mode

The **Program Mode** is used for updating the scan tool. Instructions are provided with upgrades. Refer to "3.2 Download Scanning Suite" on page 7.

```
┌─────────────────────────────────┐
│         System Setup            │
│ Print Header                    │
│ Language Setup                  │
│ Long PID/SPN Names              │
│ Pre-Trigger Setup               │
│ Tool Information                │
│ Display Test                    │
│ Keypad Test                     │
│ Memory Test                     │
│ Program Mode                    │
│                                 │
│              ⬆                  │
└─────────────────────────────────┘
```

```
┌─────────────────────────────────┐
│                                 │
│         PROGRAM MODE            │
│        See User Manual          │
│                                 │
│                                 │
│       Connect Tool to PC        │
│         with USB Cable          │
│                                 │
│                                 │
└─────────────────────────────────┘
```
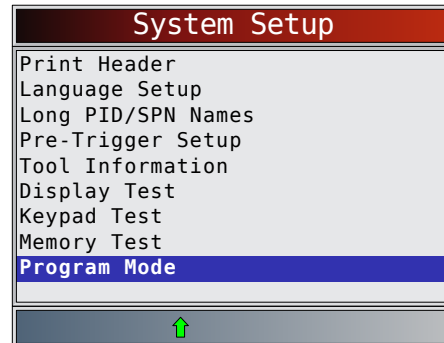
• If the **Program Mode** is entered, `BACK` is not operational. The tool must be powered off to exit **Program Mode** and then restarted to continue.

4.6 Vehicle-Specific Features

Review Data

The **Review Data** function allows the user to view the information from the previous vehicle tested. The scan tool can be powered from vehicle, battery power or PC using USB to use the **Review Data** function.

1. Select **Review Data**.
   • Use the ▲ **UP** and ▼ **DOWN** keys until **Review Data** is highlighted.
   • Press `ENTER`.

```
┌─────────────────────────────────┐
│          Main Menu              │
│ HD SAE (J1708/J1587, J1939)     │
│ HD OBD (ISO 15765-4)            │
│ Global Automotive OBDII         │
│ Review Data                     │
│ Print Data                      │
│ System Setup                    │
│                                 │
│                                 │
└─────────────────────────────────┘
```
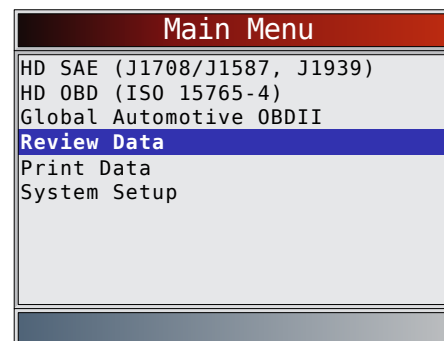
2. Select item whose data you wish to review.
   • The **Review Data** menu shows a checkmark next to the item(s) that has data.

- If there is not a checkmark next to the item, then this item can't be selected until the appropriate function is run from the **Heavy Duty Standard** menu, **HD OBD** menu or **Global Automotive OBDII** menu.
- Only one function, **Recording**, needs detailed instructions.

```
┌──────────────────────────────────┐
│          Review Data             │
├──────────────────────────────────┤
│ ✓I/M Monitors                    │
│ ✓DTCs (Codes)                    │
│ ✓State OBD Check                 │
│ ✓Recording                       │
│  View Freeze Data                │
│ ✓O2 Monitor Tests                │
│ ✓Diagnostic Monitor Tests        │
│  Vehicle Information             │
│  Modules Present                 │
│                                  │
└──────────────────────────────────┘
```
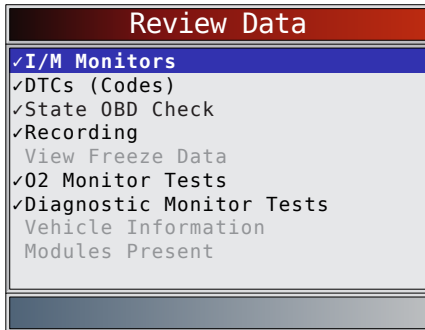
Recording

The **Recording** function is used to play back a recording. This function is very similar to **View Data**. The only difference is that **View Data** is real-time viewing of PIDs, while **Recording** is a viewing of previously recorded PIDs.
From the **Review Data** menu:

1. Select **Recording**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Recording** is highlighted.
   - The tool can keep up to 5 recordings per vehicle. If the tool has more than one recording, select the recording you wish to playback.
   - Press `ENTER`.
2. Select **Playback Recording**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Playback Recording** is highlighted.
   - Press `ENTER`.

```
┌──────────────────────────────────┐
│        Playback Options          │
├──────────────────────────────────┤
│ Playback Recording               │
│ Long PID/SPN Names               │
│ English/Metric                   │
│                                  │
│                                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```

- The recording has frame number and timestamp (in seconds).
  - Negative frames and timestamps indicate data recorded before trigger event.
  - Positive frames and timestamps indicate data recorded after trigger event.
  - Use the ▲ **UP** and ▼ **DOWN** keys to view recorded PID data within each frame.
  - Use the ◀ **LEFT** and ▶ **RIGHT** keys to scroll back and forth through frames.

```
┌──────────────────────────────────┐
│ ABSLT TPS(%)               0.0   │
│ CALC LOAD(%)               3.5   │
│ COOLANT(°F)                 95   │
│ ENG SPEED(RPM)             692   │
│ FUEL SYS 1                OPEN   │
│ FUEL SYS 2                OPEN   │
│ IAT(°F)                     75   │
│ IGN ADV(°)                 4.5   │
│ LT FTRM1(%)                3.1   │
├──────────────────────────────────┤
│ Frame: 0          Time: 0.0      │
│ Throttle position                │
├──────────────────────────────────┤
│            📈 ⬇                   │
└──────────────────────────────────┘
```
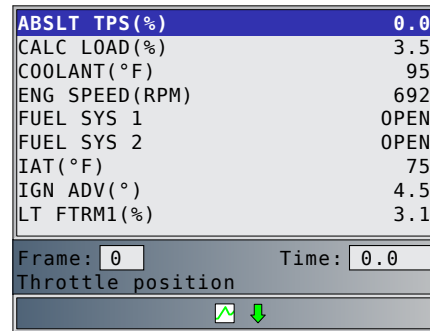
- If graphing is available for selected PID, the "📈" icon is located on the side of the screen.
- Press `ENTER` to select PIDS to graph.
  - Use the ▲ **UP** and ▼ **DOWN** keys to highlight the second PID to graph and then press the ▶ **RIGHT** key to select. A maximum of two PIDs can be graphed. Press `ENTER` to see graph.

```
┌──────────────────────────────────┐
│      Select PIDs to Graph        │
├──────────────────────────────────┤
│  ABSLT TPS(%)                    │
│ ✓CALC LOAD(%)                    │
│  COOLANT(°F)                     │
│  ENG SPEED(RPM)                  │
│  IAT(°F)                         │
│  MAF(LB/M)                       │
│  MAP("HG)                        │
│  VEH SPEED(MPH)                  │
├──────────────────────────────────┤
│ Calculated Engine Load           │
└──────────────────────────────────┘
```
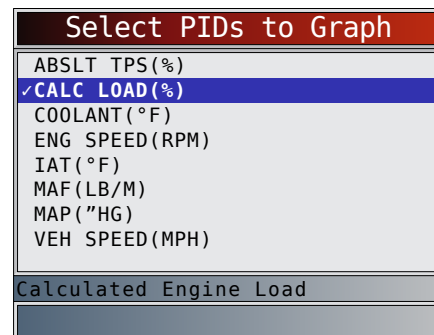
- The triangle below the graph indicates the position of the frame in the graph.
  - Use the ◀ **LEFT** and ▶ **RIGHT** keys to scroll back and forth through graph.
  - Use the ▲ **UP** and ▼ **DOWN** keys to toggle back and forth between PIDs.

```
┌──────────────────────────────────┐
│ CALC LOAD(%)             19.2    │
├──────────────────────────────────┤
│ 19.4                             │
│      ┌─┐  ╱╲╱╲  ╱╲               │
│   ╱╲╱ └─┘      ╱  ╲              │
│  ╱                               │
│                                  │
│ 17.5          ▲                  │
├──────────────────────────────────┤
│ Frame: 21         Time: 26.8     │
└──────────────────────────────────┘
```
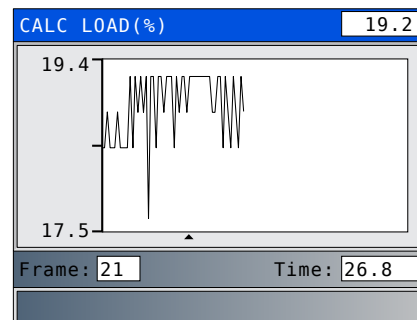
- Different vehicles communicate at different speeds and support a different number of PIDs. Therefore, the maximum number of frames that can be recorded varies.
3. Return to **Review Data** menu.

- Press BACK.

Print Data

The **Print Data** function allows the printing of diagnostic information stored in the scan tool.

- The scan tool's internal battery power can be used to print data.
- Use the **Print Header** function to turn ON/OFF printing vehicle information prior to printing data.
- Make sure you have preciously installed the PC software in Download Scanning Suite.
- Launch Scanning Suite and then start printing application.
- Follow all instructions on PC.

1. Select **Print Data**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Print Data** is highlighted.
   - Press ENTER.

```
           Main Menu
   Vehicle Diagnostics
   Acronyms
   Review Data
   Print Data
   Code Lookup
   System Setup
```

```
           Print Data

              (i)

   Launch PC printing software
          application.

   Press ENTER to continue
```
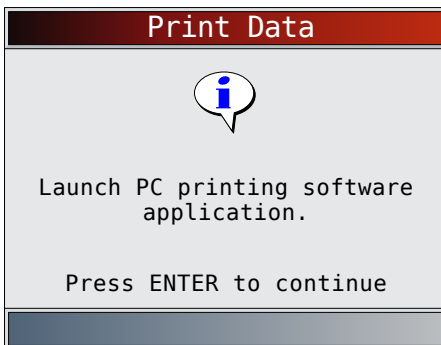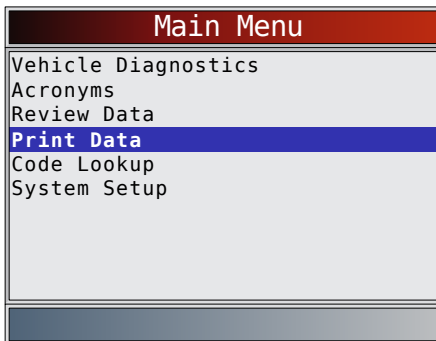
- On the **Print Data** menu, **Print All** prints all data collected by the scan tool.

```
           Print Data
   ✓Print All
   ✓I/M Monitiors
   ✓DTCs (Codes)
    State OBD Check
    Recording
    View Freeze Data
    O2 Monitor Tests
    Diagnostic Monitor Tests
    Vehicle Information
                ↓
```
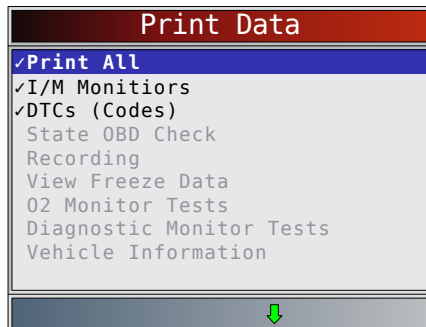
- When printing a recording, Start frame and end frame need to be defined.

- This menu contains up to 5 previous vehicles, so select which vehicle you wish to print data.

2. Select **Data To Be Printed**.
   - Use the ▲ **UP** and ▼ **DOWN** keys.
   - Press ENTER.
   - The **Print Data** menu shows a checkmark next to the items that have data.
   - If there isn't a checkmark next to the item, then this item can't be selected until the appropriate function is run from the Diagnostic Menu.

3. Return to **Select Print Data** screen.
   - Press BACK.

4.7   Locating Data Link Connector

- The Data Link Connector (DLC) is usually located under the driver's side dash for OBD II Vehicles, Deutsch 6-pin, and Deutsch 9-pin HD Vehicles.
- For more information on OBD II DLC locations, go to http://www.obdclearinghouse.com.

NOTE: When using the OBD II, 9-pin, or 6-pin cables, power to the tool generally comes from the vehicle. If the tool does not power-up, use the cigarette cable to power-up the tool.

4.8   Connect the Tool

1. Connect extension cable to the tool.
2. Connect the appropriate data link cable to the extension cable. This can either be the J1962 Type B cable, Deutsch 6-pin cable, or the Deutsch 9-pin cable depending on the vehicle. **Only use the cables included in your kit**.
3. Connect data link connector to vehicle.
4. The scan tool should power up. If the tool does not power up, make sure the cable is connected securely.
5. Connect cigarette lighter cable if the scan tool did not power up.
6. Place ignition key in the ON position and have the engine OFF.
7. Select **HD SAE (J1708/J1587, J1939), HD OBD (ISO 15765-4)** or **Global Automotive OBDII** from the **Main Menu**.
8. The required cables screen identifies which DLC cables to use for your selection.
9. If Quick Test is enabled, the Scan Tool runs the Quick Test and displays the results. Press ENTER or BACK.
10.   The Scan Tool shows **Diagnostic Menu**.

IMPORTANT: Make sure you have correctly selected your vehicle. Incorrect vehicle identification can produce unexpected test results.

4.9   Vehicle Selection

From the **Main Menu** select the vehicle to diagnose. Select **HD SAE (J1708/J1587, J1939)** if the truck vehicle supports either J1708/J1587, J1939. Select **HD OBD (ISO 15765-4)** if the truck supports ISO 15765-4 using the J1962 connector. Select **Global Automotive OBDII** if the vehicle supports OBDII as identified on the Vehicle

Emissions Control Information decal located under the vehicles hood.

From the **Main Menu**:

1. Select **HD SAE (J1708/J1587, J1939), HD OBD (ISO 15765-4)** or **Global Automotive OBDII**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **HD SAE (J1708/J1587, J1939)** is highlighted.
   - Press ⬛ENTER⬛.

```
           Main Menu
HD SAE (J1708/J1587, J1939)
HD OBD (ISO 15765-4)
Global Automotive OBDII
Review Data
Print Data
System Setup
```
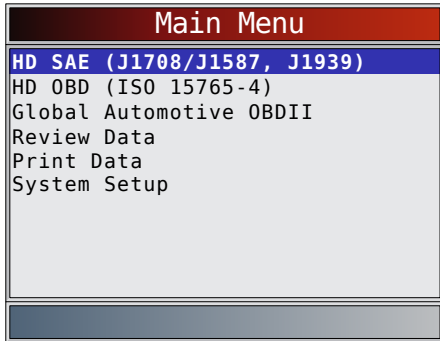
2. Use the ◀ **LEFT** and ▶ **RIGHT** keys to select Yes.
   - The scan tool keeps diagnostic data for only the last vehicle. This data is cleared by selecting Yes.
   - Press ⬛ENTER⬛.

```
        Heavy Duty Standard
               ?

    This selection requires
   clearing of diagnostic data
     for the previous vehicle.

      Do you want to continue?

         Yes          No
```
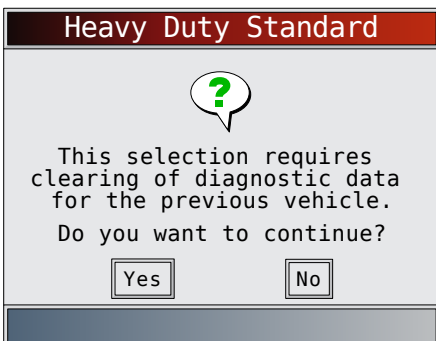
3. Make sure the proper diagnostic cable is connected per screen instructions.
   - Confirm proper scan tool cable part number is connected.
   - Press **F1** **F1** to toggle Demo mode on or off.
   - Press ⬛ENTER⬛.

IMPORTANT

To display demonstration data, press the **F1** **F1** key. A checkmark in the demo button indicates Demo function is on. Press the key again to turn the function off. When in demo mode, the scan tool doesn't communicate with a vehicle but will instead display demonstration data.

4. A **Turn Key Off** screen will display.

```
          Turn Key Off
               i

    Please turn the key off for
   10 seconds then turn the key
               on.

       Press ENTER to continue
```

- Turn key off for 10 seconds.
- Turn key on.
- Press ⬛ENTER⬛.
- If vehicle power is not detected, a screen is shown to verify tool connection (non-demo mode).

```
         Vehicle Required
               i

     Please verify the tool is
    connected to the vehicle with
     the ignition key turned on.

       Press ENTER to continue
```

5 Heavy Duty Standard Diagnostics

Heavy Duty Standard Diagnostics is available by selecting **Heavy Duty Standard** from the **Main Menu**. This section applies to all heavy duty SAE J1708/J1587 & J1939 compliant vehicles.

The first time the scan tool links to the vehicle, the communication protocol is automatically detected, and is used until the scan tool is turned off or another vehicle is diagnosed.

If an error message displays, make sure the scan tool connector is attached and the ignition key is on. Cycle ignition key to OFF for 10 seconds, then ON. This may be required to reset computer. If required, select YES to try again. If problem still exists, "7.1 Error Messages" on page 41.

The scan tool keeps data received from the previous vehicle selected until any of the following occurs:
- A new vehicle is selected.
- Scan tool is flash programmed to update software.

The Heavy Duty Standard Menu has the following selections:
- Read Codes
- Erase Codes
- View Data
- Record Data
- Module Information

- Vehicle Information
- Review Data
- Print Data
- System Setup

5.1   Read Codes

The Read Codes function allows the scan tool to read the DTCs from the vehicle's control modules. DTCs are used to help determine the cause of a problem or problems with a vehicle.

Read Codes can be done with the key on engine off (KOEO) or with the key on engine running (KOER). From the **Heavy Duty Standard** menu:

1. Select **Read Codes**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Read Codes** is highlighted.
   - Press ENTER .

```
┌─────────────────────────────────┐
│ Global Automotive OBDII         │
├─────────────────────────────────┤
│ I/M Monitors                    │
│ Read Codes                      │
│ Erase Codes                     │
│ MIL Status                      │
│ State OBD Check                 │
│ View Data                       │
│ Record Data                     │
│ View Freeze Data                │
│ Drive Cycle Monitor             │
│                                 │
│               ⬇                 │
└─────────────────────────────────┘
```

2. A module menu is displayed.
   - Use the ▲ **UP** and ▼ **DOWN** keys until the designed choice is highlighted.
   - The menu is divided into two sections: a J1587 Module section and a J1939 Module section.
   - The bottom line displays information for the highlighted module: Protocol, module address (Module Identifier=MID and Source Address = SA) and full module description.

```
┌─────────────────────────────────┐
│         Select Module           │
├─────────────────────────────────┤
│ All Listed Modules              │
│ J1587 Modules                   │
│   Engine #1                     │
│   Transmission                  │
│ J1939 Modules                   │
│   Engine #1                     │
│   Transmission #1               │
│                                 │
│                                 │
│ J1587 MID: 128 Engine #1        │
│               ⬇                 │
└─────────────────────────────────┘
```
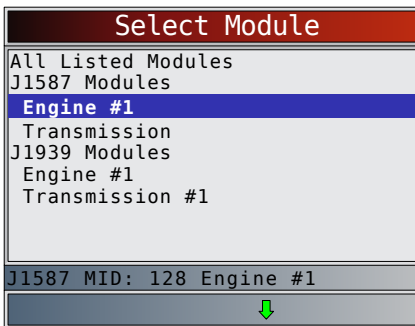
- If All Listed Modules is selected from the Select Module menu, all of the codes will be displayed as if all menu items were selected individually.
  - If DTCs are present, a message displays identifying the DTC definition source.
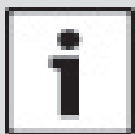
IMPORTANT
Code definitions are defined by SAE J1587 & J1939. OEM definitions may differ. Please refer to OEM Service Manuals for confirmation.

  - If no DTCs are present, a message stating "No codes found" is displayed.

```
┌─────────────────────────────────┐
│         Read Codes              │
├─────────────────────────────────┤
│                                 │
│              (i)                │
│                                 │
│                                 │
│         No codes found          │
│                                 │
│                                 │
│     Press ENTER to continue     │
│                                 │
└─────────────────────────────────┘
```
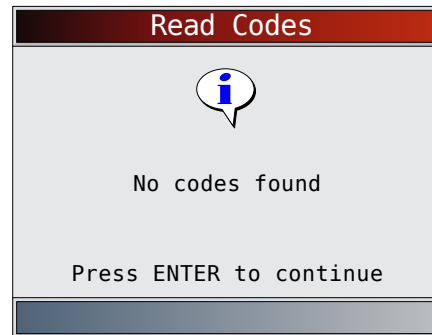
3. View and write down the DTCs.
   - Use the ▲ **UP** and ▼ **DOWN** keys to scroll thru all DTCs.
   This screen indicates where the Read Codes information is located.

