User's Manual

CP9145
CP9150

Super AutoScanner™

Tool Information

Complete the following list using the function "**Tool Information**" on page 2-5. Provide this information when contacting customer support.

Serial No: _____

SW ID: _____

HW Ver: _____

Boot Ver: _____

Prod ID: _____

Board ID: _____

Burn Date: _____

Burn Loc: _____

Safety Precautions

For your safety, read this manual thoroughly before operating your Super AutoScanner™. 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.

Before using the scan tool**,** always refer to and follow safety messages and applicable test procedures provided by the manufacturer of the vehicle or equipment being tested.

Use equipment only as described in this manual.

Read All Instructions

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. The signal word indicates the level of the hazard in a situation.

Safety Messages

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

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

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

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

IMPORTANT — **Indicates a situation which, if not avoided, may result in damage to the test equipment or vehicle.**

Safety messages contain three different type styles.

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

Example:

Engine systems can malfunction expelling fuel, oil vapors, hot steam, hot toxic exhaust gases, acid, refrigerant and other debris. **Wear safety goggles and protective gloves, user and bystander. Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.**
Engine systems that malfunction can cause injury.

Important Safety Instructions

DANGER

Some vehicles are equipped with air bags. You must follow vehicle service manual's warnings when working around the air bag components or wiring. If the service manual's instructions are not followed, the air bag may open up unexpectedly, resulting in personal injury. Note that the air bag can still open up several minutes after the ignition key is off (or even if the vehicle battery is disconnected) because of a special energy reserve module.

Risk of electric shock.

- **Do not exceed voltage limits between inputs as indicated in the "Specifications" on page 2-2.**
- **Use extreme caution when working with circuits that have greater than 60 volts DC or 24 volts AC.**

Electric shock can cause injury.

Risk of explosion.

- **Wear safety goggles and protective clothing, user and bystander. Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.**
- **Do not use this system in environments where explosive vapor may collect, such as in below-ground pits, confined areas, or areas that are less than 18 inches above the floor.**
- **Use this equipment in locations with mechanical ventilation providing at least four 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 accidental connection between battery terminals. Do not place uninsulated metal tools on the battery.**
- **When removing battery cables, remove ground cable first.**
- **Avoid sparks when connecting or disconnecting power leads to battery.**
- **Be sure ignition is OFF, headlights and other accessories are OFF and vehicle doors are closed before disconnecting battery cables. This also helps prevent damage to on-board computer systems.**
- **Always disconnect battery ground connections before servicing electrical system components.**

Explosion can cause injury.

Risk of poisoning.

- **Use this equipment in locations with mechanical ventilation providing at least four air changes per hour. Engine exhaust contains odorless lethal gas.**
- **Route exhaust outside while testing with engine running.**

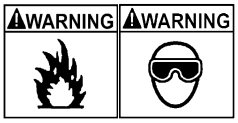
Poisoning can result in death or serious injury.

Battery acid is a highly corrosive sulfuric acid.

- **Wear safety goggles and protective gloves, user and bystander. Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.**
- **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.



Risk of fire.

- **Wear safety goggles and protective clothing, user and bystander. Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.**
- **Do not position head directly over or in front of throttle body. Do not pour gasoline down throttle body when cranking or running engine, when working with fuel delivery systems or any open fuel line. Engine backfire can occur when 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.

Risk of flying particles.

Wear safety goggles while using electrical equipment. Electrical equipment or rotating engine parts can cause flying particles.

Flying particles can cause eye injury.

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.

Risk of burns.

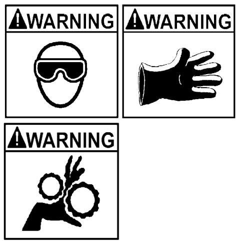
- **Do not remove radiator cap unless engine is cold. Pressurized engine coolant may be hot.**
- **Do not touch hot exhaust systems, manifolds, engines, radiators, sample probe, etc.**
- **Wear insulated gloves when handling hot engine components.**
- **Tester leads can become hot after extended testing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

Hot components can cause injury.

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

- **Wear safety goggles and protective clothing, user and bystander. Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.**
- **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.



The 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 test equipment or tools on fenders or other places in the engine compartment.**
- **Barriers are recommended to help identify danger zones in test area.**
- **Prevent personnel from walking through immediate test area.**

Contact with electrical connections and hot or moving parts can cause injury.

Risk of injury.

- **This equipment should be operated by qualified personnel only.**
- **Use this equipment only as described in this manual. Use only the manufacturer's recommended attachments.**
- **Do not operate equipment with a damaged cord or if the equipment has been dropped or damaged, until it has been examined by a qualified service representative.**

Operation of this equipment by anyone other than qualified personnel may result in injury.

Risk of unexpected vehicle movement.

- **Block drive wheels before performing a test with engine running.**
- **Unless instructed otherwise, set parking brake and put gear selector in neutral for standard transmissions or park for automatic transmissions.**
- **If vehicle has an automatic parking brake release, disconnect release mechanism for testing and reconnect when testing is completed.**
- **Do not leave a running engine unattended.**

A moving vehicle can cause injury.

Risk of equipment or circuit damage.

- **Unless specifically directed by the manufacturer, make sure the 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.

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 that all connections and data entry information are correct and that the test procedure was 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.

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Part 1 - Getting Started

The SUPER *AutoScanner*™ was developed by experts in the automotive service industry to help diagnose vehicles and assist in troubleshooting procedures. The tool will monitor vehicle events and to read codes from the computer's memory to 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.

MANUAL CONVENTIONS

This manual provides instructions to setup and use your SUPER *AUTOSCANNER*™. A glossary and application charts provide valuable reference material. Some of the information shown in text or illustrations is obtained using optional equipment. A Sales Representative can determine option availability. This section contains a list of conventions used.

Safety Messages

Refer to "**Safety Precautions**" at the beginning of this manual.

Check Note

A check note provides additional information about the subject in the preceding paragraph.

Example:

✓ Make sure the printer is turned on, on-line and connected.

Tips and Lists

Tips and lists provide information that applies to specific systems and processes. Each tip is introduced by this icon ❒ for easy identification.

Example:

❒ Use the **UP**/**DOWN** arrow keys to move up/down through the display or move the cursor (▟) to a selectable item.

Equipment Damage

Situations arise during testing that could damage the vehicle or the test equipment. The word **IMPORTANT** signals these situations.

Example:

IMPORTANT **Screens may differ slightly for vehicle make and year.**

Functions and Selections

Diagnostic and tool functions performed by the tool are highlighted in **bold**.

Example:

Select **Read Codes** and press **ENTER**.

Menus

The menus on the tool display are referenced in the procedures and are highlighted in ***bold-italic*** text.

Example:

Press the **ENTER** key to return to the ***GM Function List***.

Questions and Responses

Messages and user responses are CAPITALIZED.

Example:

Selecting NO displays a COMMAND CANCELLED message prompting you to press **ENTER** to continue back to the ***OBDII Function List***.