```
┌─────────────────────────────────┐
│ DTC:#                      X/Y   │
│ FMI:#               module: #   │
│        Module Name              │
│                                 │
│ DTC Description,                │
│ FMI Description                 │
│                                 │
│ DTC Type           Count:  #   │
│               ⬇                 │
│ ┌──────────────┐ ┌───────────┐  │
│ │ Lamp Status  │ │  Erase    │  │
│ └──────────────┘ └───────────┘  │
└─────────────────────────────────┘
```
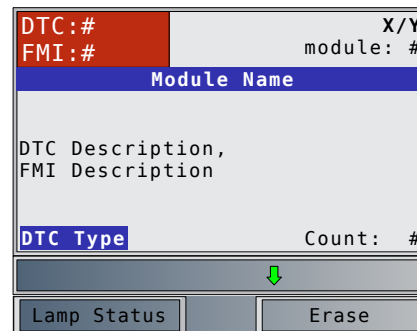
- DTC # - Number of the trouble code found. For J1587 modules, this will either be SID for Subsystem Identification or PID for Parameter Identification. For J1939 modules, this will be SPN for Suspect Parameter Number.
- FMI # - Number of the Failure Mode Identifier.
- X/Y - Indication that code x of y is being viewed where x is the code being viewed of the total y.
- module: # - Address of module reporting DTC. For J1587 modules, this will be MID for Module Identifier. For J1939 modules, this will be SA for Source Address.
- Module Name - description of the module.
- DTC Description - This area is reserved for the text description of the DTC #. It is either the description for the SPN, SID or PID depending on the module selected and the trouble code.
- FMI Description - This is appended to the DTC description and is the description of the Failure Mode Indicator.
- DTC Type - This area is reserved for providing additional information about the DTC. If Active, the DTC was occurring at the time of scan tool request. If Inactive, the DTC was not occurring at the time of the request.
- Count # - This field is optional. This is the number of occurrences this DTC has been detected.

Examples of Read Codes information screens follow.

In this example, the J1587 Engine #1 module, Module Identifier (MID) 128 is reporting a DTC. It was Active at the time DTCs were read.

```
SID:6                          1/6
FMI:2                    MID: 128
        Engine #1

Injector Cylinder #6 - Data erratic,
intermittent, or incorrect

ACTIVE

                 ⬇

Lamp Status            Erase
```
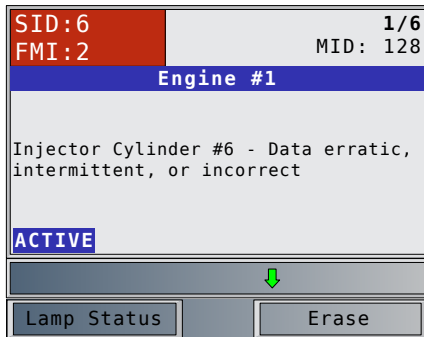
In this example, the J1939 Engine #1 module, Source Address (SA) 0 is reporting a DTC. It was Active at the time DTCs were read. This specific SPN/FMI has only occurred one time.

```
SID:91                        1/23
FMI:4                     SA:  0
        Engine #1

Accelerator Pedal Position 1 - Voltage
Below Normal, Or Shorted To Low Source

ACTIVE                   Count:  1

                 ⬇

Lamp Status            Erase
```
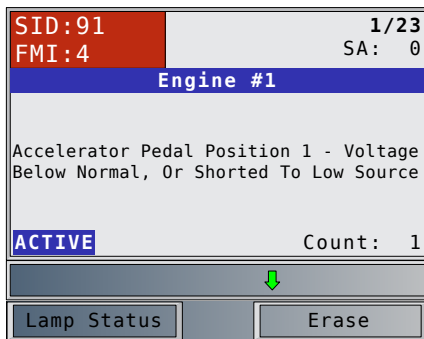
Lamp Status

Press the **F1** key while viewing a DTC to show the Lamp status for the module of the given DTC. Details of all possible Lamps is shown.

```
        Lamp Status

MIL:                  Unavailable
Red Stop:                      On
Amber Warning:                Off
Protect:                      Off




                 ⬇
```
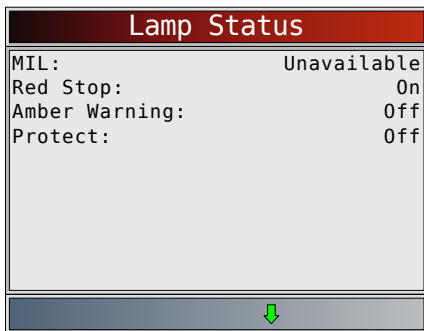
To return to the last DTC being reviewed, press **BACK**.

Erase

Press the **F2** key while viewing a DTC to jump to the Erase Codes screen. The distinction between erasing codes by pressing **F2** from **Read Codes** or selecting **Erase Codes** from the **Heavy Duty Standard** menu is that you can erase a specific DTC when starting from Read Codes. The DTC shown when the **F2** key is pressed can be erased. See "5.2 Erase Codes" on page 21.

5.2 Erase Codes

The Erase Codes function deletes DTCs from vehicle's control module(s). Perform this function key on engine off (KOEO). Do not start the engine.

The Erase Codes function may also erase diagnostic information pertaining to the specified DTC. Perform Erase Codes function only after systems have been checked completely and DTCs have been written down. After servicing the vehicle, erase stored DTCs and verify no codes have returned. If a DTC returns, problem has not been fixed or other faults are present.

From **Heavy Duty Standard** menu:

1. a. Select **Erase Codes**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Erase Codes** is highlighted.
   - Press **ENTER**.

```
     Heavy Duty Standard

Read Codes
Erase Codes
View Data
Record Data
Module Information
Vehicle Information
Review Data
Print Data
System Setup
```
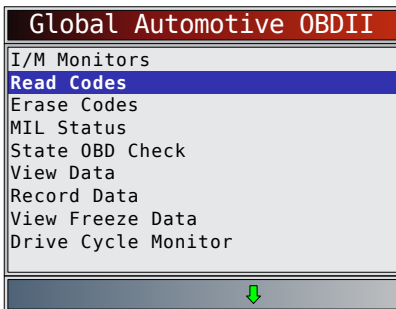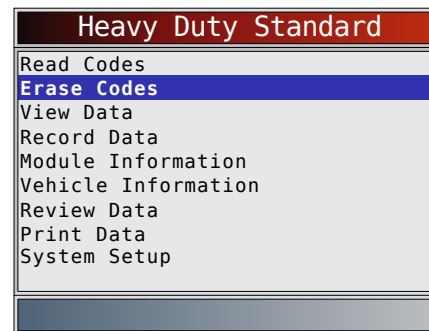
OR

From Read Codes DTC Description screen:

1. b. Press **F2, Erase**.

```
SID:91                        1/23
FMI:4                     SA:  0
        Engine #1

Accelerator Pedal Position 1 - Voltage
Below Normal, Or Shorted To Low Source

ACTIVE                   Count:  1

                 ⬇

Lamp Status            Erase
```

```
        Erase Codes

              ?

     Are you sure you want to
   erase diagnostic results and
              codes?

      Yes              No
```
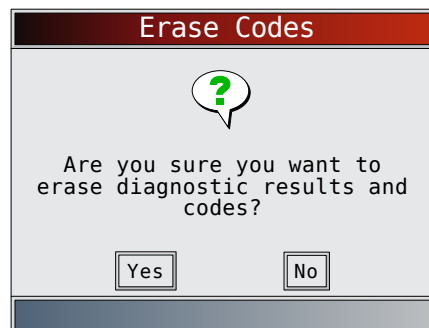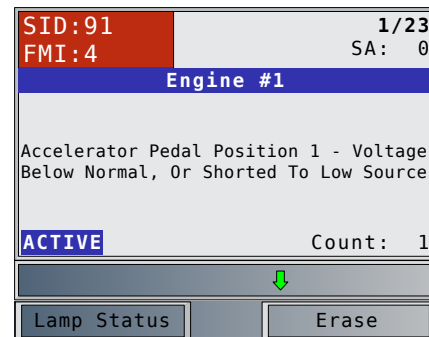
2. Select **YES** to erase diagnostic results and codes.
   - Use the ◄ **LEFT** arrow key.
   - Press **ENTER**.
   - If diagnostic results and codes are not to be erased select **NO** and press **ENTER**.

- Selecting **NO** displays a "Command cancelled" message.

```
┌─────────────────────────────┐
│        Erase Codes          │
│                             │
│             (i)             │
│                             │
│                             │
│      Command canceled       │
│                             │
│    Press ENTER to continue  │
│                             │
│                             │
└─────────────────────────────┘
```
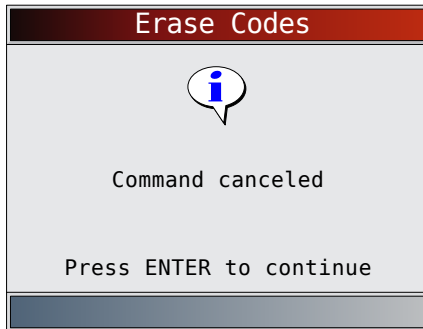
3. Turn the key on with the engine off.
   - Press ENTER.

```
┌─────────────────────────────┐
│        Erase Codes          │
│                             │
│             (i)             │
│                             │
│                             │
│  Turn key on with engine off.│
│                             │
│    Press ENTER to continue  │
│                             │
│                             │
└─────────────────────────────┘
```

4. A module menu is displayed.
   - Use the ▲ **UP** and ▼ **DOWN** keys until the designed choice is highlighted.
   - The menu is divided into two sections, a J1587 Module section and a J1939 Module section.
   - The bottom line displays information for the highlighted module: Protocol, module address (Module Identifier=MID and Source Address = SA) and full module description.

```
┌─────────────────────────────┐
│       Select Module         │
│ All Listed Modules          │
│ J1587 Modules               │
│  Engine #1                  │
│  Transmission               │
│ J1939 Modules               │
│  Engine #1                  │
│  Transmission #1            │
│                             │
│ J1587 MID: 128 Engine #1    │
│              ⬇              │
└─────────────────────────────┘
```
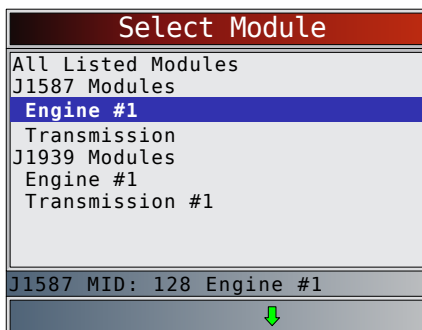
5. An erase menu is displayed.
   - Use the ▲ **UP** and ▼ **DOWN** keys until the desired erase operation is highlighted.
   - Select **Erase Specific Code (#)** to erase only the specific code #. This menu option is only available by pressing **F2** F2 from the Read Codes DTC Description Screen, not when selecting Erase Codes from the **Heavy Duty Standard** menu.
   - Select **Erase All Codes** to erase all Active and Inactive codes for the selected module.

- Select **Erase Inactive Codes** to erase only Inactive codes for the selected module.
- Select **Erase Active Codes** to erase only Active codes for the selected module.
- Press ENTER.

6. Observe the "Command sent" message is displayed.
   - Press ENTER.

```
┌─────────────────────────────┐
│        Erase Codes          │
│                             │
│             (i)             │
│                             │
│                             │
│       Command sent          │
│    Codes remaining:0        │
│                             │
│    Press ENTER to continue  │
│                             │
└─────────────────────────────┘
```

7. The Scan Tool may not be able to confirm codes were erased. This is true in the following cases:
   - The selected module didn't respond to a code request after erasing (to confirm codes were erased).
   - At least one code was read from the controller after erasing.
   - The module failed to respond to a request to erase codes.

In each of these cases, codes may not have been erased. It may be possible to erase codes if a Global erase is sent to all modules. However, this may erase codes from every module.

In these cases, the Scan Tool displays:

```
┌─────────────────────────────┐
│    Not All Codes Erased     │
│     To erase codes from the │
│   selected module, it may be│
│  necessary to send an erase to│
│          all modules.       │
│  Warning: This may erase DTCs on│
│        every module.        │
│                             │
│   Do you want to continue?  │
│     ┌─────┐       ┌─────┐   │
│     │ Yes │       │ No  │   │
│     └─────┘       └─────┘   │
│                             │
└─────────────────────────────┘
```
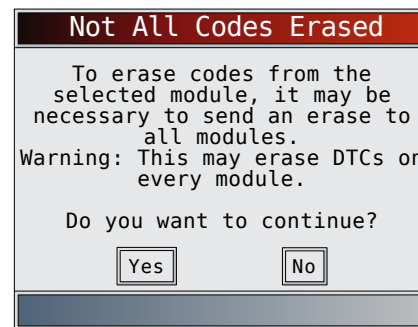
- Select Yes to attempt to erase codes from every module.
- Select No to skip.

5.3 View Data

The **View Data** function allows real time viewing of the vehicle's computer module's parameter identification (PID) data. As the computer monitors the vehicle, information is simultaneously transmitted to scan tool.

View Data allows the following items to be viewed on the scan tool:
- Sensor data
- Operation of switches
- Operation of solenoids
- Operation of relays

View Data can be shown as:
• Entire Data List
• Custom Data List

Apart from **Read Codes**, **View Data** is the most useful diagnostic function for isolating the cause of a vehicle operation problem.

From **Heavy Duty Standard** menu:

1. Select **View Data**.
   • Use the ▲ **UP** and ▼ **DOWN** keys until **View Data** is highlighted.
   • Press ENTER.

```
┌──────────────────────────────────┐
│     Heavy Duty Standard          │
├──────────────────────────────────┤
│ Read Codes                       │
│ Erase Codes                      │
│ View Data                        │
│ Record Data                      │
│ Module Information               │
│ Vehicle Information              │
│ Review Data                      │
│ Print Data                       │
│ System Setup                     │
│                                  │
└──────────────────────────────────┘
```
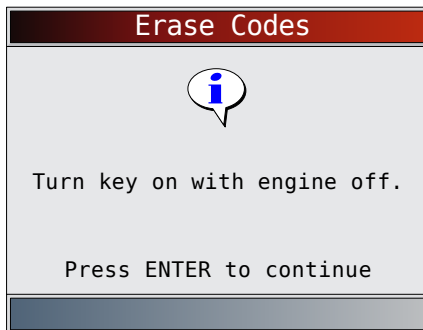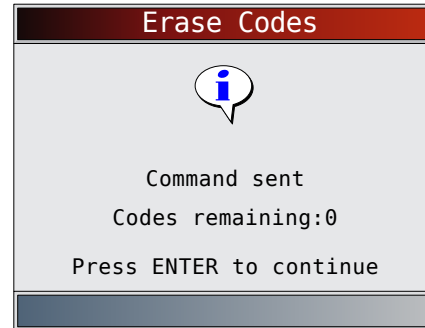
2. A module menu is displayed.
   • Use the ▲ **UP** and ▼ **DOWN** keys until the designed choice is highlighted.
   • Press ENTER.
   • The menu is divided into two sections, a J1587 Module section and a J1939 Module section depending on the modules supported (if available).
   • The bottom line displays information for the highlighted module: Protocol, module address (Module Identifier=MID and Source Address = SA) and full module description.

```
┌──────────────────────────────────┐
│         Select Module            │
├──────────────────────────────────┤
│ All Listed Modules               │
│ J1587 Modules                    │
│  Engine #1                       │
│  Transmission                    │
│ J1939 Modules                    │
│  Engine #1                       │
│  Transmission #1                 │
│                                  │
├──────────────────────────────────┤
│ J1587 MID: 128 Engine #1         │
│                ⬇                 │
└──────────────────────────────────┘
```
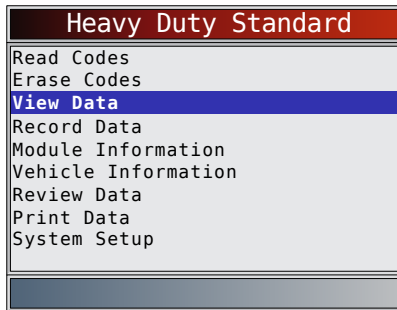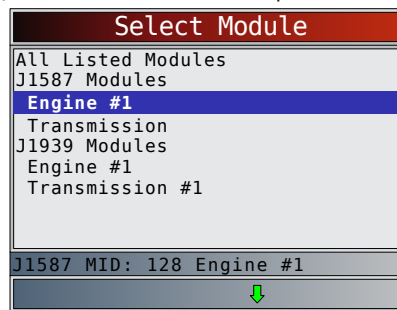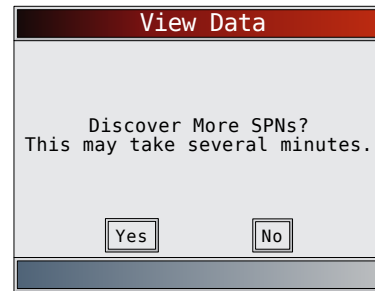
3. The Scan Tool identifies available data items (PIDs or SPNs) to view. There are two identification methods:
   • **The quick method**: The Scan Tool can take approximately 15 seconds to identify available PIDs/SPNs. It may not get every or any available PIDs/SPNs.
   • **The long method:** The Scan Tool could take up to 2 minutes to identify available PIDs/SPNs. This method is more thorough and will identify more PIDs/SPNs to view.

   If you are not prompted with the following screen, then the Scan Tool has completed identifying all PIDs/SPNs supported using the long method.

On the Screen below, select "No" to perform the quick methor or select "Yes" to perform the long method.

```
┌──────────────────────────────────┐
│          View Data               │
├──────────────────────────────────┤
│                                  │
│       Discover More SPNs?        │
│   This may take several minutes. │
│                                  │
│     ┌─────┐        ┌────┐        │
│     │ Yes │        │ No │        │
│     └─────┘        └────┘        │
│                                  │
└──────────────────────────────────┘
```

4. Observe while the scan tool validates PID MAP.
   • PID MAP validation is the tool asking the vehicle which PIDs are supported. Refer to "9 Appendix B—Glossary" on page 45 for abbreviations.

View Entire List

View Entire List shows all supported PID data for the vehicle being tested.

From **Select Data to View** menu:

1. Select **Entire Data List**.
   • Use the ▲ **UP** and ▼ **DOWN** keys until **Entire Data List** is highlighted.
   • Press ENTER.

```
┌──────────────────────────────────┐
│      Select Data to View         │
├──────────────────────────────────┤
│ Entire Data List                 │
│ Custom Data List                 │
│ Long PID/SPN Names               │
│ English/Metric                   │
│                                  │
│                                  │
└──────────────────────────────────┘
```
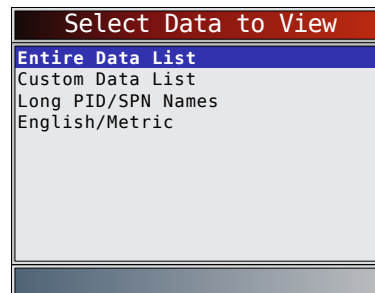
2. View PIDs on scan tool.
   • Use the ▲ **UP** and ▼ **DOWN** keys.
   • Refer to "9   Appendix B—Glossary" on page 45.

```
┌──────────────────────────────────┐
│ Eng ECU Temp(°F)         67.50   │
│ Est Perc Fan Spd(%)      29.60   │
│ EGR Valve #1 Pos(%)      37.50   │
│ PctAccelPedalPos3(%)     15.20   │
│ Throt Pos (%)            31.20   │
│ Eng Intercool Temp(°F)   86.00   │
│ Road Spd  (mph)          34.01   │
│ Pct Eng Load (%)         45.50   │
│ Eng Clnt Temp(°F)        86.00   │
│ Brake Sys AirPressEmg       ON   │
│ Brake Sys AirPressPri      OFF   │
│ Brake Sys AirPressSec      OFF   │
├──────────────────────────────────┤
│ ENGINE ECU TEMPERATURE           │
│            📈⬇                   │
└──────────────────────────────────┘
```

If Long PID/SPN Names is turned ON, the expanded text for the PID will scroll on the bottom line of display. Refer to "Long PID/SPN Names" on page 13.

If the 📈 icon displays while a PID is selected, press ENTER to select PIDs to graph. A maximum of 2 PIDs can be graphed.