Manual References

Used to reference other sections of the manual. References include the "**Title**" and page number (section-page).

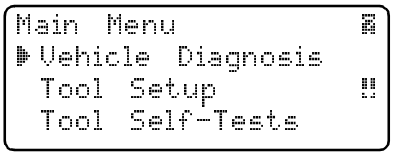
Example:

Complete the following list using the function **"Tool Information"** on page 2-5.

Screens

The screens are presented as examples and may change as the software is updated.

Example:



ON-BOARD DIAGNOSTICS

The original on-board diagnostics (OBD I) lacked consistency in communication and interface while allowing different interpretations amongst vehicle manufacturers. Ford used several types of engine control computers, Chrysler used several types of data link connectors and GM varied the trouble codes and communication protocols from year-to-year.

The following tables highlight changes for GM, Ford, and Chrysler. If this seems confusing; don't worry. Your tool makes it easy. Based on the VIN information selected during Scan Tool setup, the processor is automatically recognized. All you have to do is choose the correct adapter cable and jumper wires (if necessary). Details on adapter cables and jumper wires may be found in "**Diagnostic Link Connectors (DLC)**" on page 1-4.

GM On-Board Diagnostics

System	Years	Description
OBD I Control Module	1981–1995	Most vehicles used the 12-pin ALDL (Assembly Line Data Link) located under the dash on the driver side. Some 94-95 vehicles used the 16-pin OBD II (J1962) data link connector (DLC), but use the Historical application software. Refer to the vehicle's Vehicle Emission Control Information label.
OBD II Control Module	1994*-Present	Complies with OBD II regulations and uses the J1962 DLC.

** OBD II system used in certain 1994-1995 vehicles equipped with a 2.2L, 2.3L, 3.8L, 4.3L or 5.7L engines.*

Ford On-Board Diagnostics

System	Long Name	Years	Description
MCU	Microprocessor Control Unit	1980 –1991	Used in police vehicles, containing carbureted engines. Uses the MCU DLC.
EEC-IV	Electronic Engine Control, Fourth generation	1984 –1995	Most Ford vehicles equipped with North American engines. Uses the EEC-IV DLC.
MECS	Mazda Electronic Control System	1988 –1995	Vehicles equipped with Mazda-sourced engines. Uses MECS 6-pin and 17-pin DLCs.
EEC-V	Electronic Engine Control, Fifth generation	1994* – present	Complies with OBD II regulations and uses the OBD II J1962 DLC.
PTEC	Powertrain Electronic Controller	2000 – present	Complies with OBD II regulations and uses the OBD II J1962 DLC.

** EEC-V OBD II system used in 1994-1995 vehicles equipped with a 3.8L or 4.6L engine.*

Chrysler On-Board Diagnostics

System	Long Name	Years	Description
SMEC	Single Module Engine Controller	1989–1990	Used a 6-pin Serial Communication Interface (SCI) DLC and has bidirectional capability.
SBEC	Single Board Engine Controller	1989*–1995	Used two types of DLCs: a 6-pin SCI and a 6-pin LH series. The first to allow a tool to reset the EMR light on trucks.
OBD II PCM	OBD II Powertrain Control Module	1995**– present	Complies with OBD II regulations and uses the OBD II J1962 DLC.
JTEC	Jeep/Truck Engine Controller	1996– present	Complies with OBD II regulations and uses the OBD II J1962 DLC. The JTEC system is used on light-duty trucks and Jeeps

** In 1989, the SBEC system was installed in selected vehicles with 3.0L V6 engines.*
*** Some vehicles in 1995 were equipped with the OBD II PCM.*

OBD II stands for On-Board Diagnostics version II. OBD II is a system that the Society of Automotive Engineers (SAE) developed to standardize automotive electronic diagnosis. Technicians now can use the same tool to test any OBD II compliant vehicles without special adapters. The established SAE guidelines are:

- a universal diagnostic test connector, called the data link connector (DLC), with dedicated pin assignments.
- a standardized location for the DLC, visible under the dash on the driver's side.
- a standardized list of diagnostic trouble codes (DTCs) used by all manufacturers.
- a standardized list of parameter identification (PID) data used by all manufacturers.
- the ability of the vehicle system to record a freeze frame of the operating conditions when a fault occurs.
- expanded diagnostic capabilities that records a code whenever a condition occurs that effects vehicle emissions.
- the ability to clear stored codes from vehicle memory with the scan tool.

In addition, SAE has published hundreds of pages of text defining a standard communications protocol that establishes the 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 used will vary, depending on the vehicle.

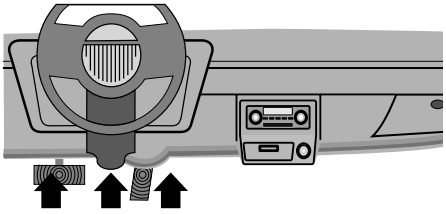
SAE publishes recommendations, not laws, but the Environmental Protection Agency (EPA) and California Air Resources Board (CARB) made many of SAE's recommendations legal requirements that vehicle manufacturers were required

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 USA. 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 USA were fully OBD II compliant.

1 DIAGNOSTIC LINK CONNECTORS (DLC)

The Data Link Connector (DLC) allows the scan tool to communicate with the vehicle's computer(s). Before OBD II, manufacturers used different data link connectors to communicate with the vehicle. The proper DLC adapter cable must be used to connect the tool to the vehicle. Also, the vehicle's DLC may be found in several different places and have many different configurations. The following describes the DLCs used by Ford, GM and Chrysler. The DLC location and types for domestic vehicles can be looked up in the charts in **"Appendix A – Data Link Connectors**" .

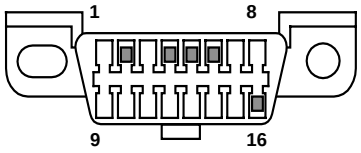
OBD II (J1962) DLC



Beginning in 1996, vehicles sold in the United States use the J1962 DLC, a term taken from a physical and electrical specification number assigned by SAE (J1962). OBD II defines the physical and electrical specification for the DLC. The DLC should be located under the dashboard on the driver 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.

Because the OBD II J1962 connector has power and ground, you only need a single cable connection to the tool for both power and tool communications. Attach the OBD II adapter cable to the extender cable, both supplied with the tool, to connect the tool. Certain pins in the connector are reserved.

1 - Manufacturer Reserved
2 - J1850 Bus+
3 - Manufacturer Reserved
4 - Chassis Ground
5 - Signal Ground
6 - CAN High, J-2284
7 - K Line, ISO 9141-2 & ISO/DIS 14230-4
8 - Manufacturer Reserved
9 - Manufacturer Reserved
10 - J1850 Bus
11 - Manufacturer Reserved
12 - Manufacturer Reserved



13 - Manufacturer Reserved
14 - CAN Low, J-2284
15 - L Line, ISO 9141-2 & ISO/DIS 14230-4
16 - Battery Power

Ford Historic (OBD I)

Since 1984, Ford used several different types of powertrain control modules (PCM). Refer to "**On-Board Diagnostics**" on page 1-2. With the proper adapter cables, your tool will be able to read these systems as well.