```
        Select PIDs to Graph
 ✓Eng ECU Temp(°F)
  Est Perc Fan Spd(%)
  EGR Valve #1 Pos(%)
  PctAccelPedalPos3(%)
  Throt Pos (%)
  Eng Intercool Temp(°F)
  Road Spd  (mph)
  Pct Eng Load (%)
  Eng Clnt Temp(°F)
  Brake Sys AirPressEmg
  Brake Sys AirPressPri
  Brake Sys AirPressSec
 ENGINE ECU TEMPERATURE
                ⇩
```

- Use the ▶ **RIGHT** arrow key to select/deselect PIDs. The highlighted PID from when `ENTER` was pressed is already selected
- Use the ◀ **LEFT** arrow key to deselect all PIDs.
- Press `ENTER` to view graph of selected PIDs.
- When graphing two PIDs, use the ▲ **UP** and ▼ **DOWN** keys to highlight the desired PID, which will also display the appropriate scale.
- Press the `ENTER` key to pause the graph. Press the `ENTER` key again to continue graphing.

- If the 📈 icon displays while a PID is selected press `ENTER` to view graph.

3. Return to PID screen.
   - Press `BACK`.
4. Return to **Select Data to View** menu.
   - Press `BACK`.
5. Return to **Heavy Duty Standard** menu.
   - Press `BACK`.

Custom List Select

The Custom Data List allows certain PIDs from the View Entire Data List, such as those PIDs that apply to a specific driveability symptom or system, to be selected. From **Select Data to View** menu:

1. Select **Custom List Select**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Custom Data List** is highlighted.
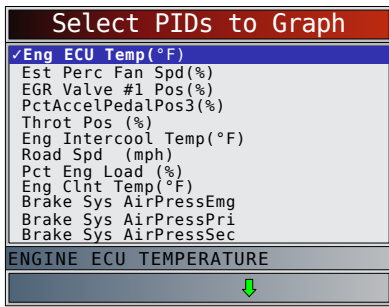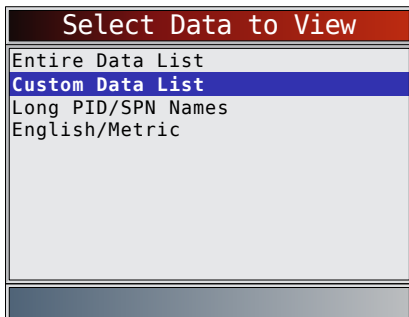   - Press `ENTER`.

```
        Select Data to View
  Entire Data List
  Custom Data List
  Long PID/SPN Names
  English/Metric




```

2. Select View Instructions or Not.
   - Use the ◀ **LEFT** and ▶ **RIGHT** keys.
   - Press `ENTER`.

```
          Custom Setup
              (?)
        Do you want to view
     instructions for creating a
          custom data list?

        [Yes]         [No]

```

3. Select PIDs to View.
   - Use the ▲ **UP** and ▼ **DOWN** keys to move up and down list.
   - The ▶ **RIGHT** arrow selects or deselects data parameter. All selected data values are marked with a √ symbol.
   - The ◀ **LEFT** arrow deselects all marked data parameters.
   - The `ENTER` key starts recording data or displaying selected data parameters.
   - If Long PID/SPN Names is turn ON, the expanded text for the PID will scroll on the bottom line of display. Refer to "Long PID/SPN Names" on page 13.
   - Selected PIDs are kept until you exit View Data and return to the **Heavy Duty Standard** menu.

```
        Select Custom List
  MIL STATUS
  O2S11(V)
  O2S12(V)
  O2S21(V)
  O2S22(V)
  OBD2 STAT
  PTO STATUS
  ST FTRM11(%)
 Malfunction Indicator Lamp Statu
           ⇧        ⇩
```
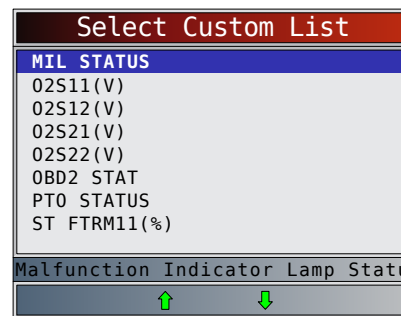
4. View PIDs on scan tool.
   - Use the ▲ **UP** and ▼ **DOWN** arrow key.
   - Refer to "9   Appendix B—Glossary" on page 45.
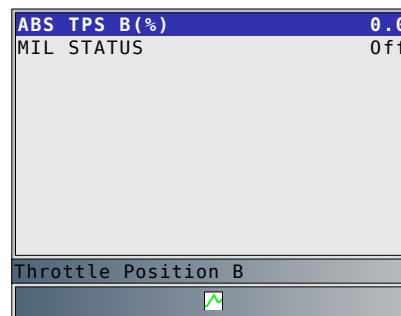
```
 ABS TPS B(%)              0.0
 MIL STATUS                Off




 Throttle Position B
               📈
```

If the 📈 icon displays while a PID is selected, press `ENTER` to view graph. Press `BACK` to return to PID Screen. Refer to "View Entire List" on page 32 for instructions on how to select PIDs to graph and how to view graph.

5. Return to Select Data to View Menu.
   - Press `BACK`.

6. Return to **Heavy Duty Standard** menu.
   • Press BACK .

5.4 Record Data

The **Record Data** function records PIDs while vehicle is parked or being driven. The **Record Data** function is mainly used for diagnosing intermittent driveability problems that cannot be isolated by any other method. The recording time varies. A recording consists of frames of data before the trigger and several frames after the trigger.

> ⚠ **CAUTION**
> Two people must be in vehicle when driving. One to drive and the other to operate the scan tool.

From **Heavy Duty Standard** menu:
1. Select **Record Data**.
   • Use the ▲ **UP** and ▼ **DOWN** keys until **Record Data** is highlighted.
   • Press ENTER .

```
     Heavy Duty Standard
Read Codes
Erase Codes
View Data
Record Data
Module Information
Vehicle Information
Review Data
Print Data
System Setup
```

2. A module menu is displayed.
   • Use the ▲ **UP** and ▼ **DOWN** keys until the designed choice is highlighted.
   • Press ENTER .
   • The menu is divided into two sections, a J1587 Module section and a J1939 Module section depending on the modules supported (if available).
   • The bottom line displays information for the highlighted module: Protocol, module address (Module Identifier=MID and Source Address = SA) and full module description.

```
       Select Module
All Listed Modules
J1587 Modules
 Engine #1
 Transmission
J1939 Modules
 Engine #1
 Transmission #1

J1587 MID: 128 Engine #1
            ⬇
```

3. The Scan Tool identifies available data items (PIDs or SPNs) to view. There are two identification methods:
   • **The quick method**: The Scan Tool can take approximately 15 seconds to identify available PIDs/SPNs. It may not get every or any available PIDs/SPNs.
   • **The long method:** The Scan Tool could take up to 2 minutes to identify available PIDs/SPNs. This method is more thorough and will identify more PIDs/SPNs to view.

If you are not prompted with the following screen, then the Scan Tool has completed identifying all PIDs/SPNs supported using the long method.

On the Screen below, select "No" to perform the quick methor or select "Yes" to perform the long method.

```
        Record Data

      Discover More SPNs?
  This may take several minutes.


    Yes          No
```

4. Follow all instructions on display.
   • The scan tool can maintain 5 recordings per vehicle. If there are already 5 recordings stored, the scan tool will ask which recording to overwrite.
   • Scan tool validates PIDs from vehicle.
5. Refer to "5.3   View Data" on page 22 to setup **Custom List** or **View Entire List** and **Pre-Trigger Setup** to set the number of frames to keep prior to triggering the recording.

```
    Select Data to Record
Entire Data List
Custom Data List
Long PID/SPN Names
English/Metric
```

6. Press ENTER to begin recording.
   • Data continues to be saved until either:
     – Record memory is full.
     – Operator presses ENTER .
   • Scan tool recording times vary. A recording consists of frames of data before trigger and several frames after trigger.

Recording

ⓘ

Collecting pretrigger data
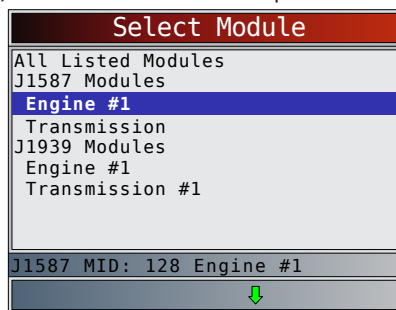
Press ENTER to trigger recording

Recording

ⓘ

Collecting data for frame #4
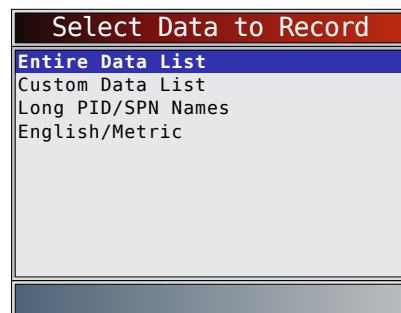
Press ENTER to end recording
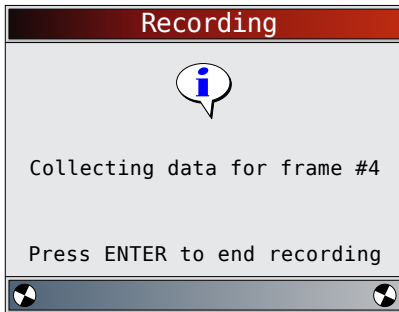
7. After recording, scan tool displays a prompt to Playback Data.
   • Select **NO** to return to **Heavy Duty Standard** menu.
   • Select **YES** to display recorded data.
   • Refer to"Recording" on page 17 for instructions on how to play back data.

Record Data

❓

Playback data?

[Yes]   [No]

5.5 Module Information

The Module Information function allows the scan tool to request information from modules on the vehicle. Information collected includes Make, Module, Serial Number, Power Unit, ECU Part Number, ECU Serial Number, ECU Location, ECU Type, ECU Manufacturer Name, ECU Hardware ID, Software Identifier, CVN ID, Calibration ID, Vehicle Distance, Trip Distance, Total Vehicle Hours, & VIN. A typical module may support some but not all of this information.

The scan tool cannot verify if data is correct for scanned modules.

From **Heavy Duty Standard** menu:
1. Select **Module Information**.
   • Use the ▲ **UP** and ▼ **DOWN** keys until **Module Information** is highlighted.
   • Press ⏎ **ENTER**.

Heavy Duty Standard

Read Codes
Erase Codes
View Data
Record Data
Module Information
Vehicle Information
Review Data
Print Data
System Setup

2. A module menu is displayed.
   • Use the ▲ **UP** and ▼ **DOWN** keys until the designed choice is highlighted.
   • The menu is divided into two sections, a J1587 Module section and a J1939 Module section.
   • The bottom line displays information for the highlighted module: Protocol, module address (Module Identifier=MID and Source Address = SA) and full module description.
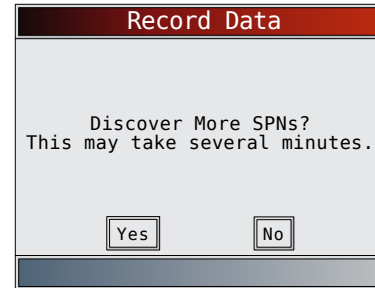

Select Module

All Listed Modules
J1587 Modules
 Engine #1
 Transmission
J1939 Modules
 Engine #1
 Transmission #1

J1587 MID: 128 Engine #1
⬇

3. View information supported by vehicle.
   • Use the ▲ **UP** and ▼ **DOWN** keys (if required). In this example, the Brake, Power Unit module returned data.

Module Information

Make
 **BNDWS
Model
 EC-30 JI
Serial Number
 F43080
Software ID
 BW-362-CD R07

Brakes, Power Unit

In this example, the Engine #1 module returned data. Use the ▲ **UP** and ▼ **DOWN** keys to view all the information.

```
┌────────────────────────────────────┐
│        Module Information          │
├────────────────────────────────────┤
│ Make                               │
│   INT                              │
│ Model                              │
│   390224241011696M10   CARB ESS    │
│   EXEMPT                           │
│ Serial Number                      │
│   6.5HM2Y5303951  *                │
│ VIN                                │
│   1HTJTSKL6BH449799                │
├────────────────────────────────────┤
│            Engine #1               │
├────────────────────────────────────┤
│               ↓                    │
└────────────────────────────────────┘
```

```
┌────────────────────────────────────┐
│        Module Information          │
├────────────────────────────────────┤
│ Serial Number                      │
│   6.5HM2Y5303951  *                │
│ VIN                                │
│   1HTJTSKL6BH449799                │
│ Calibration Information            │
│   CVN       Calibration ID         │
│   67820293                         │
│ Software ID                        │
│   PRS29XR5                         │
├────────────────────────────────────┤
│            Engine #1               │
├────────────────────────────────────┤
│               ↑                    │
└────────────────────────────────────┘
```

4. Return to **Module Information** menu.
    - Press `BACK`.
5. Return to **Heavy Duty Standard** menu.
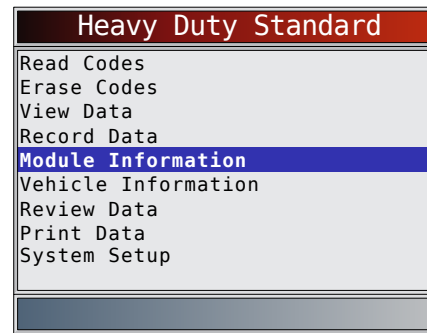   - Press `BACK`.

5.6   Vehicle Information

The Vehicle Information function allows the scan tool to request information from the Engine module(s) on the vehicle. Information collected includes Total Vehicle Distance, Total Vehicle Hours, & VIN.
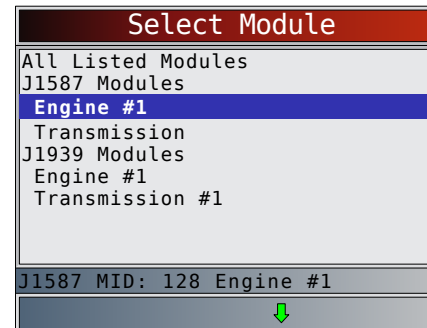
The scan tool cannot verify if data is correct for scanned modules.
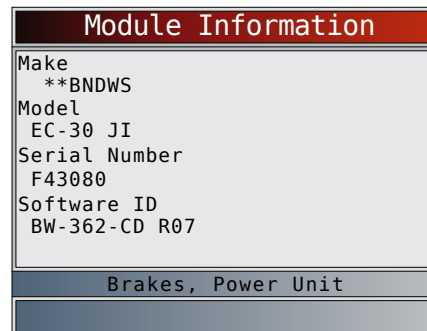
From **Heavy Duty Standard** menu:

1. Select **Vehicle Information**.
    - Use the ▲ **UP** and ▼ **DOWN** keys until **Vehicle Information** is highlighted.
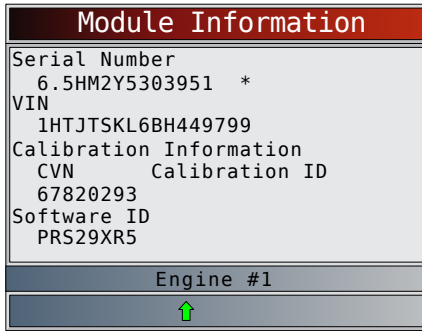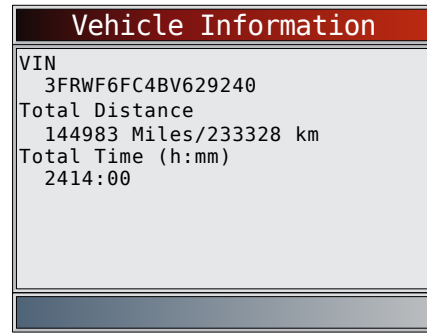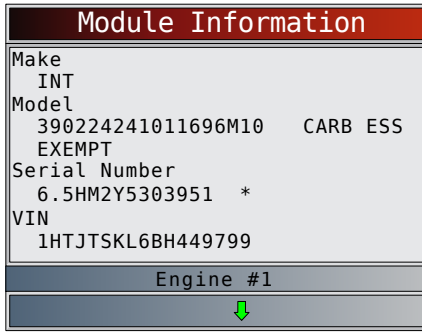   - Press `ENTER`.

```
┌────────────────────────────────────┐
│       Heavy Duty Standard          │
├────────────────────────────────────┤
│ Read Codes                         │
│ Erase Codes                        │
│ View Data                          │
│ Record Data                        │
│ Module Information                 │
│ Vehicle Information                │
│ Review Data                        │
│ Print Data                         │
│ System Setup                       │
│                                    │
├────────────────────────────────────┤
│                                    │
└────────────────────────────────────┘
```

2. View information supported by vehicle.

```
┌────────────────────────────────────┐
│        Vehicle Information          │
├────────────────────────────────────┤
│ VIN                                │
│   3FRWF6FC4BV629240                │
│ Total Distance                     │
│   144983 Miles/233328 km           │
│ Total Time (h:mm)                  │
│   2414:00                          │
│                                    │
│                                    │
├────────────────────────────────────┤
│                                    │
└────────────────────────────────────┘
```

3. Return to **Heavy Duty Standard** menu.
    - Press `BACK`.

6   OBD II Diagnostics

OBDII Diagnostics is available by selecting **HD OBD (ISO 15765-4)** or **Global Automotive OBDII** from the **Main Menu**.

This section applies to all Global OBD II compliant vehicles. The first time the scan tool links to the vehicle, the communication protocol is automatically detected, and is used until the scan tool is turned off or another vehicle is diagnosed.

If an error message displays, make sure the OBD II connector is attached and the ignition key is on. Cycle ignition key to OFF for 10 seconds, then ON. This may be required to reset computer. If required, select YES to try again. If problem still exists, refer to "7.1 Error Messages" on page 41.

The scan tool keeps data received from the previous vehicle selected until any of the following occurs:

- A new vehicle is selected.
- Scan tool is flash programmed to update software.

On initial link to vehicle, scan tool checks the status of I/M Monitors no matter which function is selected.

> **IMPORTANT**
> **Review Data**, **Print Data**, and **System Setup** are covered in Section 5 of this manual. These items are not covered in this section.

The **HD OBD** menu and **Global Automotive OBDII** menu are broken down into the following selections:

- I/M Monitors
- Read Codes
- Erase Codes
- MIL Status
- State OBD Check
- View Data
- Record Data
- View Freeze Data
- Drive Cycle Monitor
- O2 Monitor Tests
- Diagnostic Monitor Tests
- On-Board Systems
- Vehicle Information
- Modules Present

- Review Data
- Print Data
- System Setup

6.1   I/M Monitors (Emissions)

The **I/M Monitors** (Inspection / Maintenance) function is used to view a snapshot of the operations for the emission system on OBD II vehicles. **I/M Monitors** is a very useful function. To guarantee no faults exist make sure all monitors are ok or n/a and no DTCs exist. Refer to the vehicles service manual for the drive cycle operation. During normal driving conditions, the vehicle computer scans the emission system. After a specific amount of drive time (each monitor has specific driving conditions and time required), the computer monitors decide if the vehicles emission system is working correctly or not as well as detecting out of range values. When the monitor status is:

- ok - vehicle was driven enough to complete the monitor.
- inc (Incomplete) - vehicle was not driven enough to complete the monitor.
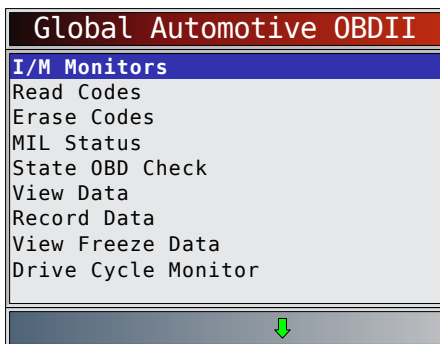- n/a (not applicable)- vehicle does not support that monitor.

Depending on vehicle, disconnecting or a discharged battery may erase DTCs and clear monitor status. Monitors may be reset by:

- Erasing codes
- Vehicle control modules losing power

The **I/M Monitors** function can be run key on engine running (KOER) or key on engine off (KOEO).

Extreme weather and/or road conditions can prevent a monitor from running. Also, some monitors may require a cold start to complete.

From the **HD OBD** menu or **Global Automotive OBDII** menu.

1. Select **I/M Monitors**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **I/M Monitors** is highlighted.
   - Press `ENTER`.