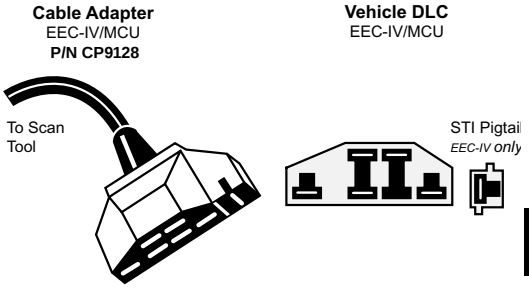
IMPORTANT **Use the Battery Power cable to provide 12V to the tool for all systems.**

EEC-IV System

The **EEC-IV** computer system uses a large six-sided connector and a pigtail connector.

MCU System

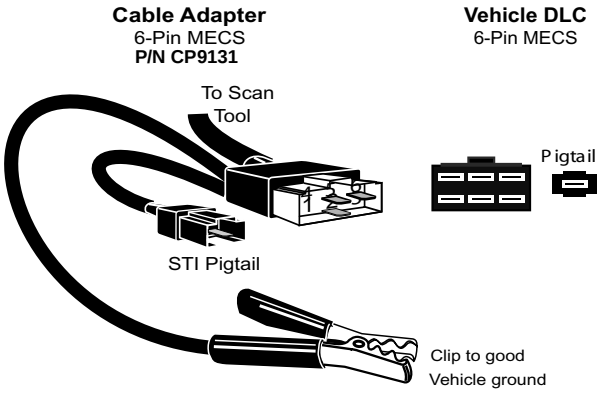
The **MCU** computer system uses the same six-sided connector, but NOT the pigtail connector. Leave the pigtail unattached.



MECS (Mazda Electronic Control System)

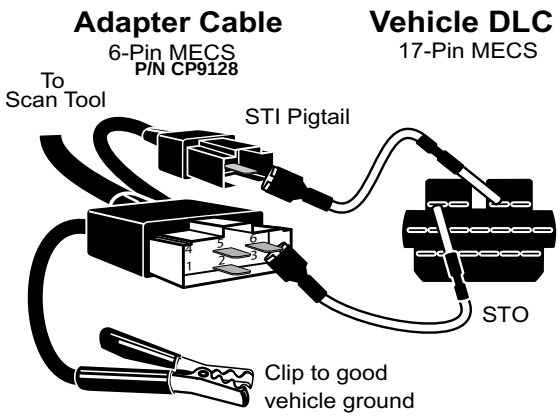
MECS vehicles (1988 –1995) use either a 6-pin (with pigtail) or a 17-pin DLC. The 6-pin MECS adapter cable and jumper wires (P/N 9131) are used to connect the tool to both DLCs. Both adapter cables are also available through your dealer.

6-Pin MECS.



17-Pin MECS

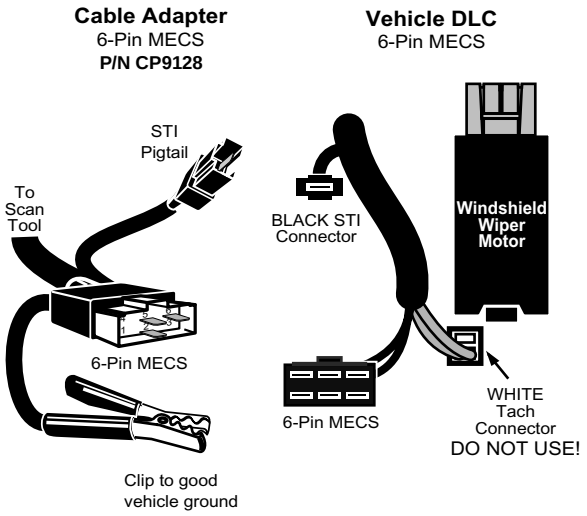
Use the 6-Pin MECS and the jumper wires.



MECS Ford Probe

IMPORTANT **Certain Probes have a WHITE TACH CONNECTOR located very close to the 6-pin Self-Test connector and bundled in the same wiring harness. This is NOT the STI (Self Test Input) Pigtail.**

Connect the pigtail to the **BLACK STI** connector located farther back on the wire harness. If the tool is connected to the **WHITE** Tach connector, serious damage will result and may void warranty. Refer to the illustration.



GM Historic (OBD I)

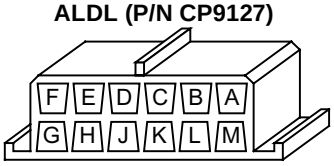
Prior to1996, most GM vehicles used the standard 12-pin Assembly Line Diagnostic Link (ALDL). Use the GM ALDL cable kit (p/n CP9127) which includes the ALDL adapter and cigarette lighter power cable for these vehicles. In 1994 & 1995, certain GM vehicles used the J1962 DLC.

IMPORTANT **Use the Battery Power cable to provide 12V to the tool.**

ALDL

The ALDL DLCs are usually located under the dashboard on the driver's side.

ALDL (P/N CP9127)



Corvettes & Fieros:

Sometimes, the DLC is located in the center console behind the ashtray. Refer to vehicle service manual for exact location. It may be in full view, or it may be recessed behind a panel. An opening in the panel should allow access to the recessed connector.

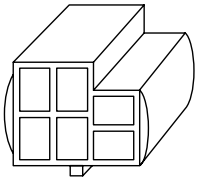
Chrysler

IMPORTANT **Use the Battery Power cable to provide 12V to the tool for both systems.**

SCI

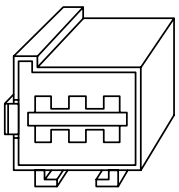
The SCI (serial communications interface) DLC is a 6-pin connector located in the engine compartment. The adapter cable to be used on these vehicles is supplied with the tool. This cable is labeled CHRY on the 15 pin DB style connector and SCI on the vehicle end.

SCI (P/N CP9129)



LH-series

LH (P/N CP9130)

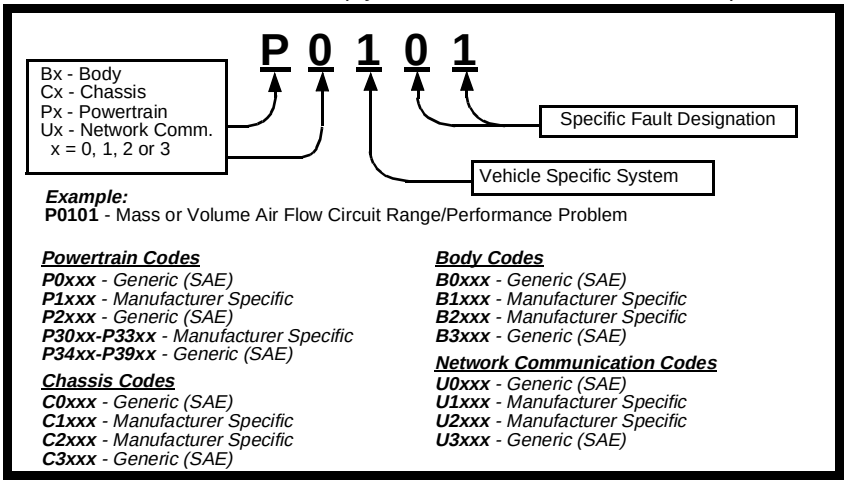


The LH-series data link connector is used on LH platform vehicles. The LH style DLC is a small, blue, rectangular 6-pin connector located in the passenger compartment below the dashboard to the right of the steering column.