```
Global Automotive OBDII
I/M Monitors
Read Codes
Erase Codes
MIL Status
State OBD Check
View Data
Record Data
View Freeze Data
Drive Cycle Monitor
                ⬇
```

Two types of **I/M Monitors** test are:

- **Since DTCs Cleared** - shows status of the monitors since the DTCs were last erased.
- **This Drive Cycle** - shows status of monitors since the start of the current drive cycle. Refer to the

vehicle service manual for more detailed information on emission-related monitors and their status.

Some vehicles do not support **This Drive Cycle**. If vehicle supports both types of monitors the I/M Monitors Menu displays.

```
I/M Monitors
Since DTCs Cleared
This Drive Cycle
```
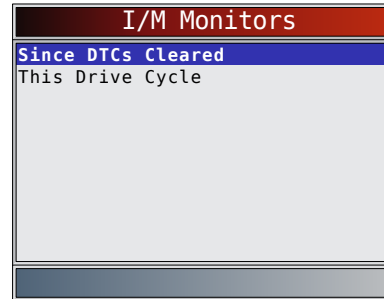
2. View summary of monitor status.
   - Use the ▲ **UP** and ▼ **DOWN** keys (if required).

Depending on monitor test, one of these two screens will be present.

```
Since DTCs Cleared
Misfire Monitor          ok
Fuel System Mon          ok
Comp Component           ok
Catalyst Mon             ok
Htd Catalyst            n/a
Evap System Mon         inc
Sec Air System         n/a
A/C Refrig Mon         n/a
Oxygen Sens Mon          ok
                ⬇
```

OR

```
This Drive Cycle
Misfire Monitor          ok
Fuel System Mon          ok
Comp Component           ok
Catalyst Mon            inc
Htd Catalyst            n/a
Evap System Mon         dis
Sec Air System         n/a
A/C Refrig Mon         n/a
Oxygen Sens Mon         inc
                ⬇
```
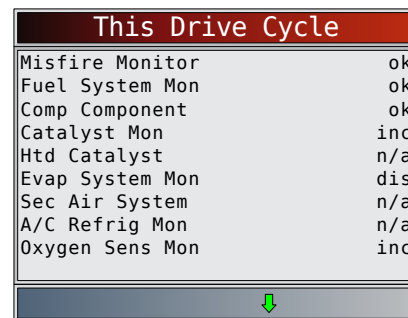
Abbreviations and names for OBD II monitors supported by the scan tool are shown below. They are required by the United States Environmental Protection Agency (EPA). Not all monitors are supported by all vehicles.

Monitors	Expanded Name
Misfire Monitor	Misfire monitor
Fuel System Mon	Fuel System Monitor
Comp Component	Comprehensive components monitor
Catalyst Mon	Catalyst monitor
Htd Catalyst	Heated catalyst monitor
Evap System Mon	Evaporative system monitor
Sec Air System	Secondary air system monitor
A/C Refrig Mon	Air conditioning refrigerant monitor
Oxygen Sens Mon	Oxygen sensor monitor
Oxygen Sens Htr	Oxygen sensor heater monitor
EGR/VVT Sys Mon	Exhaust gas recirculation or variable valve timing monitor

NMHC Cat Mon	Non-methane hydrocarbon catalyst monitor
NOX Treat Mon	Nitrogen oxide treatment monitor
Boost Pres Mon	Boost pressure monitor
Exhst Gas Sensr	Exhaust gas sensor
PM Filter Mon	Particulate matter filter monitor

3. Return to the **HD OBD** menu or **Global Automotive OBDII** menu.
    • Press **BACK**.

6.2   Read Codes

The **Read Codes** function allows the scan tool to read the DTCs from the vehicle's control modules. DTCs are used to help determine the cause of a problem or problems with a vehicle. These codes cause the control module to illuminate the malfunction indicator lamp (MIL) when emission-related or driveability fault occurs. When referring to the engine control module, MIL is also known as service engine soon or check engine lamp. **Read Codes** can be done with the key on engine off (KOEO) or with the key on engine running (KOER).

From the the **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **Read Codes**.
    • Use the ▲ **UP** and ▼ **DOWN** keys until **Read Codes** is highlighted.
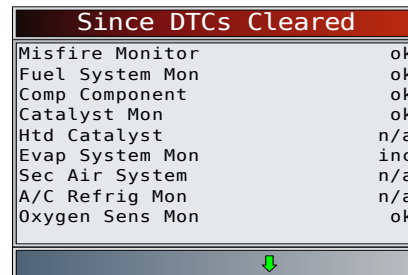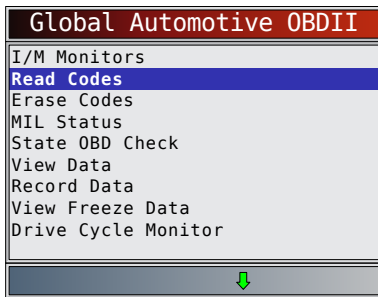   • Press **ENTER**.

```
Global Automotive OBDII
I/M Monitors
Read Codes
Erase Codes
MIL Status
State OBD Check
View Data
Record Data
View Freeze Data
Drive Cycle Monitor

            ⬇
```

If no DTCs are present, a message stating "No codes found" is displayed.

```
        Read Codes

            i

        No codes found

    Press ENTER to continue
```

2. View and write down the DTCs.
    • Use the ▲ **UP** and ▼ **DOWN** keys until the desired choice is highlighted.

This screen indicates where the **Read Codes** information is located.

```
DTC#                        X/Y
                          Module

DTC Description


DTC Type

            ⬇
```
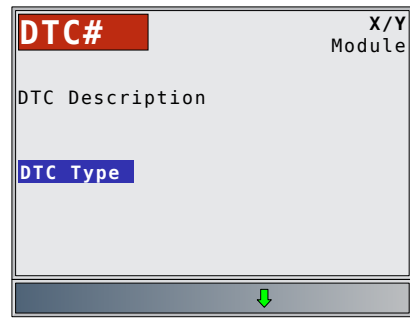
DTC Number - number of the trouble code found in vehicle service information.

X of Y - Indication that code x of y is being viewed, where x is the code being viewed of the total y.

Module - The address of the module (e.g. Mod $28) is shown in this field. The table below describes modules supported.

Module	Description
MOD $XX	Module address for the OBD II/EOBD module reporting the DTC

DTC Description - This area is reserved for the text describing the trouble code listed in the DTC number field.

DTC Type - This area is reserved for providing additional information about the DTC. Multiple DTC types may be possible for a given DTC number. Not all vehicles support DTC types.

This table describes possible DTC types.

DTC Type	Description
Confirmed	Confirmed codes are reported when a component, sensor, or other part of the vehicle is indication a malfunction is present.
Current	Codes transmitted through the PCMs data stream when a trouble condition is active and cannot be erased. The problem must be repaired to remove the DTC.
Pending	Pending codes are also referred to as continuous monitor or maturing codes. An intermittent fault causes the control module to store a code in memory. If the fault does not occur within a certain number of warm-up cycles (depending on vehicle), the code clears from memory. If fault occurs a specific number of times, the code matures into a DTC and the MIL illuminates or blinks. This function can be used with KOEO or KOER.

Examples of Read Codes information screens follow. In this example, module (MOD) $18 is reporting the DTCs.

```
P0113                    1/3
                     Mod $18

Intake Air Temperature Sensor
1 Circuit High Input



                      ⬇
```
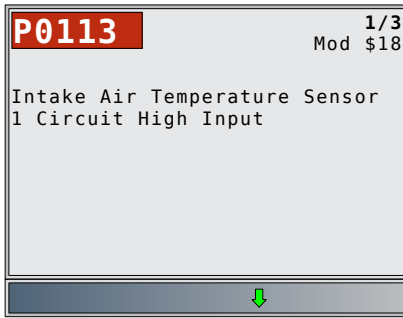
Pending indicates a global OBD II/EOBD pending code.

```
P1501                    2/3
                     Mod $18

Vehicle Speed Sensor Out
of Range Self Test

PENDING

              ⬆        ⬇
```
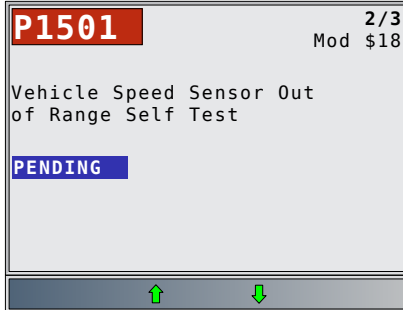
3. Return to **HD OBD** menu or **Global Automotive OBDII** menu.
    • Press **BACK**.

6.3   Erase Codes

The **Erase Codes** function deletes DTCs and resets I/M Monitor data from vehicle's control module(s). Perform this function key on engine off (KOEO). Do not start the engine.

The **Erase Codes** function may also erase View Freeze Data, O2 Monitor Tests, and Diagnostic Monitor Test results depending on vehicle.

The **Erase Codes** function sets monitors to inc.

Perform **Erase Codes** function only after systems have been checked completely and DTCs have been written down.

After servicing the vehicle, erase stored DTCs and verify no codes have returned. If a DTC returns, problem has not been fixed or other faults are present.

Permanent DTCs cannot be erased with the Erase Codes function.

Depending on which monitor sets a code, the vehicle may need to be driven and the monitor ran before concluding that the fault is repaired.

From **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **Erase Codes**.
    • Use the ▲ **UP** and ▼ **DOWN** keys until **Erase Codes** is highlighted.
    • Press **ENTER**.
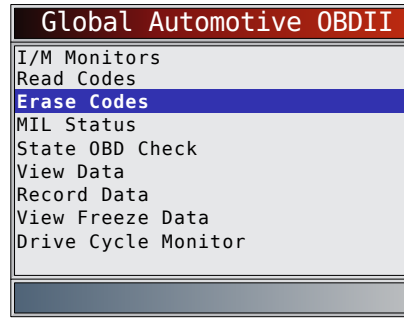
```
Global Automotive OBDII
I/M Monitors
Read Codes
Erase Codes
MIL Status
State OBD Check
View Data
Record Data
View Freeze Data
Drive Cycle Monitor
```

• If diagnostic results and codes are not to be erased select **NO** and press **ENTER**.

```
        Erase Codes
            ❓

     Are you sure you want to
   erase diagnostic results and
              codes?

      [ Yes ]        [ No ]
```
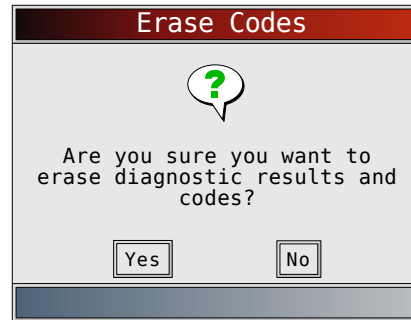
• Selecting **NO** displays a "Command canceled" message.
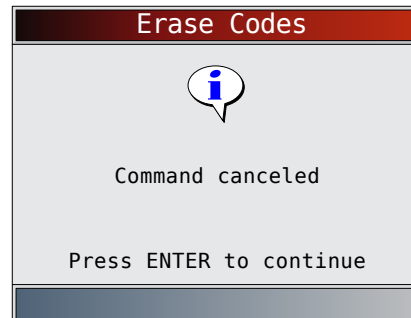
```
        Erase Codes
            ⓘ


       Command canceled

     Press ENTER to continue
```

2. Select **YES** to erase diagnostic results and codes.
    • Use the ◀ **LEFT** arrow key.
    • Press **ENTER**.

```
        Erase Codes
            ❓

     Are you sure you want to
   erase diagnostic results and
              codes?

      [ Yes ]        [ No ]
```
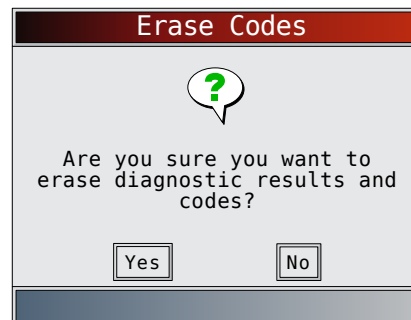
3. Observe "Command sent" message is displayed.
    • Press **ENTER**.

```
           Erase Codes
                 i

             Command sent
           Codes remaining:0

         Press ENTER to continue
```
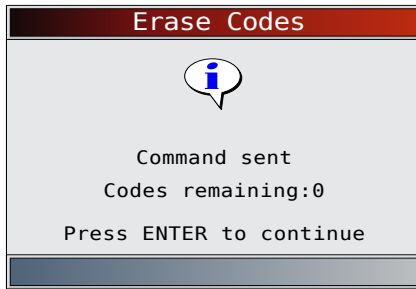
4.   Return to **HD OBD** menu or **Global Automotive OBDII** menu.

   •   Press **BACK** .

6.4   MIL Status

From **HD OBD** menu or **Global Automotive OBDII** menu:

1.   Select **MIL Status**.
   •   Use the ▲ **UP** and ▼ **DOWN** keys until **MIL Status** is highlighted.
   •   Press **ENTER** .

```
     Global Automotive OBDII
   I/M Monitors
   Read Codes
   Erase Codes
   MIL Status
   State OBD Check
   View Data
   Record Data
   View Freeze Data
   Drive Cycle Monitor
```

2.   View **MIL Status**.
   •   Press **ENTER** to return to **HD OBD** menu or **Global Automotive OBDII** menu.

```
             MIL is ON
                 i


       MIL lamp should be ON if
           engine is running

         Press ENTER to continue
```

```
             MIL is OFF
                 i


       MIL lamp should be OFF
           engine is running

         Press ENTER to continue
```

6.5   State OBD Check

The **State OBD Check** function is used to display a basic status of the vehicles OBD system.

•   Malfunction indicator lamp (MIL) status
•   Codes found
•   I/M monitors

Erase Codes deletes DTCs and resets I/M monitors from vehicle's computer module(s).

The **State OBD Check** function has the following areas:

•   MIL Status ON or OFF
•   Number of Codes Found
•   Number of Monitors OK
•   Number of Monitors Inc
•   Number of Monitors N/A

State OBD Check should be done with the key on engine running (KOER) due to showing MIL status.

The number of codes found are only Global OBD II codes and not pending codes.

The number of monitors that are either ok, inc, or na are only Since DTCs Cleared and not This Drive Cycle.

Refer to "6.1   I/M Monitors (Emissions)" on page 28 and "6.2   Read Codes" on page 29 for more detailed information about the results.

From **HD OBD** menu or **Global Automotive OBDII** menu:

1.   Select **State OBD Check**.
   •   Use the ▲ **UP** and ▼ **DOWN** keys until **State OBD Check** is highlighted.
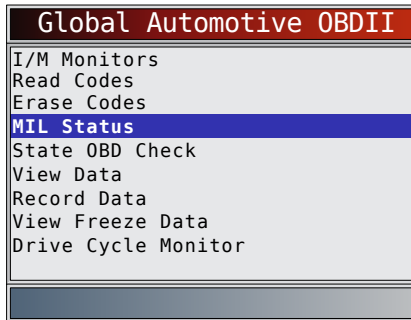   •   Press **ENTER** .

```
     Global Automotive OBDII
   I/M Monitors
   Read Codes
   Erase Codes
   MIL Status
   State OBD Check
   View Data
   Record Data
   View Freeze Data
   Drive Cycle Monitor
```
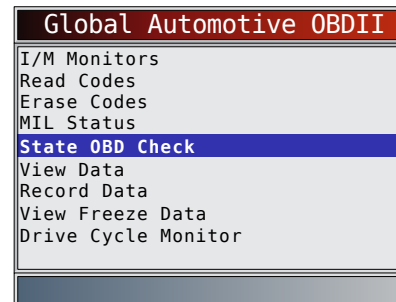
2.   View **State OBD Check** display.

```
        State OBD Check
   MIL Status            OFF
   Codes Found             0
   Monitors OK             3
   Monitors Inc            4
   Monitors N/A            4
```
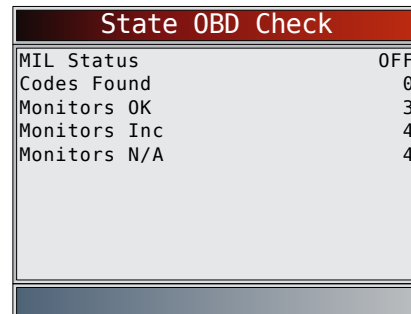
3.   Return to **HD OBD** menu or **Global Automotive OBDII** menu.
   •   Press **BACK** .

6.6   View Data

The **View Data** function allows real time viewing of the vehicle's computer module's parameter identification

(PID) data. As the computer monitors the vehicle, information is simultaneously transmitted to scan tool.
View Data allows the following items to be viewed on the scan tool:

• Sensor data
• Operation of switches
• Operation of solenoids
• Operation of relays

View Data can be shown as:

• Entire Data List
• Custom Data List

Apart from **Read Codes**, **View Data** is the most useful diagnostic function for isolating the cause of a vehicle operation problem.

From **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **View Data**.
   • Use the ▲ **UP** and ▼ **DOWN** keys until **View Data** is highlighted.
   • Press ⏎ **ENTER** .

```
Global Automotive OBDII
I/M Monitors
Read Codes
Erase Codes
MIL Status
State OBD Check
View Data
Record Data
View Freeze Data
Drive Cycle Monitor
```

2. Observe while the scan tool validates PID MAP.
   • PID MAP validation is the tool asking the vehicle which PIDs are supported. Refer to "8 Appendix A—Global OBD II PID Definitions" on page 42 for a complete list of PIDs supported by the tool.
   • Multiple PIDs may be sent if vehicle is equipped with more than one computer module (for example a powertrain control module [PCM] and a transmission control module [TCM]). The scan tool identifies them by their identification names (ID) assigned by manufacturer (i.e. $10 or $1A).
   • If one or more control module stops responding, the scan tool displays a message.
     – If continuing, dashes will replace data in right-hand column.
     – If **NO** is selected, then the scan tool attempts to re-establish communication with that module.
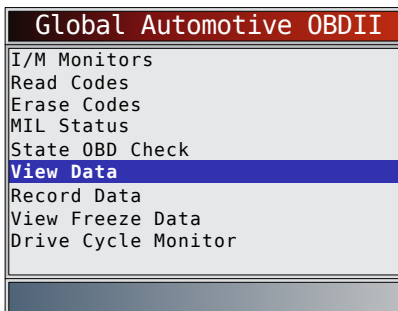
```
Validating PIDs

    Waiting for vehicle to
           respond


        Please Wait
```

```
Validating PIDs


      Validating PID List

         PID 19/329


        Please Wait
```

View Entire List

View Entire List shows all supported PID data for the vehicle being tested.

From **Select Data to View** menu:

1. Select **Entire Data List**.
   • Use the ▲ **UP** and ▼ **DOWN** keys until **Entire Data List** is highlighted.
   • Press ⏎ **ENTER** .

```
Select Data to View
Entire Data List
Custom Data List
English/Metric
```
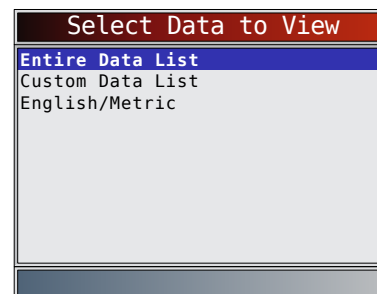
2. View PIDs on scan tool.
   • Use the ▲ **UP** and ▼ **DOWN** keys.
   • Refer to "8   Appendix A—Global OBD II PID Definitions" on page 42.

```
ABS LOAD(%)              0.0
ABSLT TPS($01)          6.3
ABSLT TPS($07)          6.3
ACC POS D(%)            0.0
BARO PRS("HG)          29.2
CALC LOAD(%)            0.0
CALC LOAD(%)            0.0
CAT TEMP11(°F)           73
CLR DIST(mi)            499
CLR DIST(mi)            513
Absolute Load Value
```

If Long PID/SPN Names is turned ON, the expanded text for the PID will scroll on the bottom line of display. Refer to "Long PID/SPN Names" on page 13.

If the 📈 icon displays while a PID is selected, press ⏎ **ENTER** to select PIDs to graph. A maximum of 2 PIDs can be graphed.