The LH Adapter Cable (P/N CP91230) is optional and must be purchased separately.

DIAGNOSTIC TROUBLE CODES (DTCS)

Diagnostic Trouble Codes (DTCs) consist of a five-digit alphanumeric code. The DTC format and general code types are shown below. When the on-board computer recognizes and identifies a problem, a DTC for that fault is stored in memory. These codes are intended to help you determine the root cause of a problem.



Example:
P0101 - Mass or Volume Air Flow Circuit Range/Performance Problem

Powertrain Codes
P0xxx *- Generic (SAE)*
P1xxx *- Manufacturer Specific*
P2xxx *- Generic (SAE)*
P30xx-P33xx *- Manufacturer Specific*
P34xx-P39xx *- Generic (SAE)*

Chassis Codes
C0xxx *- Generic (SAE)*
C1xxx *- Manufacturer Specific*
C2xxx *- Manufacturer Specific*
C3xxx *- Generic (SAE)*

Body Codes
B0xxx *- Generic (SAE)*
B1xxx *- Manufacturer Specific*
B2xxx *- Manufacturer Specific*
B3xxx *- Generic (SAE)*

Network Communication Codes
U0xxx *- Generic (SAE)*
U1xxx *- Manufacturer Specific*
U2xxx *- Manufacturer Specific*
U3xxx *- Generic (SAE)*

Within each general category, the DTCs are assigned to specific ranges that cover certain vehicle systems.

Lower	Upper	Assigned DTC System
P0000	P00FF	Fuel Air Metering Auxiliary Emission Controls
P0100	P02FF	Fuel Air Metering
P0300	P03FF	Ignition System or Misfire
P0400	P04FF	Auxiliary Emission Controls
P0500	P05FF	Vehicle Speed Idle Speed Control Auxiliary Inputs
P0600	P06FF	Computer and Auxiliary Outputs
P0700	P09FF	Transmission
P0A00	P0AFF	Hybrid Propulsion
P1000	P10FF	Manufacturer Control Fuel & Air Metering, Auxiliary Emission Controls
P1100	P12FF	Manufacturer Control Fuel Air Metering
P1300	P13FF	Manufacturer Control Ignition System or Misfire
P1400	P14FF	Manufacturer Control Auxiliary emission Controls
P1500	P15FF	Manufacturer Cntrl Veh.Spd. Idle Speed Control Auxiliary Inputs

Lower	Upper	Assigned DTC System
P1600	P16FF	Manufacturer Control Auxiliary Inputs Auxiliary Outputs
P1700	P19FF	Manufacturer Control Transmission
P2000	P22FF	Fuel Air Metering Auxiliary emission Controls
P2300	P23FF	Ignition System or Misfire
P2400	P24FF	Auxiliary emission Controls
P2500	P25FF	Auxiliary Inputs
P2600	P26FF	Computer and Auxiliary Outputs
P2700	P27FF	Transmission
P2900	P32FF	Fuel Air Metering Auxiliary Emission Controls
P3300	P33FF	Ignition System or
P3400	P34FF	Cylinder Deactivation
U0000	U00FF	Network Electrical
U0100	U02FF	Network Communication
U0300	U03FF	Network Software
U0400	U04FF	Network Data

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 the definitions assigned by this specification are known as Generic OBD II codes. OBD II requires compliance of this standard, and has made it a standard for all cars, light trucks, APVs, MPVs, and SUVs sold in the U.S. Codes not reserved by the SAE are reserved for the manufacturer and referred to as Manufacturer Specific.

1 VEHICLE SERVICE INFORMATION

The following is a list of publishers who have manuals containing electronic engine control diagnostic information. Some manuals may be available at auto parts stores or your local public library. For others, you need to write for availability and pricing, specifying the make, model and year of your vehicle.

Chilton Book Company
Chilton Way
Radnor, PA 19089

Haynes Publications
861 Lawrence Drive
Newbury Park, CA 91320

Cordura Publications
Mitchell Manuals, Inc.
Post Office Box 26260
San Diego, CA 92126

Motoríst Auto Repair Manual
Hearst Company
250 W. 55th Street
New York, NY 10019

General Motors Corporation:
Buick, Cadillac, Chevrolet, GEO, GMC, Oldsmobile, & Pontiac
Helm Incorporated
Post Office Box 07130
Detroit, MI 48207

Saturn:
Adistra Corporation
c/o Saturn Publications
101 Union St.
Post Office Box 1000
Plymouth, MI 48170

Ford Motor Company:
Ford, Lincoln, & Mercury
Ford Publication Department
Helm Incorporated
Post Office Box 07150
Detroit, MI 48207

Chrysler Corporation:
Chrysler, Plymouth, & Dodge
Chrysler Motors Service Training
26001 Lawrence Avenue
Center Line, MI 48015

Suitable manuals have titles such as:

- “Electronic Engine Controls”
- “Fuel Injection and Feedback Carburetors”
- “Fuel Injection and Electronic Engine Controls”
- “Emissions Control Manual”