```
┌────────────────────────────────┐
│     Select PIDs to Graph        │
├────────────────────────────────┤
│ ✓ABSLT TPS(%)                   │
│  CALC LOAD(%)                   │
│  COOLANT(°F)                    │
│  ENG SPEED(RPM)                 │
│  EQ RATIO11                     │
│  IAT(°F)                        │
│  IGN ADV(°)                     │
│  LT FTRM1(%)                    │
├────────────────────────────────┤
│ Throttle Position               │
│              ⬇                  │
└────────────────────────────────┘
```

- Use the ▶ **RIGHT** arrow key to select/deselect PIDs. The highlighted PID from when **ENTER** was pressed is already selected
- Use the ◀ **LEFT** arrow key to deselect all PIDs.
- Press **ENTER** to view graph of selected PIDs.
- When graphing two PIDs, use the ▲ **UP** and ▼ **DOWN** keys to highlight the desired PID, which will also display the appropriate scale.
- Press the **ENTER** key to pause the graph. Press the **ENTER** key again to continue graphing.

- If the 📈 icon displays while a PID is selected press **ENTER** to view graph.

3. Return to PID screen.
   - Press **BACK**.
4. Return to **Select Data to View** menu.
   - Press **BACK**.
5. Return to **Datastream Menu**.
   - Press **BACK**.

Custom List Select

The Custom Data List allows certain PIDs from the View Entire Data List, such as those PIDs that apply to a specific driveability symptom or system, to be selected. From **Select Data to View** menu:

1. Select **Custom List Select**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Custom Data List** is highlighted.
   - Press **ENTER**.

```
┌────────────────────────────────┐
│     Select Data to View         │
├────────────────────────────────┤
│ Entire Data List                │
│ Custom Data List                │
│ English/Metric                  │
│                                 │
│                                 │
│                                 │
│                                 │
│                                 │
├────────────────────────────────┤
│                                 │
└────────────────────────────────┘
```

2. Select View Instructions or Not.
   - Use the ◀ **LEFT** and ▶ **RIGHT** keys.
   - Press **ENTER**.

```
┌────────────────────────────────┐
│         Custom Setup            │
│            ❓                   │
│      Do you want to view        │
│   instructions for creating a   │
│        custom data list?        │
│                                 │
│       ┌─────┐    ┌─────┐        │
│       │ Yes │    │ No  │        │
│       └─────┘    └─────┘        │
│                                 │
└────────────────────────────────┘
```

3. Select PIDs to View.
   - Use the ▲ **UP** and ▼ **DOWN** keys to move up and down list.
   - The ▶ **RIGHT** arrow selects or deselects data parameter. All selected data values are marked with a √ symbol.
   - The ◀ **LEFT** arrow deselects all marked data parameters.
   - The **ENTER** key starts recording data or displaying selected data parameters.
   - If Long PID/SPN Names is turn ON, the expanded text for the PID will scroll on the bottom line of display. Refer to "Long PID/SPN Names" on page 13.
   - Selected PIDs are kept until you exit View Data and return to the **Datastream Menu**.

```
┌────────────────────────────────┐
│     Select Custom List          │
├────────────────────────────────┤
│ MIL STATUS                      │
│ O2S11(V)                        │
│ O2S12(V)                        │
│ O2S21(V)                        │
│ O2S22(V)                        │
│ OBD2 STAT                       │
│ PTO STATUS                      │
│ ST FTRM11(%)                    │
├────────────────────────────────┤
│ Malfunction Indicator Lamp Statu│
│      ⬆         ⬇                │
└────────────────────────────────┘
```

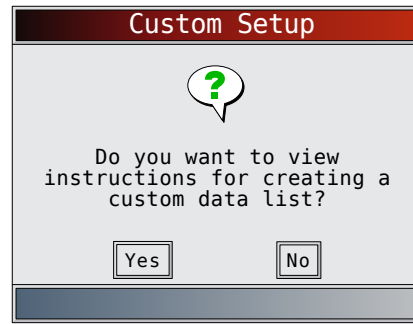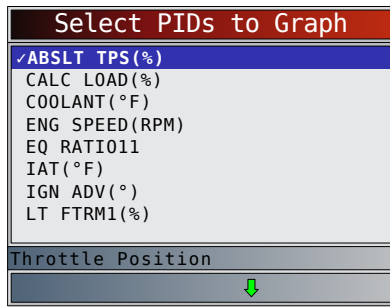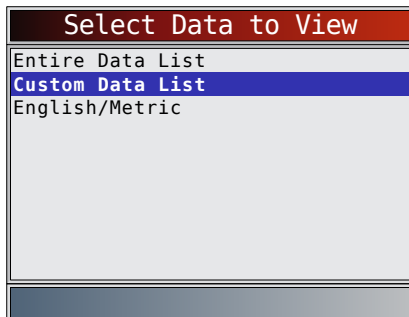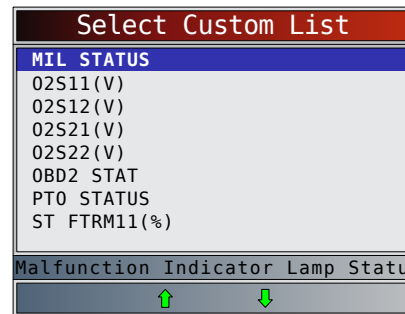4. View PIDs on scan tool.
   - Use the ▲ **UP** and ▼ **DOWN** arrow key.
   - Refer to "8   Appendix A—Global OBD II PID Definitions" on page 42.
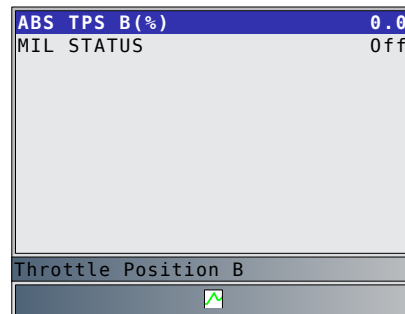
```
┌────────────────────────────────┐
│ ABS TPS B(%)              0.0   │
│ MIL STATUS               Off    │
│                                 │
│                                 │
│                                 │
│                                 │
│                                 │
├────────────────────────────────┤
│ Throttle Position B             │
│            📈                   │
└────────────────────────────────┘
```

If the 📈 icon displays while a PID is selected, press **ENTER** to view graph. Press **BACK** to return to PID Screen. Refer to "View Entire List" on page 32 for instructions on how to select PIDs to graph and how to view graph.

5. Return to Select Data to View Menu.
   - Press **BACK**.

6. Return to **HD OBD** menu or **Global Automotive OBDII** menu.
    • Press BACK.

6.7 Record Data

The **Record Data** function records PIDs while vehicle is parked or being driven. The **Record Data** function is mainly used for diagnosing intermittent driveability problems that cannot be isolated by any other method. The recording time varies. A recording consists of frames of data before the trigger and several frames after the trigger.

⚠ **CAUTION**
Two people must be in vehicle when driving. One to drive and the other to operate the scan tool.

From **HD OBD** menu or **Global Automotive OBDII** menu:
1. Select **Record Data**.
    • Use the ▲ **UP** and ▼ **DOWN** keys until **Record Data** is highlighted.
    • Press ENTER.

```
┌─────────────────────────────────┐
│     Global Automotive OBDII     │
├─────────────────────────────────┤
│ I/M Monitors                    │
│ Read Codes                      │
│ Erase Codes                     │
│ MIL Status                      │
│ State OBD Check                 │
│ View Data                       │
│ Record Data                     │
│ View Freeze Data                │
│ Drive Cycle Monitor             │
│                                 │
└─────────────────────────────────┘
```
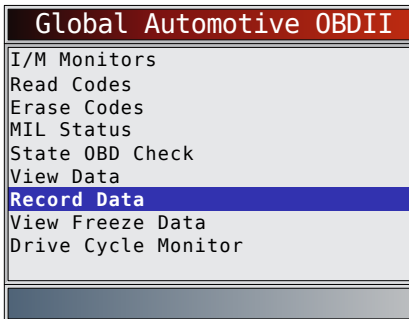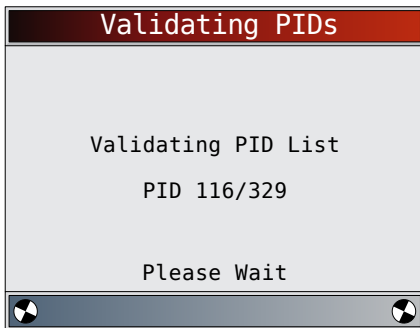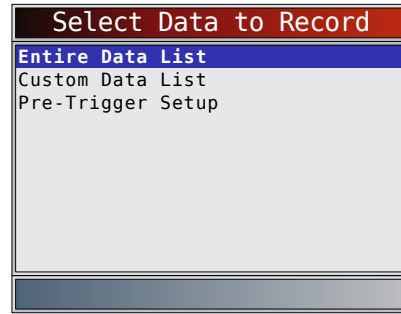
2. Follow all instructions on display.
    • The scan tool can maintain 5 recordings per vehicle. If there are already 5 recordings stored, the scan tool will ask which recording to overwrite.
    • Scan tool validates list of global PIDs from vehicle.

```
┌─────────────────────────────────┐
│        Validating PIDs          │
├─────────────────────────────────┤
│                                 │
│       Validating PID List       │
│                                 │
│          PID 116/329            │
│                                 │
│          Please Wait            │
│ ✺                           ✺  │
└─────────────────────────────────┘
```

3. Refer to"6.6 View Data" on page 31 to setup **Custom List** or **View Entire List** and **Pre-Trigger Setup** to set the number of frames to keep prior to triggering the recording.

```
┌─────────────────────────────────┐
│     Select Data to Record       │
├─────────────────────────────────┤
│ Entire Data List                │
│ Custom Data List                │
│ Pre-Trigger Setup               │
│                                 │
│                                 │
│                                 │
│                                 │
└─────────────────────────────────┘
```

4. Press ENTER to begin recording.
    • Data continues to be saved until either:
        – Record memory is full.
        – Operator presses ENTER.
    • Scan tool recording times vary. A recording consists of frames of data before trigger and several frames after trigger.

```
┌─────────────────────────────────┐
│          Recording              │
├─────────────────────────────────┤
│             ⓘ                   │
│                                 │
│    Collecting pretrigger data   │
│                                 │
│      Press ENTER to trigger     │
│            recording            │
│ ✺                           ✺  │
└─────────────────────────────────┘
```

```
┌─────────────────────────────────┐
│          Recording              │
├─────────────────────────────────┤
│             ⓘ                   │
│                                 │
│   Collecting data for frame #4  │
│                                 │
│    Press ENTER to end recording │
│ ✺                           ✺  │
└─────────────────────────────────┘
```

5. After recording, scan tool displays a prompt to Playback Data.
    • Select **NO** to return to **Datastream Menu**.
    • Select **YES** to display recorded data.
    • Refer to"Recording" on page 17 for instructions on how to play back data.

```
┌─────────────────────────────────┐
│          Record Data            │
├─────────────────────────────────┤
│             ❓                   │
│                                 │
│         Playback data?          │
│                                 │
│   ┌─────┐          ┌────┐       │
│   │ Yes │          │ No │       │
│   └─────┘          └────┘       │
│                                 │
└─────────────────────────────────┘
```
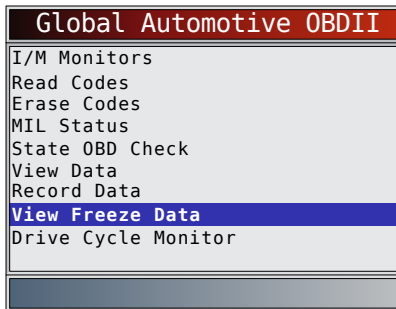
6.8 View Freeze Data

When an emission-related fault occurs, certain vehicle conditions are recorded by the on-board computer. This information is referred to as freeze frame data. **View Freeze Data** is a snapshot of the operating conditions at the time of an emission-related fault. **View Freeze Data** can be overwritten by faults with a higher priority. If codes were erased, **View Freeze Data** may not be stored in vehicle memory depending on vehicle.

From **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **View Freeze Data**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **View Freeze Data** is highlighted.
   - Press ENTER.

```
 Global Automotive OBDII
 I/M Monitors
 Read Codes
 Erase Codes
 MIL Status
 State OBD Check
 View Data
 Record Data
 View Freeze Data
 Drive Cycle Monitor
```

2. Select frame if more than one frame is present.
   - Use the ▲ **UP** and ▼ **DOWN** keys until the desired frame is highlighted.
   - Press ENTER.

```
 Select Data to View
 P0102 (MOD $10)
 Long PID/SPN Names
 English/Metric
```
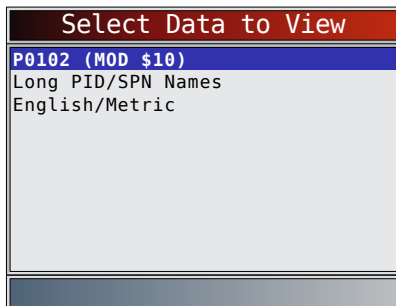
3. View PIDs on scan tool.
   - Use the ▲ **UP** and ▼ **DOWN** keys.
   - Refer to "8   Appendix A—Global OBD II PID Definitions" on page 42.

```
 TROUB CODE           P2122
 FUEL SYS 1            N/A
 FUEL SYS 2            N/A
 CALC LOAD(%)          0.0
 COOLANT (°F)         -40
 ST FTRM1(%)          0.0
 LT FTRM1(%)          0.0
 MAP("HG)             28.1
 ENG SPEED(RPM)         0
 VEH SPEED(MPH)         0
 Definition that caused Freeze Fra
             ⬇
```

   - If Long PID/SPN Names is turned on, the expanded text for the PID will scroll on the bottom line of the display. Refer to "Long PID/SPN Names" on page 13.
4. Select another frame to view (if available).

   - Press BACK.
5. Return to **HD OBD** menu or **Global Automotive OBDII** menu.
   - Press BACK.

6.9 Drive Cycle Monitor

The **Drive Cycle Monitor** function is very similar to **I/M Monitors** though the **Drive Cycle Monitor** is used to view real-time operations of the emissions system on OBD II vehicles. **Drive Cycle Monitor** continuously updates as the vehicle reports operations of the emission system.
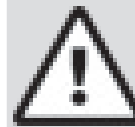
> ⚠️ **CAUTION**
> Two people must be in vehicle when driving. One to drive and the other to operate the scan tool.

- Refer to the vehicle service manual for the drive cycle operation.

Drive Cycle Monitor can be used if you want to drive the vehicle until all of the monitors are OK.

During normal driving conditions, the vehicle computer scans the emission system. After a specific amount of drive time (each monitor has specific driving conditions and time requirements), the computer monitors will decide if the vehicle emissions system is working correctly or not as well as detecting out a range of values. When the monitor status is:

- "ok" - vehicle has been driven enough for function.
- "inc" (incomplete) - vehicle was not driven enough to complete all of the monitors.
- "n/a" (not applicable) - vehicle does not support that monitor.

Reset monitors by:

- Erasing codes.
- Vehicle computer module losing power (on some vehicles).

From **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **Drive Cycle Monitor**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Drive Cycle Monitor** is highlighted.
   - Press ENTER.

```
 Global Automotive OBDII
 I/M Monitors
 Read Codes
 Erase Codes
 MIL Status
 State OBD Check
 View Data
 Record Data
 View Freeze Data
 Drive Cycle Monitor
```
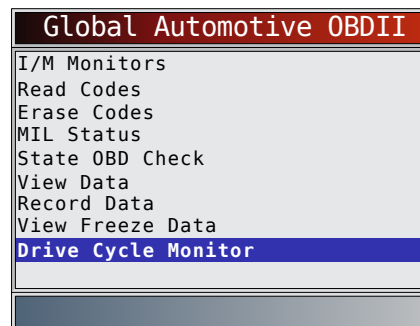
- Two types of drive cycle monitors are:
  - **Since DTCs Cleared** shows status of the monitors since the Diagnostic Trouble Codes were last erased.

– **This Drive Cycle** shows status of monitors since start of current drive cycle. Refer to the vehicle service manual for more detailed information on emission-related monitors and their status.
– Some vehicles do not support **This Drive Cycle**. If vehicle supports both types of drive cycle monitors the **Drive Cycle Monitor** menu will display.

```
┌─────────────────────────────┐
│     Drive Cycle Monitor     │
├─────────────────────────────┤
│ Since DTCs Cleared          │
│ This Drive Cycle            │
│                             │
│                             │
│                             │
│                             │
├─────────────────────────────┤
│                             │
└─────────────────────────────┘
```

2. View summary of monitor status.
   • Use the ▲ **UP** and ▼ **DOWN** keys (if required).
3. Depending on the drive cycle monitors, either the **This Drive Cycle** or the **Since DTCs Cleared** screen will display.

```
┌─────────────────────────────┐
│      This Drive Cycle       │
├─────────────────────────────┤
│ Catalyst Mon            inc │
│ Oxygen Sens Mon         inc │
│ Oxygen Sens Htr         inc │
│ EGR/VVT Sys Mon         inc │
│                             │
│                             │
│                             │
├─────────────────────────────┤
│                             │
└─────────────────────────────┘
```

OR

```
┌─────────────────────────────┐
│      Since DTCs Cleared     │
├─────────────────────────────┤
│ Misfire Monitor          ok │
│ Fuel System Mon          ok │
│ Comp Component           ok │
│ Catalyst Mon             ok │
│ Htd Catalyst            n/a │
│ Evap System Mon         inc │
│ Sec Air System          n/a │
│ A/C Refrig Mon          n/a │
│ Oxygen Sens Mon          ok │
├─────────────────────────────┤
│              ⬇              │
└─────────────────────────────┘
```

• The scan tool display is continuously updated. Monitors that are "ok" will disappear and only the "inc" monitors will remain displayed. Monitors designated "n/a" are not displayed.
• When all Monitors are "OK", a screen stating "All supported monitors are OK" will display.

```
┌─────────────────────────────┐
│      This Drive Cycle       │
├─────────────────────────────┤
│             🛈              │
│                             │
│  All supported monitors are OK │
│                             │
│   Press ENTER to continue   │
│                             │
├─────────────────────────────┤
│                             │
└─────────────────────────────┘
```

OR

```
┌─────────────────────────────┐
│      Since DTCs Cleared     │
├─────────────────────────────┤
│             🛈              │
│                             │
│  All supported monitors are OK │
│                             │
│   Press ENTER to continue   │
│                             │
├─────────────────────────────┤
│                             │
└─────────────────────────────┘
```

4. Return to **Special Tests Menu**.
   • Press `BACK`.

6.10 O2 Monitor Tests

OBD II regulations require applicable vehicles monitor and test oxygen (O2) sensors to determine problems related to fuel and emissions. The O2 Monitor Tests allows retrieval of completed O2 sensors monitor test results.

• The **O2 Monitor Tests** is not an on-demand test. O2 sensors are not tested when selected via the menu. O2 sensors are tested when engine operating conditions are within specified limits.
• If the vehicle communicates using a controller area network (CAN), **O2 Monitor Tests** are not supported by vehicle. A message is displayed. Refer to "6.11 Diagnostic Monitor Tests" on page 37 for O2 monitor data.
• O2 sensors are located before (upstream) and after (downstream) catalyst(s). Sensors are named (xy) for their position to both cylinder banks and catalysts.
   – The O2 sensor for cylinder bank 1 has prefix 1y while O2 sensor for cylinder bank 2 has prefix 2y.
   – The O2 sensor upstream of catalyst (closest to engine) has suffix x1 while O2 sensor downstream of catalyst has suffix x2. If vehicle contains more catalysts, O2 sensor downstream of second catalyst has suffix x3 and O2 sensor downstream of next catalyst has suffix x4.
   – For example, O2S21 is upstream O2 sensor for cylinder bank 2.

The following O2 Sensor Tests are available:
• Rich-to-lean sensor threshold voltage
• Lean-to-rich sensor threshold voltage

- Low sensor voltage for switch time
- High sensor voltage for switch time
- Rich-to-lean sensor switch time
- Lean-to-rich sensor switch time
- Minimum sensor voltage test cycle
- Maximum sensor voltage test cycle
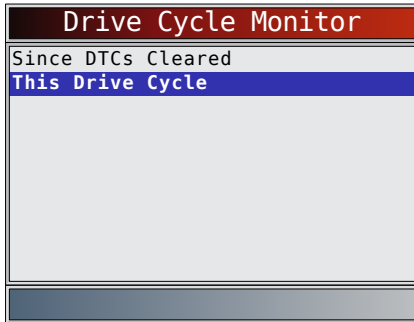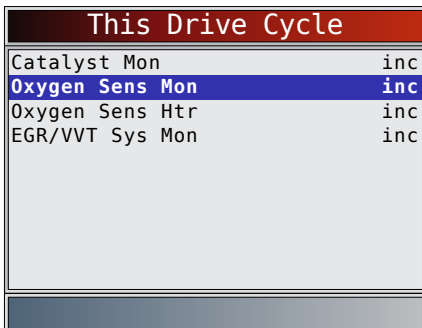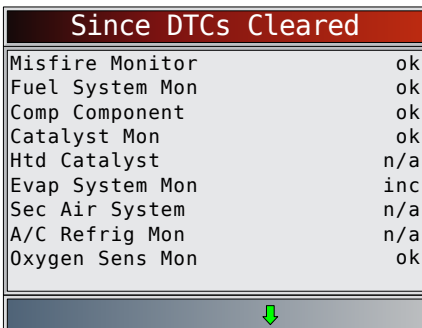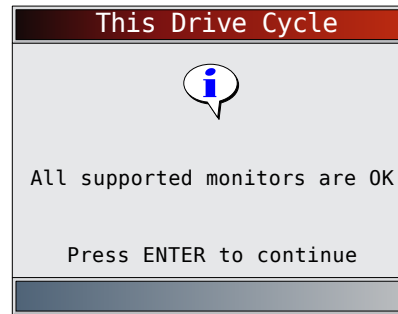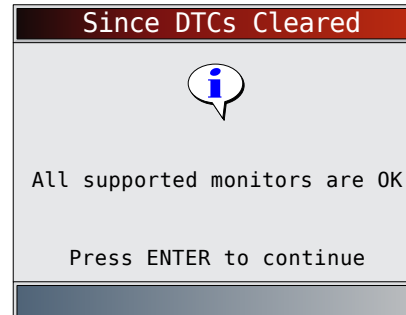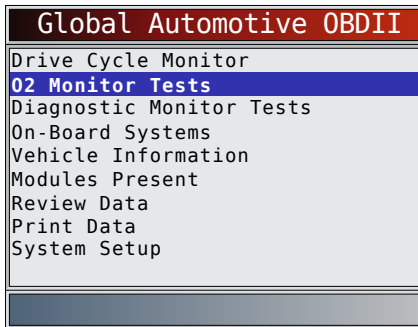- Time between sensor transitions
- Sensor period
- Manufacturer specific tests

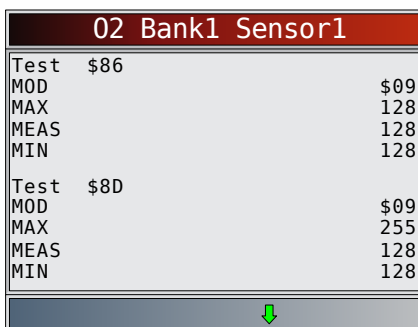From **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **O2 Monitor Tests**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **O2 Monitor Tests** is highlighted.
   - Press `ENTER`.

```
Global Automotive OBDII
Drive Cycle Monitor
O2 Monitor Tests
Diagnostic Monitor Tests
On-Board Systems
Vehicle Information
Modules Present
Review Data
Print Data
System Setup
```

2. Select O2 sensor.
   - Use the ▲ **UP** and ▼ **DOWN** keys until the desired O2 monitor is highlighted.
   - Press `ENTER`.

```
Select O2 Sensor
O2 Bank1 Sensor1
```
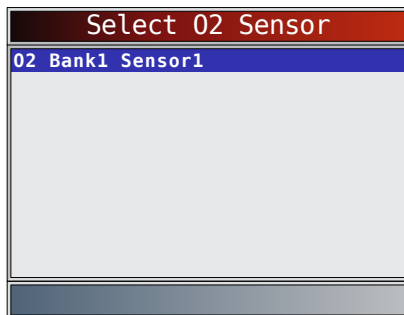
- The O2 sensors located upstream (before catalyst) may perform differently than ones located downstream (after catalyst).
- Test IDs are shown for unknown O2 sensor tests.

3. View results of selection.
   - Use the ▲ **UP** and ▼ **DOWN** keys.

```
O2 Bank1 Sensor1
Test  $86
MOD                    $09
MAX                    128
MEAS                   128
MIN                    128

Test  $8D
MOD                    $09
MAX                    255
MEAS                   128
MIN                    128
```

4. Return to **O2 Sensor Tests** menu.
   - Press `BACK`.
5. Return to **HD OBD** menu or **Global Automotive OBDII** menu.
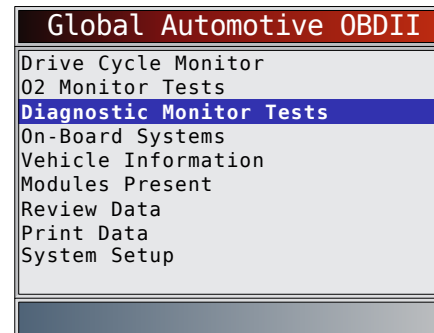   - Press `BACK`.

6.11 Diagnostic Monitor Tests

The **Diagnostic Monitor Test** function is useful after servicing or after erasing a vehicle's memory. Test results do not necessarily indicate a faulty component or system.

- Non-CAN vehicles **Diagnostic Monitor Test** receives test results for emission-related powertrain components and systems that are not continuously monitored.
- CAN vehicles **Diagnostic Monitor Test** receives test results for emission-related powertrain components and systems that are and are not continuously monitored.
- Vehicle manufacturer is responsible for assigning test and component IDs.
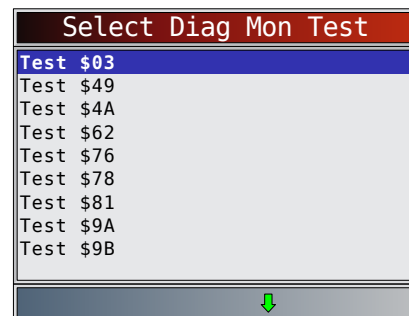
From **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **Diagnostic Monitor Tests**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Diagnostic Monitor Tests** is highlighted.
   - Press `ENTER`.

```
Global Automotive OBDII
Drive Cycle Monitor
O2 Monitor Tests
Diagnostic Monitor Tests
On-Board Systems
Vehicle Information
Modules Present
Review Data
Print Data
System Setup
```

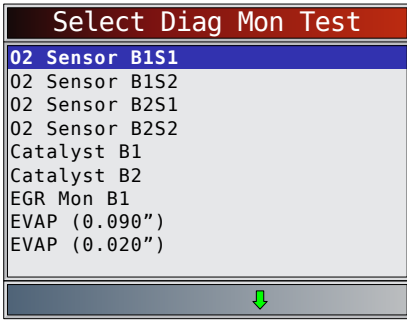- Applicable diagnostic monitor tests are displayed.

2. Review test results displayed on scan tool.
   - Use the ▲ **UP** and ▼ **DOWN** keys until desired result is highlighted.
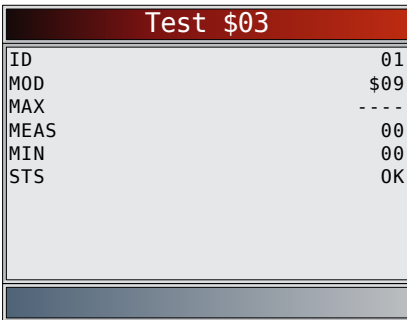   - Press `ENTER`.

   Non-CAN Vehicles

```
Select Diag Mon Test
Test $03
Test $49
Test $4A
Test $62
Test $76
Test $78
Test $81
Test $9A
Test $9B
```

Refer to appropriate vehicle service manual for test IDs and definitions.

CAN Vehicles

```
┌─────────────────────────────────┐
│     Select Diag Mon Test        │
├─────────────────────────────────┤
│ O2 Sensor B1S1                  │
│ O2 Sensor B1S2                  │
│ O2 Sensor B2S1                  │
│ O2 Sensor B2S2                  │
│ Catalyst B1                     │
│ Catalyst B2                     │
│ EGR Mon B1                      │
│ EVAP (0.090")                   │
│ EVAP (0.020")                   │
│                                 │
│               ⇩                 │
└─────────────────────────────────┘
```
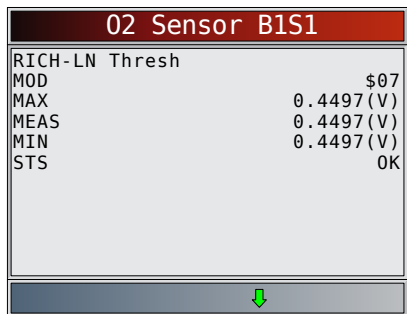
On Non-CAN vehicles the scan tool displays:
- Test data (test ID)
- Maximum value (MAX)
- Test measurements (MEAS)
- Minimum value (MIN)
- Status (STS)
- Measurements and Specification values are hexadecimal numbers (i.e., $1A, $FE, $11.)
- Module (MOD)

```
┌─────────────────────────────────┐
│           Test $03              │
├─────────────────────────────────┤
│ ID                          01  │
│ MOD                        $09  │
│ MAX                        ---- │
│ MEAS                        00  │
│ MIN                         00  │
│ STS                         OK  │
│                                 │
│                                 │
│                                 │
└─────────────────────────────────┘
```

- On CAN vehicles scan tool displays:
  - Test performed. The test performed can be $## if test is not defined. Refer to vehicle service manual for details.
  - Measured values and units of measured (such as volts, amps, and seconds).
  - Status of monitor test data.
  - Module ID where the monitor test data came from.

```
┌─────────────────────────────────┐
│         O2 Sensor B1S1          │
├─────────────────────────────────┤
│ RICH-LN Thresh                  │
│ MOD                        $07  │
│ MAX                  0.4497(V)  │
│ MEAS                 0.4497(V)  │
│ MIN                  0.4497(V)  │
│ STS                         OK  │
│                                 │
│               ⇩                 │
└─────────────────────────────────┘
```

3. Return to **Select Test** menu.
   - Press BACK.
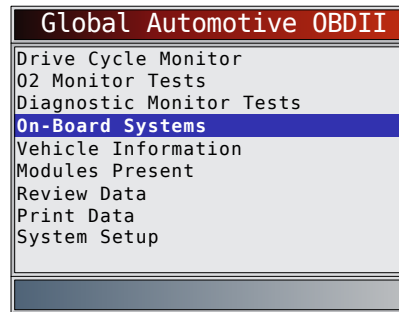4. Return to **Special Tests Menu**.
   - Press BACK.

6.12 On-Board Systems

The **On-Board Systems** test allows the scan tool to control operation of vehicle components, tests or systems.
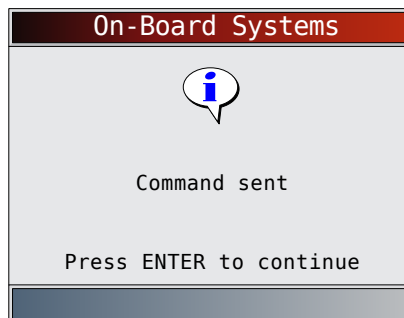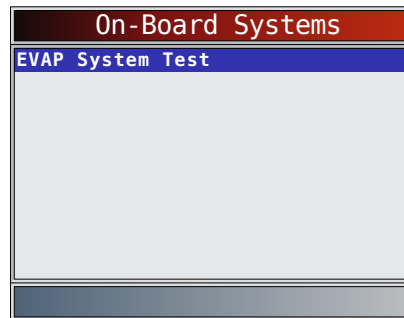
- Some manufacturers do not allow tools to control vehicle systems. A vehicle not supporting an on-board system is identified by a message that is displayed when selected.
- Refer to the vehicle service manual for on-board systems instructions.
- The manufacturer is responsible for determining the criteria to automatically stop test. Refer to appropriate vehicle service manual.

From **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **On-Board Systems**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **On-Board Systems** is highlighted.
   - Press ENTER.

```
┌─────────────────────────────────┐
│     Global Automotive OBDII     │
├─────────────────────────────────┤
│ Drive Cycle Monitor             │
│ O2 Monitor Tests                │
│ Diagnostic Monitor Tests        │
│ On-Board Systems                │
│ Vehicle Information             │
│ Modules Present                 │
│ Review Data                     │
│ Print Data                      │
│ System Setup                    │
│                                 │
└─────────────────────────────────┘
```

- A list of on-board systems and components available for testing are shown on the display.

2. Select test.
   - Use the ▲ **UP** and ▼ **DOWN** keys until desired test is highlighted.
   - Press ENTER.

```
┌─────────────────────────────────┐
│        On-Board Systems         │
├─────────────────────────────────┤
│ EVAP System Test                │
│                                 │
│                                 │
│                                 │
│                                 │
│                                 │
│                                 │
│                                 │
└─────────────────────────────────┘
```

```
┌─────────────────────────────────┐
│        On-Board Systems         │
├─────────────────────────────────┤
│              (i)                │
│                                 │
│                                 │
│         Command sent            │
│                                 │
│                                 │
│      Press ENTER to continue    │
│                                 │
└─────────────────────────────────┘
```

3. Return to **On-Board Systems** menu.

- Press ENTER.
4. Return to **HD OBD** menu or **Global Automotive OBDII** menu.
   - Press BACK.

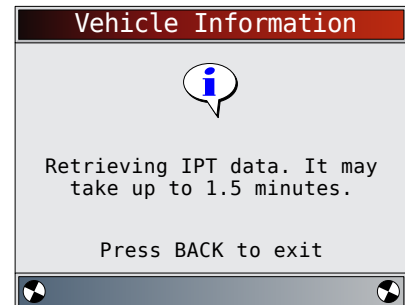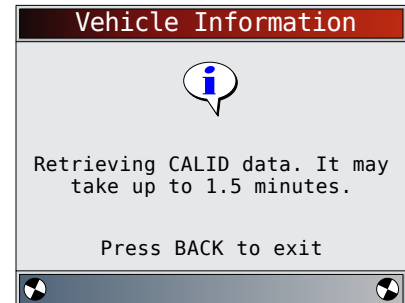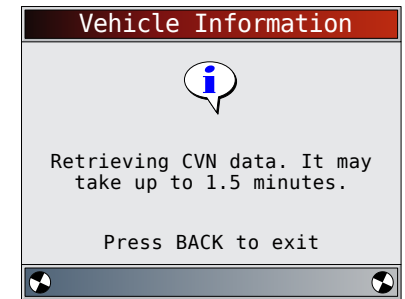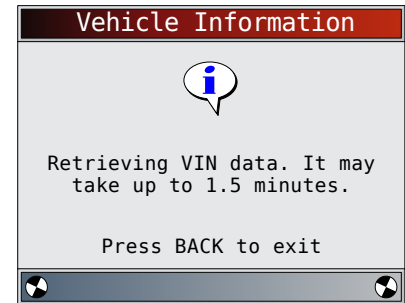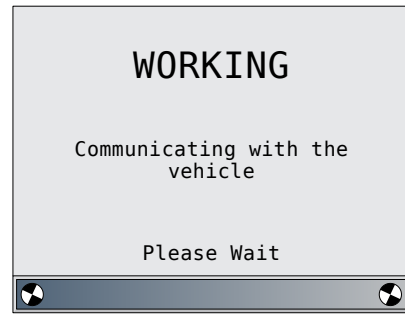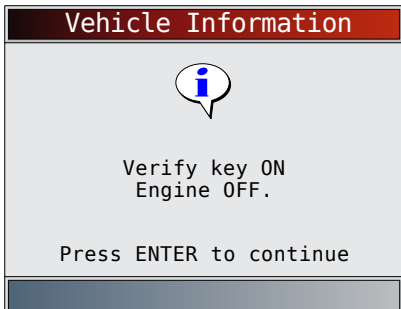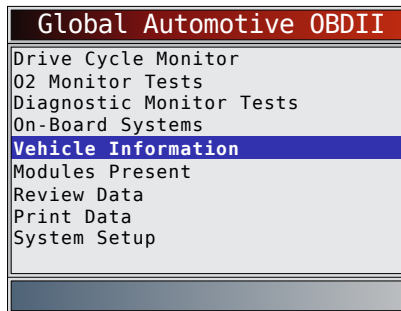## 6.13 Vehicle Information

The **Vehicle Information** function allows the scan tool to request the vehicle's VIN number, calibration ID(s) which identifies software version in vehicle control module(s), calibration verification numbers (CVN(s)) and in-use performance tracking.
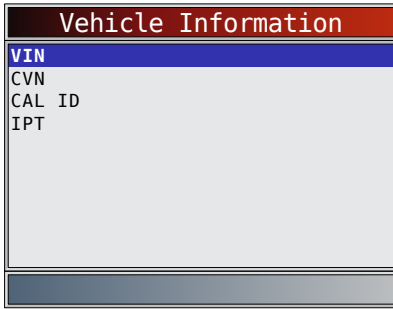
- **Vehicle Information** function applies to model year 2000 and newer OBD II compliant vehicles.
- The scan tool cannot verify if data is correct for scanned vehicles.
- CVNs are calculated values required by OBD II regulations.
- The CVN calculation may take several minutes.
- CVNs are reported to determine if emission-related calibrations have been changed. Multiple CVNs may be reported for a control module.
- In-use performance tracking tracks performance of key I/M Monitors.

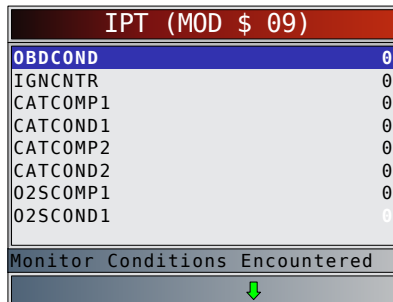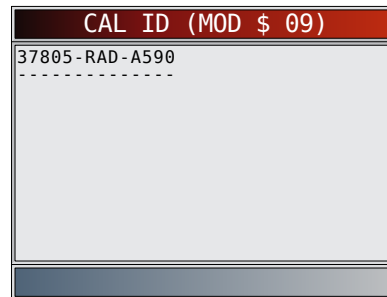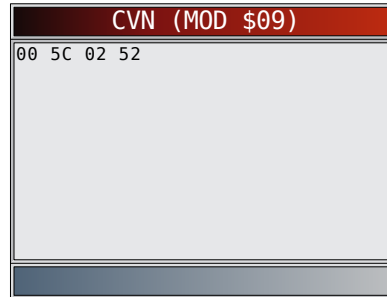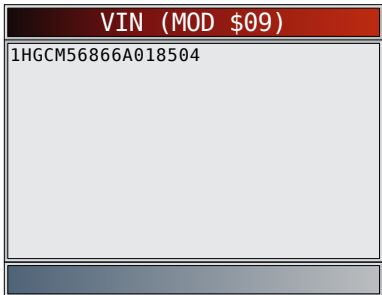From **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **Vehicle Information**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Vehicle Information** is highlighted.
   - Press ENTER.

```
Global Automotive OBDII
Drive Cycle Monitor
O2 Monitor Tests
Diagnostic Monitor Tests
On-Board Systems
Vehicle Information
Modules Present
Review Data
Print Data
System Setup
```

```
Vehicle Information
           (i)

   Verify key ON
   Engine OFF.

Press ENTER to continue
```

```
WORKING

Communicating with the
       vehicle


   Please Wait
```

```
Vehicle Information
           (i)

Retrieving VIN data. It may
  take up to 1.5 minutes.

   Press BACK to exit
```

```
Vehicle Information
           (i)

Retrieving CVN data. It may
  take up to 1.5 minutes.

   Press BACK to exit
```

```
Vehicle Information
           (i)

Retrieving CALID data. It may
  take up to 1.5 minutes.

   Press BACK to exit
```

```
Vehicle Information
           (i)

Retrieving IPT data. It may
  take up to 1.5 minutes.

   Press BACK to exit
```

2. Select information to view from the menu.
   - Use the ▲ **UP** and ▼ **DOWN** keys until desired selection is highlighted.
   - Press ENTER.

```
┌──────────────────────────────────┐
│      Vehicle Information          │
├──────────────────────────────────┤
│ VIN                              │
│ CVN                              │
│ CAL ID                           │
│ IPT                              │
│                                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```

- If the selected menu item has data for more than one module, a menu listing all modules returning data for that menu item is shown.