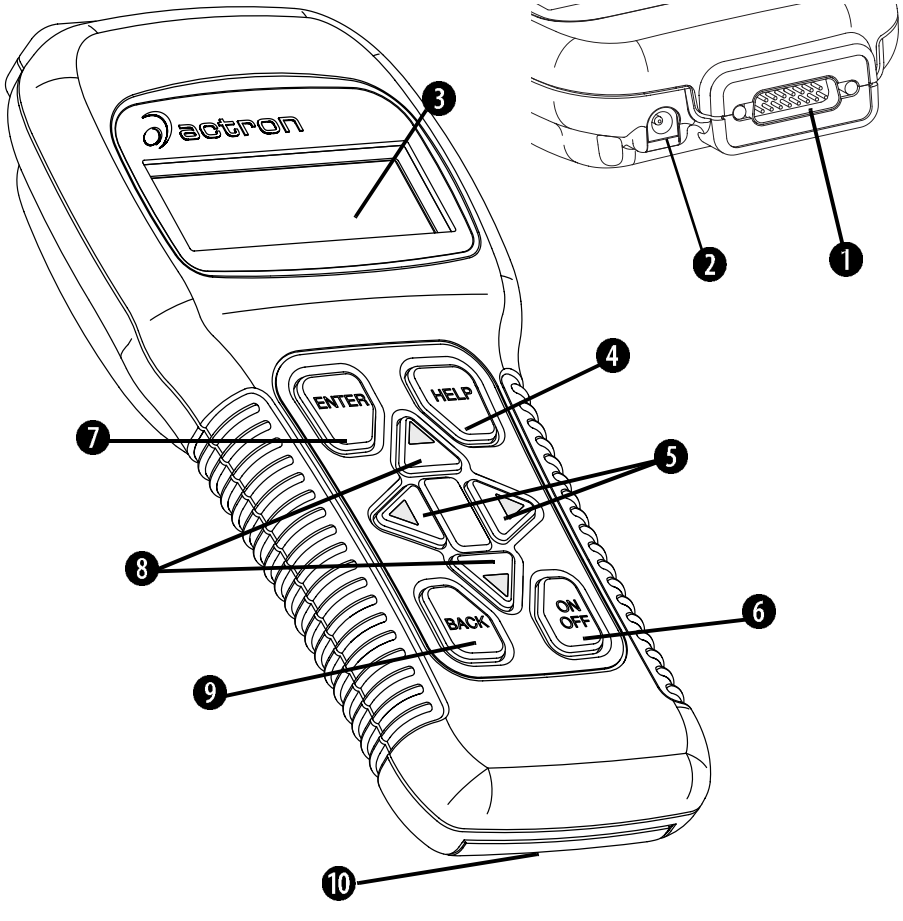
... or similar titles

Part 2 - Using The Tool

TOOL DESCRIPTION

❶ **DB15 Male Connector** – provides connection for vehicle interface and for a serial port via the RS232 Adapter (CP9119)
❷ **12V Power Jack**– provides power connection.
❸ **LCD Display** – 4 line x 20 character.
❹ **HELP key** – accesses the Help function.
❺ **LEFT/RIGHT** arrows – Select responses and moves cursor (⁘) in code lookup.
❶ **ON/OFF** key – turns power ON/OFF when not connected to vehicle.
❷ **ENTER key** – selects displayed items.
❸ **UP/DOWN arrows** – moves the selection pointer (⊪) and scrolls UP or DOWN.
❹ **BACK** key – go back to previous screens, redo selections or correct mistake.
❿ **Battery compartment**

Front of Tool



Specifications

Display: LCD, 4 line, 20 column
Operating Temperature: 0 to 50°C (-32 to 122°F)
Storage Temperature: -20 to 70°C (-4 to 158°F)
Internal Power: 9V cell (Type 6LR61)
External Power: 10.0 to 15.5 Volts

✓ Most vehicle control modules require at least 8.0 V to operate properly.

Power Dissipation: 3.5 Watts maximum

Dimensions:	**Height**	**Width**	**Length**
	1.563"	4.5"	9.125"
	40 mm	114 mm	232 mm

Weight: 33.1oz (918 g)

Accessories

	CP9145	**CP9150**
Standard 8 ft Extender Cable	Included	Included
Battery Power Cable	Optional	Included
– includes cigarette lighter adapter		
– includes CP9118 Battery Clip Adapter		
Adapter Cables:		
– Standard OBD II (J1962) cable	Included	Included
– CP9127 GM ALDL cable kit	Optional	Included
– CP9128 Ford EEC-IV/MCU cable kit	Optional	Included
– CP9129 Chrysler SCI cable kit	Optional	Included
– 9605 Chrysler LH cable kit	Optional	Optional
– 9603 Ford MECS cable kit	Optional	Optional
CP9119 RS232 Adapter	Optional	Optional

Optional / Replacement Parts are available from the following:

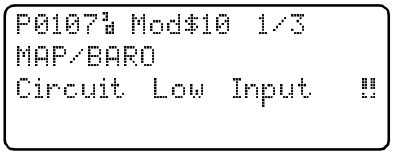
- dealer where you originally purchased your tool.
- manufacturer contact customer service at **1-800-228-7667** (8:00 – 6:00 EST Monday – Friday) or send an email to **tech_support@actron.com**.

Display

The tool uses a 4 line by 20 character, Liquid Crystal Display (LCD). The large viewing area displays Help messages, instructions, and diagnostic information.

Five characters help you navigate and operate the tool:

- appears in upper right corner of display to indicate Help is available.
- identifies the selection.
- indicates additional information is available on the next screen.
- indicates additional information is available on the previous screen.
- Low battery symbol will appear in bottom right-hand corner of the screen at power-up if the internal batteries need replacement or are not installed.
- identifies Pending DTCs in the Global OBD II Read Codes function.



Keyboard

The tool's software is designed for ease in operating and navigating through menus. Do not use solvents such as alcohol to clean the keypad or display. Use a mild nonabrasive detergent and a soft cotton cloth. Do not soak the keypad as water might find its way inside the tool.

Power

✓ Refer to "**Tool Does Not Power Up**" on page 7-1 if you encounter problems.

Internal Battery Power

The tool contains a 9V battery that provides power for remote printing and tool programing. Press and hold down the **ON**/**OFF** key for at least one second to turn ON the tool. Each time the tool is powered up, the voltage of the batteries is checked. If the voltage is low, the Low Battery Symbol ( ) displays on the screen. Replace batteries using the instructions provided in "**Battery Replacement**" on page 7-3.

Power must be provided through the data link connector or 12V power jack. A message displays if power is not connected.

```
You Must Plug Tool
  Into Vehicle DLC
For This Operation
Press ENTER to Cont
```

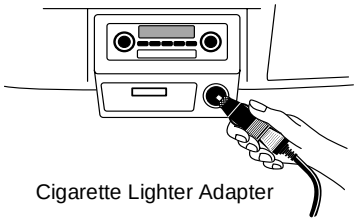
✓ If tool is stored for long periods, remove the batteries to prevent electrolyte leakage from damaging the battery compartment.

✓ To conserve the battery, the scan tool turns Off after 2 minutes.

Vehicle Power

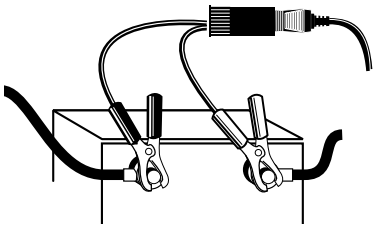
When using the OBD II J1962 or Chrysler LH adapter cables, the power to the tool comes from vehicle Data Link Connector (DLC). The other adapter cables do not provide power to the tool. In these cases, power can be provided from the cigarette lighter, an accessory plug, or the vehicle battery using battery clip adapters. Refer to "**Diagnostic Link Connectors (DLC)**" on page 1-4.

Some vehicle cigarette lighters are not powered when the ignition is in the OFF position. Therefore, you may wish to use battery clip adapters.



Cigarette Lighter Adapter

CP9118 Battery Clip Adapter (optional)



AC Power Adapter

An AC power adapter can be used to power the tool. The tool is equipped to accept any 110 Vac - 12 Vdc wall adapter with the following specifications:

- 300 mA minimum current unregulated wall power adapter.
- Adapter Dimensions:5.5 mm Outside Diameter
- 2.5 mm Inside Diameter
- The Inside Tip is positive (+).

SCAN TOOL OPERATION

To diagnose a vehicle, connect the DLC and power adapter (if applicable) to the scan tool. Refer to "**Diagnostic Link Connectors (DLC)**" on page 1-4 of **Getting Started**.

If you just want to power up the tool to do its self-tests, code lookup, review or printing data from the last vehicle tested, then you do not need to attach the cable to the Data Link Connector. The internal battery provides power for this.

Tool Power-Up

Connect the tool to the vehicle using the appropriate DLC and power connections.

When the tool powers up, a series of messages display on the screen beginning with a "Welcome" screen and ending with a "Key Button Help" screen. If you wish to review the key button definitions, push the **HELP** key; otherwise, press **ENTER** to continue.

Tool Navigation

User Interface

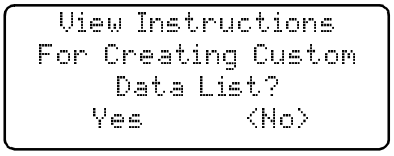
All menu and lists are intuitive and operate the same way.

- ❒ Use the **UP**/**DOWN** arrow keys to move up/down through the display or move the cursor (▶) to a selectable item.
- ❒ Press the **ENTER** key to select the function or item.
- ❒ To return to previous screens, press the **BACK** key.
- ❒ This information can be viewed on the tool by pressing the **HELP** key after powering up the tool.

If a list or message contains more than four lines, an arrow icon displays on the last column of the display to indicate the scrolling direction available: up (⇞) or down (⇟). Use the **UP**/**DOWN** arrow keys to move line-by-line through the display. When the bottom of the list is reached, then only the ⇞ displays. At the top of the list, only the ⇟ displays.

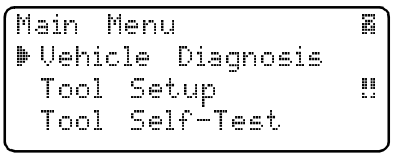
User Responses

The tool may ask a question which requires a YES or NO response — brackets (< >) enclose the default one. To accept the default choice, press the **ENTER** key. To change the answer, use the **LEFT**/**RIGHT** arrow keys to move the brackets to another response and press **ENTER**.



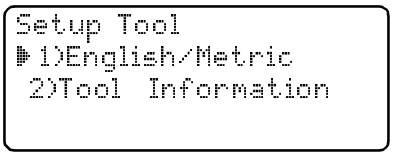
Tool Setup

Tool Setup allows you to change the measurement units and display tool information. The settings remain until the internal battery becomes discharged.



Measurement Units

To change the measurement units, use the **UP**/**DOWN** arrow keys to select **English/Metric** and press **ENTER**.



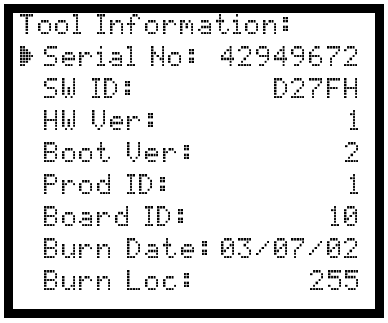
In the ***Measurement Units*** menu, select **English** or **Metric** and then press **ENTER**. English is the default.

Press **ENTER** again to return to the ***Setup Tool*** menu.

Tool Information

This function allows you to view specific tool information that may be needed when contacting customer service. Select **Tool Information** with the **UP**/**DOWN** arrow keys and press **ENTER**.

The information shown to the right displays on the screen. Use the **UP**/**DOWN** arrow keys to view all the lines.



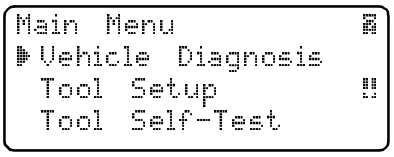
Press the **BACK** or **ENTER** key to return to the ***Setup Tool*** menu.

✓ Write this information in the space provided on the inside of the front cover.

Vehicle Selection

When the tool powers up, the “Key Button Help” screen is followed by a ***Main Menu*** screen.

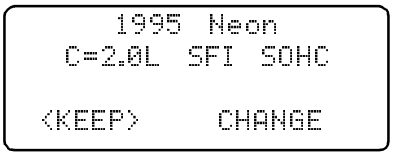
Pick **Vehicle Diagnosis** to begin Vehicle Selection.



If there is a previous vehicle present, the tool displays that vehicle. You can choose the last vehicle selected or setup for a new vehicle. The tool retains all data retrieved from the last vehicle selected until any of the following occurs:

- ❒ A new vehicle is selected
- ❒ Battery is dead or disconnected
- ❒ Tool is flash programmed to update software
- ❒ The last vehicle selected is kept but you choose Erase Data

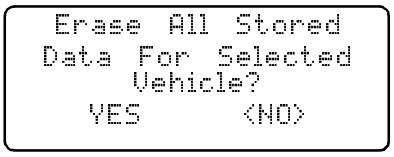
You can either keep the previously selected vehicle or change it. If changing the vehicle, press the **RIGHT** arrow key and press **ENTER**. Otherwise, press **ENTER** to keep the current one.



Keep Current Vehicle

The next screen asks if you want to erase the stored data. The default is NO.

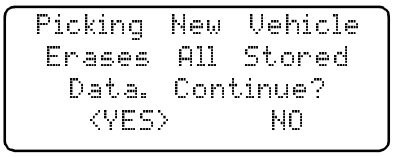
After pressing **ENTER**, the function list displays.



Changing the Vehicle

Changing vehicles erases all data stored in the tool. The default is YES.

Press **ENTER** to continue.



2

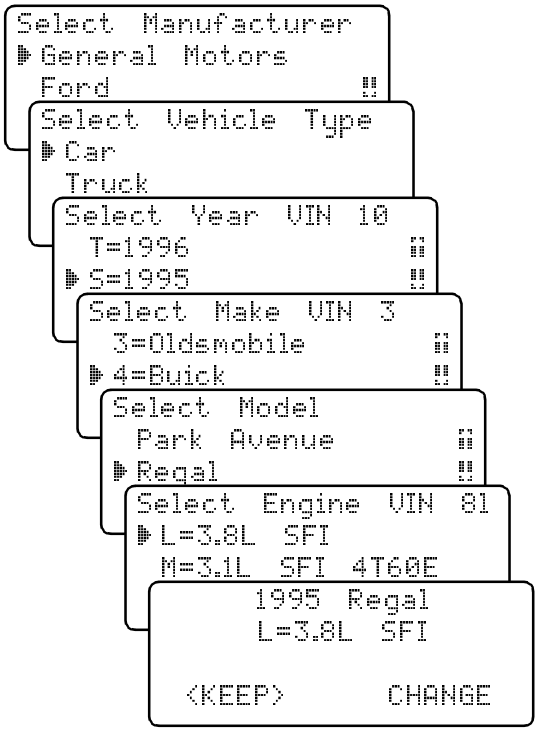
Four Vehicle Options are available: General Motors, Ford, Chrysler and Global OBD II. Global OBD II does not require additional information and takes you directly to the function list. The other three require additional information so that the tool and vehicle can communicate. For example, select GENERAL MOTORS.