3. View information supported by vehicle.
   - Use the ▲ **UP** and ▼ **DOWN** keys (if required).

```
┌──────────────────────────────────┐
│       VIN (MOD $09)               │
├──────────────────────────────────┤
│ 1HGCM56866A018504                │
│                                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```

```
┌──────────────────────────────────┐
│       CVN (MOD $09)               │
├──────────────────────────────────┤
│ 00 5C 02 52                      │
│                                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```

```
┌──────────────────────────────────┐
│      CAL ID (MOD $ 09)            │
├──────────────────────────────────┤
│ 37805-RAD-A590                   │
│ ---------------                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```

```
┌──────────────────────────────────┐
│       IPT (MOD $ 09)              │
├──────────────────────────────────┤
│ OBDCOND                       0  │
│ IGNCNTR                       0  │
│ CATCOMP1                      0  │
│ CATCOND1                      0  │
│ CATCOMP2                      0  │
│ CATCOND2                      0  │
│ O2SCOMP1                      0  │
│ O2SCOND1                         │
├──────────────────────────────────┤
│ Monitor Conditions Encountered   │
│              ↓                   │
└──────────────────────────────────┘
```

- In the above examples, Module $09 returned data. Scroll down to view information. CVNs are shown as hexadecimal numbers.
- Abbreviations and names for in-use performance tracking data supported by the Tool are shown below. Not all data is supported by all vehicles.
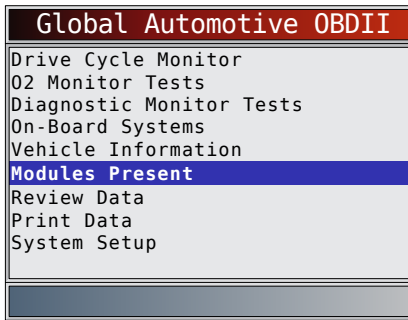
Abbreviated Name	Expanded Name
In-Use Perf Tracking	In-Use Performance Tracking
OBDCOND	OBD Monitoring Conditions Encountered Counts
IGNCNTR	Ignition Counter
CATCOMPX	Catalyst Monitor Completion Counts Bank x
CATCONDX	Catalyst Monitor Conditions Encountered Counts Bank x
O2SCOMPX	O2 Sensor Monitor Completion Counts Bank x
O2SCONDX	O2 Sensor Conditions Encountered Counts Bank x
EGRCOMP	EGR Monitor Completion Condition Counts
EGRCOND	EGR Monitor Conditions Encountered Counts
AIRCOMP	AIR Monitor Completion Condition Counts (Secondary Air)
AIRCOND	AIR Monitor Conditions Encountered Counts (Secondary Air)
EVAPCOMP	EVAP Monitor Completion Condition Counts
EVAPCOND	EVAP Monitor Conditions Encountered Counts

- If message INVALID displays on screen, the data returned from the vehicle is incorrect, or is not formatted in accordance with OBD II specifications.

4. Return to **Vehicle Information** menu.
   - Press BACK.
5. Return to **HD OBD** menu or **Global Automotive OBDII** menu.
   - Press BACK.
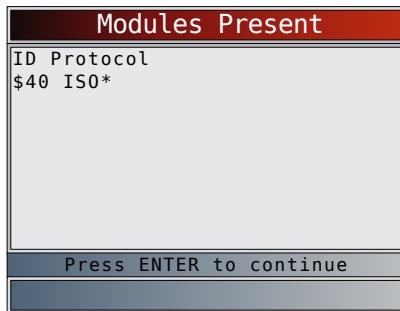
6.14 Modules Present

The scan tool identifies the module IDs and communication type for all Global OBD II modules in the vehicle. From the **HD OBD** menu or **Global Automotive OBDII** menu:

1. Select **Modules Present**.
   - Use the ▲ **UP** and ▼ **DOWN** keys until **Modules Present** is highlighted.
   - Press ENTER.
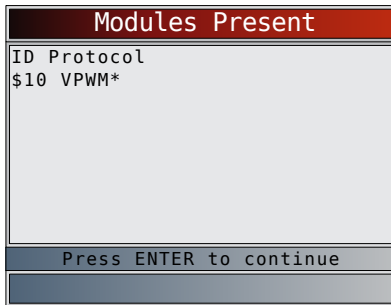
```
Global Automotive OBDII
Drive Cycle Monitor
O2 Monitor Tests
Diagnostic Monitor Tests
On-Board Systems
Vehicle Information
Modules Present
Review Data
Print Data
System Setup
```

The types of protocols (communication types) supported by the scan tool are:

*   ISO 9141-2 protocol is shown as ISO.

```
Modules Present
ID Protocol
$40 ISO*




        Press ENTER to continue
```
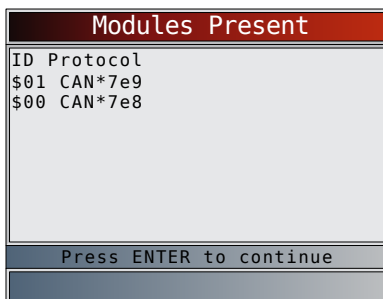
*   SAE J1850 protocol is shown as VPWM or PWM.

```
Modules Present
ID Protocol
$10 VPWM*




        Press ENTER to continue
```

OR

```
Modules Present
ID Protocol
$10 PWM*




        Press ENTER to continue
```
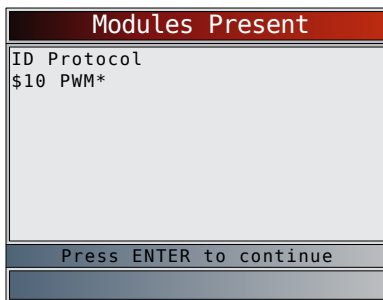
*   ISO 15765-4 protocol is shown as CAN.

```
Modules Present
ID Protocol
$01 CAN*7e9
$00 CAN*7e8




        Press ENTER to continue
```

Since CAN vehicles use module IDs larger than 2 digits, the scan tool assigns a 2 digit module ID to be used in place of the actual CAN module ID. The module ID assigned for the CAN module ID is used in all functions of the scan tool.

*   ISO 14230-4 protocol is shown as K2K (Keyword 2000).

```
Modules Present
ID Protocol
$10 K2K*




        Press ENTER to continue
```
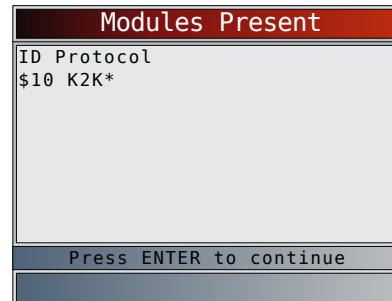
In the above examples, the * indicates the protocol used to communicate to the vehicle's control module.

7   Troubleshooting

7.1   Error Messages

Check the following if an error message displays:

*   Verify ignition key is in the ON and not in the ACCESSORIES position.
*   Make sure the DLC Cable is attached to vehicle's data link connector (DLC) and scan tool.
*   Look at DLC and check for cracked or recessed pins, or for any substance that could prevent a good electrical connection.
*   Test for continuity between the DLC wiring and the computer. In an extreme case, there may be a broken wire.
*   Check for bent or broken pins.
*   With the engine off, check for blown fuses in the vehicle fuse box.
*   Make sure the vehicle's control module has a good ground. If the computer case is grounded, then clean the connection and apply a conductive (dielectric) grease to the mating surfaces.
*   With the key on engine off (KOEO), verify vehicle battery voltage is at least 8.0V.
*   Verify the control module is not defective. Refer to the service manual to diagnose the control module.

7.2   Scan Tool Does Not Power Up

⚠ **WARNING**
Review Safety Messages on page 4 before troubleshooting.

If scan tool will not power up, communicate with vehicle control module, pass scan tool self-tests, or functions incorrectly in any other way, do the following:

*   Check and replace the batteries if needed.
*   Clean the DLC pins.

- Disconnect and reconnect DLC making sure it is connected correctly.
- Check vehicle battery to make sure at least 8.0 volts is present.
- Contact customer service.
- With the engine off, check for blown fuses in the vehicle fuse box.

7.3 Vehicle Communication Fault

The vehicle's control module(s) enters into an unrecoverable state.

1. Turn vehicle key to off position.
   - Wait 10 seconds.
   - Press ENTER.

```
┌─────────────────────────────────┐
│        Vehicle Required         │
│                                 │
│               (i)               │
│                                 │
│    Please verify the tool is    │
│  connected to the vehicle with  │
│   the ignition key turned on.   │
│                                 │
│    Press ENTER to continue      │
│                                 │
└─────────────────────────────────┘
```

7.4 Operating Error or Erroneous Data

An Operating Error or Erroneous Data occurs if vehicle's computer(s) stop(s) communicating with the scan tool.

1. Make selection.
   - Use the ◄ **LEFT** and ► **RIGHT** keys.
   - Press ENTER.