The menus provide a list of choices and reference the vehicle's VIN where applicable. The VIN is visible from outside the vehicle by looking through the base of the front windshield at the top of the dashboard on the driver's side. Because manufacturers use different VIN schemes, the tool will indicate which digit of the VIN to locate for information such as Year, Make and Engine.

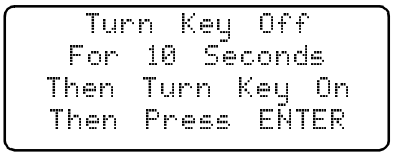
Use **UP**/**DOWN** arrow keys to move through the list.

If you make a mistake, press the **BACK** key to return to the previous menu.

At the last screen, press **ENTER**.



If a message displays, follow the instructions then press **ENTER**.



✓ Vehicles manufactured from 2000 to present automatically use Global OBD II Diagnostics even if GM, Ford or Chrysler was selected.

Part 3 - Global OBD II Diagnostics

This section covers all OBD II compliant vehicles. Non OBD II vehicles manufactured by GM, Ford and Chrysler are covered in Parts 5, 6 and 7, respectively.

✓ If an **Operating Error** message displays, refer to "**Error Messages**" on page 7-2 and check the following :

- ❒ make sure the OBD II connector is securely attached, and the ignition key is ON. Cycle the ignition key to OFF for 10 seconds, then ON. This may be required to reset the computer. If required, select YES to try again.
- ❒ the vehicle fails to link because it does not support OBD II diagnostics. Check the emissions label on the vehicle for OBD II compliance.

✓ On the initial link to the vehicle, the scan tool checks the status of the **I/M Monitors** and displays it regardless of the function selected.

I/M READINESS

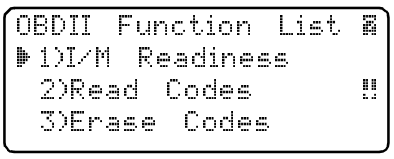
The **I/M Readiness** (Inspection and Maintenance) function displays the state of the vehicle's OBD II Monitors. Monitors are tests designed to verify the operation of emission related systems or components and detect out-of-range values. The vehicle may have to be operated under certain driving conditions to initiate a monitor. If the vehicle loses electrical power or codes are erased, the monitors may be cleared. This function can be performed with the key ON — engine OFF (KOEO) or key ON — engine Running (KOER).

The abbreviations and names for the OBD II Monitors supported by this tool are shown in the following list. They are required by the U.S. Environmental Protection Agency (EPA). Not all monitors are supported by all vehicles.

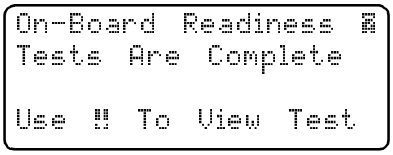
Abbreviated Name	Expanded Name
Misfire Monitor	Misfire Monitor
Fuel System Mon	Fuel System Monitor
Com Component	Comprehensive Components Monitor
Catalyst Mon	Catalyst Monitor
Htd Catalyst	Heated Catalyst Monitor
Evap System Mon	Evaporative System Monitor
Sec Air System	Secondary AIR System Monitor
A/C Refrig Mon	Air Conditioning Refrigerant Monitor
Oxygen Sens Mon	Oxygen Sensor Monitor
Oxygen Sens Htr	Oxygen Heater Sensor Monitor
EGR System Mon	Exhaust Gas Recirculation System Monitor

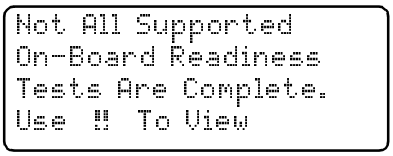
The vehicle may support more than one type of I/M Readiness. The first type shows the status of the monitors since the DTCs were last erased. They are displayed under the heading ***SINCE DTCs CLEARED***. The second type shows the status of the monitors since the start of the current drive cycle, and are displayed under the heading ***THIS DRIVING CYCLE***. If the monitors are not supported for ***THIS DRIVING CYCLE***, then the scan tool only shows monitors for ***SINCE DTCs CLEARED*** with no header on line 1.

Select **I/M Readiness** from the ***OBDII Function List*** menu and press **ENTER**.

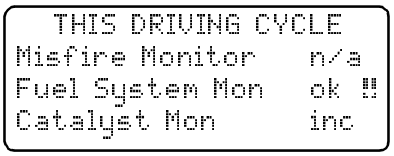


A message stating whether the I/M Readiness monitors are completed.





Use the **DOWN** arrow key to view the monitor statuses. If both monitor types are supported, use the **LEFT**/**RIGHT** arrow keys to toggle between monitor types.



3

- A status of **"OK"** means that the required driving conditions for that monitor have been met and the monitor passed.
- A status of **"Inc"** means that the required driving conditions for that monitor have not been met or the monitor did not pass.
- A status of **"N/A"** means the vehicle does not support that monitor.

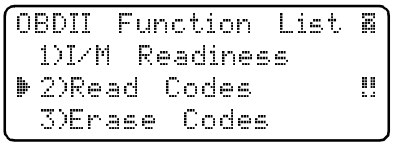
When done, press the **BACK** key to return to the ***OBDII Function List***.

READ CODES

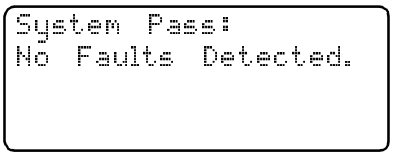
The **Read Codes** function retrieves DTCs from the vehicle's computer module(s). This function can be performed with the KOEO or KOER. There are two types of codes, Malfunction Indicator Lamp (MIL) codes and Pending codes.

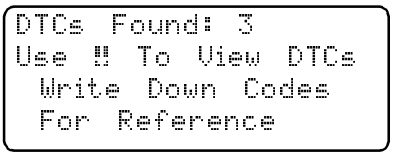
- **MIL Codes**: These codes cause the computer to illuminate the MIL when an emission related or driveability fault occurs. The MIL is also known as the "service Engine Soon" or "Check Engine Lamp". MIL codes remain in the vehicle's memory until the fault is repaired.
- **Pending Codes**: These codes are also referred as "continuous monitor" and "maturing codes". An intermittent fault will cause the computer to store a code in memory. If the fault does not occur within 40 warm-up cycles, the code will be cleared from memory. If the fault occurs a specific number of times, the code will mature into a DTC and the MIL will turn on. If the DTC is a pending code, then the icon ( ) displays next to the DTC number.