```
┌─────────────────────────────────┐
│         LINK  ERROR             │
│                                 │
│      Check connection! Try      │
│             again?              │
│                                 │
│     [ Yes ]         [ No ]      │
│                                 │
└─────────────────────────────────┘
```

7.5 Battery Replacement

The scan tool requires 4-AAA alkaline batteries to operate without vehicle power.

- When the batteries need to be replaced, the low-battery icon (🔋) is displayed.
- Rechargeable batteries do not last as long as alkaline types and are not recommended.
- Non-rechargeable Lithium (Li) battery can be used. Lithium types last longer than the alkaline types, but they are more expensive.

1. Place display face-down on a non-abrasive surface.
2. Remove battery cover by turning phillips screw counterclockwise. Slide battery cover off.
3. Remove batteries and properly discard.
4. Install four new AAA Alkaline batteries.

5. Reinstall battery cover by sliding battery cover on. Install phillips screw turning it clockwise. Do not overtighten screw.

7.6 Tool Self-Tests

Tool Self-Tests check the display, keys, and internal memory.

- Refer to "4 Using the Scan Tool" on page 10 for the operation procedures for scan tool self-tests.

7.7 Technical Support

Toll-Free Number: 1-855-267-2483.

8 Appendix A—Global OBD II PID Definitions

Although there are in excess of 300 PIDs, the tool only displays the PIDs the vehicle supports.

PID	PID Description
ABS FRP	Absolute Fuel Rail Pressure
ABS LOAD	Absolute Load Value
ABS TPS B, C	Throttle Position B, C
ABSLT TPS	Absolute Throttle Position
ACC POS D	Accelerator Pedal D, E, F
ACC POS REL	Relative Accelerator Pedal Position
AECD1_TIME1, TIME 2	Total Run Time with EI-AECD #1 Timer 1 Active, #2 Timer Active
AECD10_TIME1, TIME 2	Total Run Time with EI-AECD #10 Timer 1 Active, #2 Timer Active
AECD11_TIME1, TIME 2	Total Run Time with EI-AECD #11 Timer 1 active, #2 Timer Active
AECD12_TIME1, TIME 2	Total Run Time with EI-AECD #12 Timer 1 active, #2 Timer Active
AECD13_TIME1, TIME 2	Total Run Time with EI-AECD #13 Timer 1 active, #2 Timer Active
AECD14_TIME1, TIME 2	Total Run Time with EI-AECD #14 Timer 1 active, #2 Timer Active
AECD15_TIME1, TIME 2	Total Run Time with EI-AECD #15 Timer 1 active, #2 Timer Active
AECD16_TIME1, TIME 2	Total Run Time with EI-AECD #16 Timer 1 active, #2 Timer Active
AECD17_TIME1, TIME 2	Total Run Time with EI-AECD #17 Timer 1 active, #2 Timer Active

PID	PID Description
AECD18_TIME1, TIME 2	Total Run Time with EI-AECD #18 Timer 1 active, #2 Timer Active
AECD19_TIME1, TIME 2	Total Run Time with EI-AECD #19 Timer 1 active, #2 Timer Active
AECD2_TIME1, TIME 2	Total Run Time with EI-AECD #2 Timer 1 Active, #2 Timer Active
AECD20_TIME1, TIME 2	Total Run Time with EI-AECD #20 Timer 1 active, #2 Timer Active
AECD3_TIME1, TIME 2	Total Run Time with EI-AECD #3 Timer 1 Active, #2 Timer Active
AECD4_TIME1, TIME 2	Total Run Time with EI-AECD #4 Timer 1 Active, #2 Timer Active
AECD5_TIME1, TIME 2	Total Run Time with EI-AECD #5 Timer 1 Active, #2 Timer Active
AECD6_TIME1, TIME 2	Total Run Time with EI-AECD #6 Timer 1 Active, #2 Timer Active
AECD7_TIME1, TIME 2	Total Run Time with EI-AECD #7 Timer 1 Active, #2 Timer Active
AECD8_TIME1, TIME 2	Total Run Time with EI-AECD #8 Timer 1 Active, #2 Timer Active
AECD9_TIME1, TIME 2	Total Run Time with EI-AECD #9 Timer 1 Active, #2 Timer Active
ALCOHOL	Alcohol Fuel Percent
BARO PRS	Barometric Pressure
BAT_PWR	Hybrid Battery Pack Remaining Life
BP_A_ACT, B_ACT	Boost Pressure Sensor A, Sensor B
BP_A_CMD, B_CMD	Commanded Boost Pressure A, Pressure B
BP_A_STAT, B_STAT	Boost Pressure A Control Status, B Control Status
CACT 11, 12	Charge Air Cooler Temperature Bank 1 Sensor 1 supported, Sensor 2 supported
CACT 21,22	Charge Air Cooler Temperature Bank 2 Sensor 1 supported, Sensor 2 supported
CALC LOAD	Calculated Engine Load
CAT TEMP11, TEMP12	Catalitic Converter Temp Bank1, Temp Bank 3
CAT TEMP21, TEMP22	Catalitic Converter Temp Bank2, Temp Bank 4
CLR DIST	Distance since erase
CLR TIME	Minutes Run since Erase
CLR TRPS	Warmups Since Erase
CMD EQ RAT	Commanded Equivalence Ratio
COOLANT	Engine Coolant Temp
DPF_REG_AVGD	Average Distance Between DPF Regen
DPF_REG_AVGT	Average Time Between DPF Regen
DPF_REG_STAT	Diesel Particulate Filter (DPF) Regen Status
DPF_REG_TYP	Diesel Particulate Filter (DPF) Regen Type
DPF_REGEN_PCT	Normalized Trigger for DPF Regen
DPF1_DP, DPF2_DP	Diesel Particulate Filter (DPF) Bank 1 Delta Pressure Bank 2 Delta Pressure
DPF1_INP, DPF2_INP	Diesel Particulate Filter (DPF) Bank 1 Inlet Pressure, Bank 2 Inlet Pressure
DPF1_INT, DPF2_INT	DPF Bank 1 Inlet Temperature Sensor, Bank 2 Inlet Temperature Sensor

PID	PID Description
DPF1_OUTP, DPF2_OUTP	Diesel Particulate Filter (DPF) Bank 1 Outlet Pressure, Bank 2 Outlet Pressure
DPF1_OUTT, DPF2_OUTT	DPF Bank 1 Outlet Temperature Sensor, Bank 2 Outlet Temperature Sensor
ECT 1, 2	Engine Coolant Temperature 1, Temperature 2
EGR CMD	Comanded EGR
EGR ERR	Exhaust Gas Recirculation Error
EGR_A_ACT, B_ACT	Actual EGR A Duty Cycle / Position, B Duty Cycle / Position
EGR_A_CMD, B_CMD	Commanded EGR A Duty Cycle / Position, B Duty Cycle / Position
EGR_A_ERR, B_ERR	EGR A Error, B Error
EGRT 11, 21	Exhaust Gas Recirculation Temperature Bank 1 Sensor 1, Bank 2 Sensor 1
EGRT 12, 22	Exhaust Gas Recirculation Temperature Bank 1 Sensor 2, Bank 2 Sensor 2
EGT 11, 21	Exhaust Gas Temperature (EGT) Bank 1 Sensor 1, Bank 2 Sensor 1
EGT 12, 22	Exhaust Gas Temperature (EGT) Bank 1 Sensor 2, Bank 2 Sensor 2
EGT 13, 23	Exhaust Gas Temperature (EGT) Bank 1 Sensor 3, Bank 2 Sensor 3
EGT 14, 24	Exhaust Gas Temperature (EGT) Bank 1 Sensor 4, Bank 2 Sensor 4
EMIS_SUP	Emission requirements to which vehicle is designed
ENG RUN	Time Since Engine Start
ENG SPEED	Engine RPM
EOT	Engine Oil Temperature
EP_1, 2	Exhaust Pressure Sensor Bank 1, Bank 2
EQ RATIO	Equivalence Ratio
EVAP PURGE	Commanded EVAP Purge
EVAP VP	EVAP Vapor Pressure
EVAP VPA	Absolute EVAP Vapor Pressure
FRP_A, B	Fuel Rail Pressure A, B
FRP_A_CMD, B_CMD	Commanded Fuel Rail Pressure A, B
FRT_A, B	Fuel Rail Temperature A, B
FUEL LEVEL	Fuel Level Input
FUEL PRES	Fuel Rail Pressure
FUEL SYS 1, 2	Fuel System 1 Loop Status, System 2 Loop Status
FUEL TYPE	Fuel Type
FUEL_RATE	Engine Fuel Rate
FUEL_TIMING	Fueling Injection Timing
GPL_STAT	Glow Plug Lamp Status
IAF_A_CMD, B_CMD	Commanded Intake Air Flow A Control, B Control
IAF_A_REL, B_REL	Relative Intake Air Flow A Position, B Position
IAT	Intake Air Temp
IAT 11, 21	Intake Air Temperature Sensor Bank 1 Sensor 1, Bank 2 Sensor 1
IAT 12, 22	Intake Air Temperature Sensor Bank 1 Sensor 2, Bank 2 Sensor 2

PID	PID Description
IAT 13, 23	Intake Air Temperature Sensor Bank 1 Sensor 3, Bank 2 Sensor 3
ICP_A, B	Injection Control Pressure A, B
ICP_A_CMD, B_CMD	Commanded Injection Control Pressure A, B
IDLE_TIME	Total Idle Run Time
IGN ADV	Timing Advance
LAMBDA11, 21	02 Sensor Lambda Bank 1 Sensor 1, Bank 2 Sensor 1
LAMBDA12, 22	02 Sensor Lambda Bank 1 Sensor 2, Bank 2 Sensor 2
LT FTRM1	Long Term Fuel Trim 1 or 3
LT FTRM2	Long Term Fuel Trim 2 or 4
LT SEC FT1, 2, 3, 4	Long Term Secondary O2 Sensor Fuel Trim 1, 2, 3, 4
MAF, A, B	Mass Air Flow, A, B
MAP, A, B	Manifold Absolute Pressure, A, B
MIL DIST	MIL_DIST
MIL STATUS	Malfunction Indicator Lamp
MIL TIME	Minutes Run by MIL activated
MST	Manifold Surface Temperature
N/D_STAT	Auto Trans Neutral Drive Status
N/G_STAT	Manual Trans Neutral Gear Status
NNTE_Stat	NOx NTE control area status
NOX 11, 21	NOx Sensor Concentration Bank 1 Sensor 1, Bank 2 Sensor 1
NOX 12,22	NOx Sensor Concentration Bank 1 Sensor 2, Bank 2 Sensor 2
NOX LEVEL HI, HI1, HI2, HI3, HI4	SCR inducement system actual state 10K history HI1 (0-10000 km), 10K history HI2 (10000-20000 km), 10K history HI3 20000-30000 km), 10K history HI4 (30000-40000 km): NOx emission too high
NOX_ADS_DESUL	NOx Adsorber Desulfurization Status
NOX_ADS_REGEN	NOx Adsorber Regen Status
NWI_TIME	Total Run Time by the Engien whicle NOx warning mode is activated
O2S	O2 Voltage or Current indicates Bank/Sensor
O2S11_PCT, O2S21_PCT	02 Sensor Concentration Bank 1 Sensor 1, Bank 2 Sensor 1
O2S12_PCT, O2S22_PCT	02 Sensor Concentration Bank 1 Sensor 2, Bank 2 Sensor 2
OBD2 STAT	OBD Status
OUT TEMP	Ambient Air Temp
PM 11, PM 21	PM Sensor Mass Concentration Bank 1 Sensor 1, Bank 2 Sensor 1
PNTE_Stat	PM NTE control area status
PTO STATUS	PTO Status
PTO_STAT	Power Take Off (PTO) Status
PTO_TIME	Total Run Time With PTO Active
REAG_DEMD	Average Demanded Reagent Consumption
REAG_LVL	Reagent Tank Level
REAG_RATE	Average Reagent Consumption
REL FRP	Relative Fuel Rail Pressure

PID	PID Description
REL TPS	Relative Throttle Position
RUN_TIME	Total Engine Run Time
SCR REAG DEV, DEV1, DEV2, DEV3, DEV4	SCR inducement system actual state 10K history DEV1 (0 - 10000 km), 10K history DEV2 (10000 - 20000 km), 10K history DEV3 (20000 - 30000 km), 10K history DEV4 (30000 - 40000 km): deviation of reagent consumption
SCR REAG LOW, LOW1, LOW2, LOW3, LOW4	SCR inducement system actual state 10K history LOW1 (0 - 10000 km), 10K history LOW2 (10000 - 20000 km), 10K history LOW3 (20000 - 30000 km), 10K history LOW4 (30000 - 40000 km): reagent level too low
SCR REAG WRONG, WRONG1, WRONG2, WRONG3, WRONG4	SCR inducement system actual state 10K history WRONG1 (0 - 10000 km), 10K history WRONG2 (10000 - 20000 km), 10K history WRONG3 (20000 - 30000 km), 10K history WRONG4 (30000 - 40000 km): incorrect reagent
SCR SYS ACTIVE	SCR inducement system actual state: inducement system active
SCR_DIST_1D	Distance travelled in current 10K block (0 - 10000 km)
SCR_DIST_1N, 2N, 3N, 4N	Distance travelled while inducement system active in current 10K block 1N (0 - 10000 km), 20K block 2N (10 - 20000 km), 30K block 3N (20 - 30000 km), 40K block 4N (30 - 40000 km)
SECOND AIR	Secondary Air Status
ST FTRM	Fuel Trim Bank/Sensor
ST FTRM1, 3	Short Term Fuel Trim1 or 3
ST FTRM2, 4	Short Term Fuel Trim2 or 4
ST SEC FT1, 2, 3, 4	Short Term Secondary O2 Sensor Fuel Trim 1, 2, 3, 4
TAC_A_CMD, B_CMD	Commanded Throttle Actuator A Control, B Control
TAC_A_REL, B_REL	Relative Throttle A Position, B Position
TCA_CINP, TCB_CINP	Turbocharger Compressor Inlet Pressure Sensor A, Pressure Sensor B
TCA_CINT, TCB_CINT	Turbocharger A Compressor Inlet Temperature, Turbocharger B
TCA_COUTT, TCB_COUTT	Turbocharger A Compressor Outlet Temperature, Turbocharger B
TCA_RPM, TCB_RPM	Turbocharger A RPM, B RPM
TCA_TOUTT, TCB_TOUTT	Turbocharger A Turbine Outlet Temperature, Turbocharger B
TCA_TINT, TCB_TINT	Turbocharger A Turbine Inlet Temperature, Turbocharger B
THROT CMD	Commanded Throttle Actuator Control
TP G	Absolute Throttle Position G
TQ_ACT	Actual Engine - Percent Torque
TQ_DD	Driver's Demand Engine - Percent Torque
TQ_MAX1, MAX2, MAX3, MAX4, MAX5	Engine percent torque at idle point 1, 2, 3, 4, 5
TQ_REF	Engine Reference Torque
TROUB CODE	Code causing the Freeze Frame

PID	PID Description
VEH SPEED	Vehicle Speed
VGT_A_ACT	Variable geometry turbo A position
VGT_A_ACT, B_ACT	Variable Geometry Turbo A Position, Turbo B
VGT_A_CMD	Commanded variable geometry turbo A position
VGT_A_CMD, B_CMD	Commanded Variable Geometry Turbo A Position, Turbo B
VGT_A_STAT	Variable geometry turbo A control status
VGT_A_STAT, B_STAT	Variable Geometry Turbo A Control Status, Turbo B
VGT_B_ACT	Variable geometry turbo B position
VGT_B_CMD	Commanded variable geometry turbo B position
VGT_B_STAT	Variable geometry turbo B control status
VPWR	Control Module Voltage
WG_A_ACT	Wastegate A position
WG_A_ACT, B_ACT	Wastegate A Position, B Position
WG_A_CMD	Commanded wastegate A control
WG_A_CMD, B_CMD	Commanded Wastegate A Control, B Control
WG_B_ACT	Wastegate B position
WG_B_CMD	Commanded wastegate B control

9 Appendix B—Glossary

A/C:
Air conditioner

A/C clutch relay:
The PCM uses this relay to energize the A/C clutch, turning the A/C compressor on or off.

A/C pressure sensor:
Measures air conditioning refrigerant pressure and sends a voltage signal to the PCM.

A/C pressure switch:
A mechanical switch connected to the A/C refrigerant line. The switch is activated (sending a signal to the PCM) when the A/C refrigerant pressure becomes too low or high.

A/D:
Analog to digital

A/F:
Air/Fuel ratio. The proportion of air and fuel delivered to the cylinder for combustion. For example, an A/F ratio of 14:1 denotes 14 times as much air as fuel in the mixture. Ideally the A/F ratio is 14.7:1.

ABS:
Anti-lock crake system

Accel:
Accelerator

Acssry:
Accessory

Actuator:
Actuators such as relays, solenoids, and motors allow the PCM to control the operation of vehicle systems.

Air Injection Reaction (AIR) System:
An emission control system operated by the PCM. During cold starts, an air pump injects outside air into the exhaust manifold to help burn hot exhaust gases. This reduces pollution and speeds warm-up of oxygen sensors and catalytic converters. After the engine is warm, the air will either be dumped back to the atmosphere (or into the air cleaner assembly) or sent to the catalytic converter.

Adp:
Adaptive

AFT:
Aftertreatment

AFT 1:
Aftertreatment 1

AFT 2:
Aftertreatment 2

Alt:
Alternator

AP:
Absolute pressure

APP:
Acceleration pedal position (sensor)

Appl:
Application

ASR:
Acceleration slip regulation

Assm:
Assembly

Aux:
Auxiliary

Avail:
Available

Avg:
Average

Bank x:
The standard way of referring to the bank of cylinders containing cylinder #x. In-line engines have only one bank of cylinders. Most commonly used to identify the location of oxygen sensors. See O2S, Sensor x, Sensor x.

BAP:
Barometic absolute pressure

Baro:
Barometric

BARO:
Barometric pressure sensor. See MAP sensor.

Batt:
Battery

BBV:
Brake boost vacuum (sensor)

BCM:
Body control module

Boost control solenoid:
A solenoid that is energized by the PCM, in order to control turbo/supercharger boost pressure.

Brake switch signal:

An input signal to the PCM indicating that the brake pedal is being pressed. This signal is typically used to disengage cruise control systems and torque converter clutch (TCC) solenoids. See also TCC.

Cal:
Calibration

Calc:
Calculated

CAM:
Camshaft position sensor. Sends a frequency signal to the PCM to synchronize fuel injector and spark plug firing.

Catalytic converter:
Designed to reduce exhaust emissions.

CAN:
Controller area network

CARB:
California air resources board. Governing body for emissions control in California.

CC:
Cruise control

Cfg:
Configuration

Chnl:
Channel

Circ:
Circuit

CKP REF:
Crankshaft position reference.

CKP:
Crankshaft position. See CPS.

CKT:
Circuit

Clnt:
Coolant

Closed loop (CL):
A feedback system that uses the O2 Sensor(s) to monitor the results of combustion. Based on the signal(s) from the O2 sensor(s), the PCM modifies the air/fuel mixture to maintain optimum performance with lowest emissions. In closed loop mode, the PCM can fine tune control of a system to achieve an exact result.

Cmd:
Command

Cmn:
Common

CMP:
Camshaft position sensor

CO:
Carbon monoxide; odorless gas produced by incomplete combustion.

Code scanner:
A device that interfaces with and communicates information via a data link.

Cont:
Continuous

Continuous memory codes:
See pending codes.

CPS:
Crankshaft position sensor. Sends a frequency signal to the PCM. It is used to reference fuel injector operation and synchronize spark plug firing on distributorless ignition systems (DIS).

Ctrl:
Control

CTS:
Coolant temperature sensor. A resistance sensor that sends a voltage signal to the PCM indicating the temperature of the coolant. This signal tells the PCM whether the engine is cold or warm.

CVRTD:
Continuous variable real time damping

Cyl:
Cylinder

D/R:
Drive/reverse

Data Link Connector (DLC):
Connector providing access and/or control of the vehicle information, operating conditions, and diagnostic information. Vehicles with OBD II use a 16-pin connector located in the passenger compartment.

Data stream:
The actual data communications sent from the vehicle's PCM to the data connector.

Decel:
Deceleration

Dem:
Demand

DEPS:
Digital engine position sensor.

Des:
Desired

Detonation:
See knock.

Dev:
Deviation

DI/DIS:
Direct Ignition/Distributorless Ignition System. A system that produces the ignition spark without the use of a distributor.

Diff:
Differential

Dist:
Distance

DP:
Particulate

DPF:
Diesel particulate filter

DPFE:
Differential pressure feedback-exhaust gas recirculation sensor

Drvr:
Driver

DTC:

Diagnostic trouble code. An alphanumeric identifier for a fault condition identified by the on board diagnostic system.

Duty Cycle:
A term applied to signals that switch between on and off. Duty cycle is the percentage of time the signal is on. For example, if the signal is on only one fourth of the time, then the duty cycle is 25%. The PCM uses duty cycle type signals to maintain precise control of an actuator.

EBCM:
Electronic brake control module

EBTCM:
Electronic brake/traction control module

ECM:
Engine control module or electronic control module

Eco:
Economy

ECT:
Engine coolant temperature sensor. See CTS.

EEPROM:
Electrically erasable programmable read only memory

EFE:
Early fuel evaporation

EFI:
Electronic fuel injection. Any system where a computer controls fuel delivery to the engine by using fuel injectors.

EGR:
Exhaust gas recirculation. The PCM uses the EGR system to recirculate exhaust gases back into the intake manifold to reduce emissions. EGR is used only during warm engine cruise conditions.

Eng:
Engine

EOP:
Engine oil pressure (switch)

EOT:
Engine oil temperature (sensor)

EPA:
Environmental protection agency

Equip:
Equipment

ESC:
Electronic spark control. An ignition system function that warns the PCM when knock is detected. The PCM then retards spark timing to eliminate the knocking condition.

Est:
Estimated

EST:
Electronic spark timing. An ignition system that allows the PCM to control spark advance timing. The PCM determines optimum spark timing from sensor information — engine speed, throttle position, coolant temperature, engine load, vehicle speed, Park/Neutral switch position, and knock sensor condition.

EVAP:
Evaporative emissions system

Exh:
Exhaust

FC:
Fan control

Fltr:
Filter

Freeze frame:
A block of memory containing DTCs of the vehicle operating conditions for a specific time.

Freq:
Frequency

Frict:
Friction

FTP:
Federal test procedure. Strict test of vehicle's emissions.

Gen:
Generator

Ground (GND):
An electrical conductor used as a common return for an electric circuit(s) and with a relative zero potential (voltage).

Hall effect sensor:
Any of a type of sensor utilizing a permanent magnet and a transistorized Hall Effect switch. Hall Effect type sensors may be used to measure speed and position of the crankshaft or camshaft — for spark timing and fuel injector control.

HO2S:
Heated oxygen sensor. See O2S.

HRes:
High Resolution

Htr:
Heater

HVAC:
Heating, ventilation, & air conditioning (system)

Hydr:
Hydraulic

I/M:
Inspection and maintenance. An emission control program.

IAC:
Idle air control. A device mounted on the throttle body which adjusts the amount of air bypassing a closed throttle so that the PCM can control idle speed.

IAT:
Intake air temperature (sensor)

ICM:
Ignition control module.

Id:
Identification

Id:
Identifier

Ign:
Ignition

IMRC:
Intake manifold runner control

Inj:
Injector

Inp:
Input
Inst:
Instant
Intk:
Intake
IPC:
Instrument panel cluster
ISC:
Idle speed control. A small electric motor mounted on the throttle body and controlled by the PCM. The PCM can control idle speed by commanding the ISC to adjust its position.
ISO:
International Organization of Standardization also know as International Standards Organization.
JStick:
Joystick
KAM:
Keep alive memory
Knock sensor (KS):
Used to detect engine detonation or knock. The sensor contains a piezoelectric element and is threaded into the engine block. Special construction makes the element sensitive only to engine vibrations associated with detonation.
Knock:
Uncontrolled ignition of the air/fuel mixture in the cylinder. Also referred to as detonation or ping. Knock indicates extreme cylinder pressures or "hotspots" that are causing the air/fuel mixture to detonate prematurely.
KOEO:
Key ON engine OFF. Turn the ignition key to on, but don't start the engine.
KOER:
Key ON engine running. Start the vehicle.
LCD:
Liquid crystal display
LT:
Long-term
LTFT:
Long term fuel trim
Lvl:
Level
M/T:
Manual transmission or manual transaxle.
MAF:
Mass air flow (sensor). Measures the amount and density of air entering the engine and sends a frequency or voltage signal to the PCM. The PCM uses this signal in its fuel delivery calculations.
MAP:
Manifold absolute pressure (sensor). Measures intake manifold vacuum or pressure and sends a frequency or voltage signal (depending on sensor type) to the PCM. This gives the PCM information on engine load for control of fuel delivery, spark advance, and EGR flow.
MAT:

Manifold air temperature (sensor). A resistance sensor in the intake manifold that sends a voltage signal to the PCM indicating the temperature of the incoming air. The PCM uses this signal for fuel delivery calculations.
Max:
Maximum
Mgt:
Management
MIL:
Malfunction indicator lamp. The MIL is most commonly known as the check engine or service engine soon light. A required on-board indicator to alert the driver of an emission-related malfunction.
Min:
Minimum
Misfire:
Caused by the air fuel ratio being incorrect.
Monitor:
A test performed by the on-board computer to verify proper operation of emission-related systems or components.
MPFI or MFI:
Multi-port fuel injection. MPFI is a fuel injection system using one (or more) injector(s) for each cylinder. The injectors are mounted in the intake manifold, and fired in groups rather than individually.
Neu:
Neutral
Nom:
Nominal
NOx:
Oxides of nitrogen. The system EGR and Camshafts injects exhaust gases into the intake manifold to reduce these gases at the tailpipe.
O2S:
Oxygen sensor. Generates a voltage of 0.6 to 1.1 volts when the exhaust gas is rich (low oxygen content). The voltage changes to 0.4 volts or less when the exhaust gas is lean (high oxygen content). This sensor only operates after it reaches a temperature of approximately 349ºC (660ºF). O2 sensors are usually found both upstream and downstream of the catalytic converter. The PCM uses these sensors to fine tune the air-fuel ratio and to monitor the efficiency of the catalytic converter. See Bank 1, Bank 2, Sensor 1, Sensor 2.
OBD II:
On-board diagnostics, second generation. OBD II is a U.S. Government-mandated standard requiring all cars and light trucks to have a common data connector, connector location, communication protocol, DTCs and code definitions. OBD II first appeared on vehicles in late 1994, and is required to be present on all cars sold in the US after January 1, 1996.
ODM:
Output device monitor
OP:
Operating
Open loop (OL):

A control system mode that does not monitor the output to verify if the desired results were achieved. A fuel delivery system usually operates in open loop mode during cold engine warm-up because the oxygen sensors are not yet ready to send a signal. Without the oxygen sensor signal, the computer cannot check the actual results of combustion.

Out:
Output

PCM:
Powertrain control module. The brains of the engine and transmission control systems housed in a metal box with a number of sensors and actuators connected via a wiring harness. Its job is to control fuel delivery, idle speed, spark advance timing, and emission systems. The PCM receives information from sensors, then energizes various actuators to control the engine. The PCM is also known as the ECM (engine control module).

Pct:
Percent

Pending codes:
Also referred to as continuous memory codes and maturing diagnostic trouble codes. Pending codes may be set by emission related powertrain components and systems. If the fault does not occur after a certain number of drive cycles, the code is erased from memory.

Perf:
Performance

PID:
Parameter identification. Identifies an address in memory which contains vehicle operating information.

PNP:
Park/neutral position. A switch that tells the PCM when the gear shift lever is in the park or neutral position. When in park or neutral, the PCM operates the engine in an idle mode.

Pos:
Position

Pot:
Potential

Press:
Pressure

PROM:
Programmable read-only memory. The PROM contains programming information the PCM needs to operate a specific vehicle model/engine combination.

Prop:
Propulsion

Psngr:
Passenger

PSPS:
Power steering pressure switch

PTO:
Power takeoff

Purge solenoid:
Controls the flow of fuel vapors from the carbon canister to the intake manifold. The canister collects vapors evaporating from the fuel tank, preventing them from escaping to the atmosphere and causing pollution. During warm engine cruise conditions, the PCM energizes the Purge Solenoid so the trapped vapors are drawn into the engine and burned.

PWM:
Pulse width modulated

Pwr:
Power

PZM:
Platform zone module

QDM:
Quad driver module

RAM:
Random access memory

Recirc:
Recirculation

Ref:
Reference

Regen:
Regenerative

Rel:
Relative

Relay:
An electromechanical device in which connections in one circuit are switched.

Reluctance sensor:
A type of sensor typically used to measure crankshaft or camshaft speed and/or position, driveshaft speed, and wheel speed.

Req:
Requested

Req:
Request

ROM:
Read-only memory. Permanent programming information stored inside the PCM, containing the information the PCM needs to operate a specific vehicle model/engine combination.

RPM:
Revolutions per minute

Rtrdr:
Retarder

SAE:
Society of Automotive Engineers

Scan tool:
A device that interfaces with and communicates information on a data link.

SDM:
Sensing and diagnostic module

Sensor x:
A standard term used to identify the location of oxygen sensors. Sensor 1 is located upstream of the catalytic converter. See O2S, Bank 1, Bank 2.

Sensor:
Any device that reports information to the PCM. The job of the sensor is to convert a parameter such as engine temperature into an electrical signal that the PCM can understand.

SFI or SEFI:
Sequential fuel injection or sequential electronic fuel Injection. A fuel injection system that uses one or more injectors for each cylinder. The injectors are mounted in the intake manifold and are fired individually.

Snsr:
Sensor

Solenoid:
A device consisting of an electrical coil which when energized, produces a magnetic field in a plunger, which is pulled to a central position. A solenoid may be used as an actuator in a valve or switch.

Spd:
Speed

Src:
Source

ST:
Short-term

Std:
Standard

STFT:
Short term fuel trim

Stim:
Stimulation

STS:
Service throttle soon

Sup:
Supplemental

Sw:
Switch

Sw'd:
Switched

Sys:
System

TAC:
Throttle actuator control

TBI:
Throttle body injection. A fuel injection system having one or more injectors mounted in a centrally located throttle body, as opposed to positioning the injectors close to an intake valve port. TBI is also called Central Fuel Injection (CFI) in some vehicles.

TCC:
Torque converter clutch

TCM:
Transmission control module

TCS:
Traction control system for PCM and brakes

TDC:
Top dead center. When a piston is at its uppermost position in the cylinder.

Temp:
Temperature

TFP:
Transmission fluid pressure

TFT:
Transmission fluid temperature (sensor)

Thresh:

Threshold

Throt:
Throttle

Throttle body:
A device which performs the same function as a carburetor in a fuel injection system. On a throttle body injection (TBI) system, the throttle body is both the air door and the location of the fuel injectors. On port fuel injection systems (PFI, MPFI, SFI, etc.), the throttle body is simply an air door. Fuel is not added until the injectors at each intake port are activated. In each case, the throttle body is attached to the accelerator pedal.

Torq:
Torque

Tot:
Total

TPS:
Throttle position sensor. Potentiometer-type sensor connected to the throttle shaft. Its voltage signal output increases as the throttle is opened. The PCM uses this signal to control many systems such as idle speed, spark advance, fuel delivery, etc.

Traction assist:
Assist in traction with brakes only.

Trans:
Transmission

Trip:
Vehicle operation for a period of time so the systems can be monitored.

TTS:
Transmission temperature sensor. A resistance sensor mounted in the transmission housing in contact with the transmission fluid. It sends a voltage signal to the PCM indicating the temperature of the transmission.

Turbo:
Turbocharger

Util:
Utility

VECI:
Vehicle emission control information. A decal located in the engine compartment containing information about the emission control systems found on the vehicle. The VECI is the authoritative source for determining whether a vehicle is OBD II compliant.

Veh:
Vehicle

VIN:
Vehicle identification number. This is the factory-assigned vehicle serial number. This number is stamped on a number of locations throughout the vehicle, but the most prominent location is on top of the dashboard on the driver's side, visible from outside the car. The VIN includes information about the car, including where it was built, body and engine codes, options, and a sequential build number.

VSS:
Vehicle speed sensor. Sends a frequency signal to the PCM. The frequency increases as the vehicle moves

faster to give the PCM vehicle speed information used to determine shift points, engine load, and cruise control functions.

VTD:

Vehicle theft deterrent

Vtg:

Voltage

Warm-up cycle:

Warm-up cycle is when the engine coolant temperature rises at least 40 degrees above that at engine start up.

WOT:

Wide-open throttle. The vehicle operating condition brought about when the throttle is completely (or nearly) open. The PCM typically delivers extra fuel to the engine and de-energizs the A/C compressor at this time for acceleration purposes. The PCM uses a switch or the TPS to identify the WOT condition.

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