Select **Read Codes** and press **ENTER**. The Scan Tool retrieves the DTCs stored in the vehicle's computer module(s).

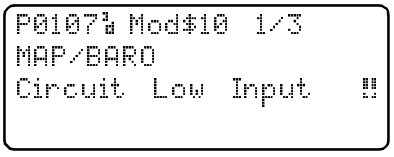


The Scan Tool displays the DTCs or a message stating SYSTEM PASS: NO CODES FOUND. Scroll down to view the DTCs or press the **BACK** key to return to the ***OBDII Function List.***

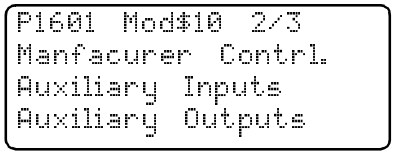


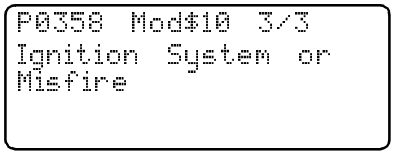


Write down the DTCs for reference and then press **BACK** to return to the ***OBD II Function List***. Note that the DTC P0107 is a pending one.



If the DTC definition is not found or is manufacturer-specific, then the DTC family (or range) is provided. Refer to "**Diagnostic Trouble Codes (DTCs)**" on page 1-7





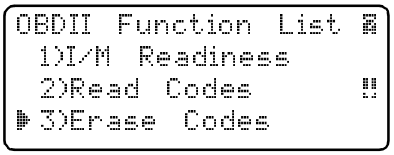
ERASE CODES

The **Erase Codes** function deletes the DTCs from the vehicle's computer memory. It may also erase Freeze Frame, O2 Sensor Data, System Monitors, and On-Board Monitor test results. Perform this function only after the systems have been checked completely and DTCs have been documented. This function should be performed with KOEO — Do not START engine.

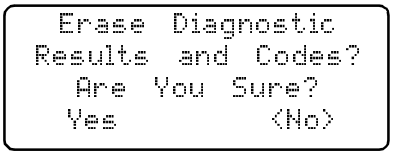
After servicing the vehicle, delete the stored DTCs and verify no codes have been reset. If DTCs return, the problem has not been corrected or other faults are present.

✓ In addition to clearing DTCs, the **Erase Codes** function may also erase Freeze Frame and I/M Readiness test results.

Select **Erase Codes** and press the **ENTER** key.



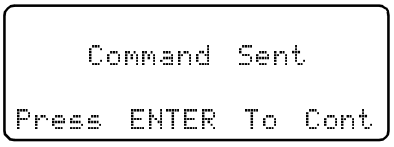
A message appears asking if you are sure. Press the **LEFT**/**RIGHT** arrow keys to move the brackets to the desired response and press **ENTER**.



Selecting NO cancels the function. Press **ENTER** to return back to the ***OBDII Function List***.

Selecting YES displays a screen prompting you to turn ignition KOEO, press **ENTER** key to continue.

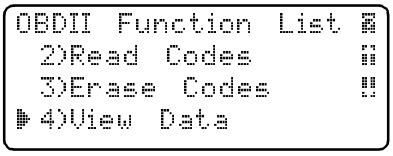
A message confirming that the **Erase Codes** command was successful displays. Press **ENTER** to return to the ***OBDII Function List***.



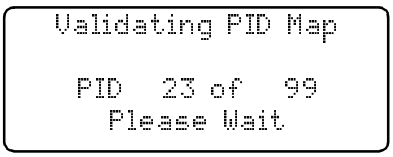
VIEW DATA

The **View Data** function allows you to view the vehicle's Parameter Identification (PID) data in real time. As the computer monitors the vehicle, the information is simultaneously transmitted to the scan tool. Apart from **Read Codes**, **View Data** is the most useful diagnostic function for isolating the cause of a vehicle operation problem. Viewing data is also used for observing sensor data and the status of switches, solenoids, and relays.

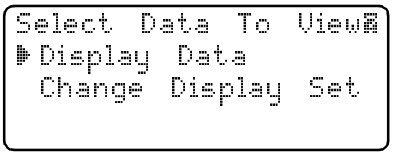
Select **View Data** from the ***OBDII Function List*** and press **ENTER**.



The scan tool asks the vehicle to provide the global PIDs it supports and generates a list.



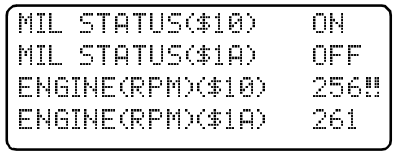
The ***Select Data To View*** menu displays. Select **Display Data** to view the PIDs or **Change Display Set** to change the number of lines displayed on the screen. Selecting fewer lines provides faster update rates. The default is four lines.



Press **ENTER** to establish a communication link.

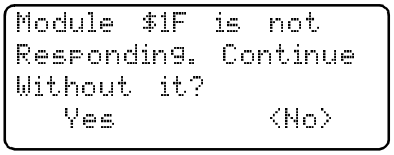
Multiple PIDs may be sent if the vehicle is equipped with more than one computer module — Powertrain Control Module (PCM), Transmission Control Module (TCM), etc. The scan tool identifies them by their identification names (ID) assigned by the manufacturer (i.e. $40 or $1F).

If the Scan Tool receives multiple responses for a PID, such as MIL STATUS, it displays the PID and with the computer module ID blinking in parentheses.



Use the **UP**/**DOWN** arrow keys to move through the list. Use the **LEFT**/**RIGHT** arrow keys to page up/down.

If one or more control modules stops responding, the tool will display a message that it is not responding.



If No is selected, the Scan Tool attempts to reestablish communication with that module. If you choose to continue, dashes will replace the module ID.

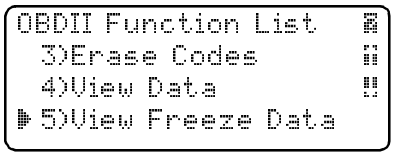
Press the **BACK** key twice to return to the ***OBDII Function List***. Pressing the **BACK** key once returns to the ***Select Data To View*** menu.

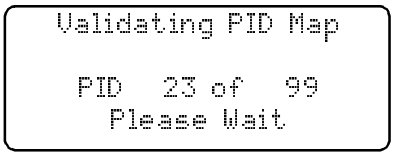
VIEW FREEZE DATA

When an emission-related fault occurs, certain vehicle conditions are recorded by the on-board computer. This information is referred to as a Freeze Frame data. The information is a "snapshot" of the operating conditions at the time of a fault. This data can be overwritten by faults with a higher priority.

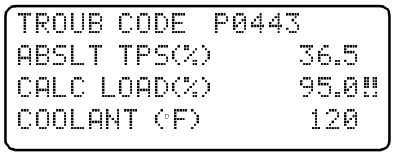
✓ If codes were erased, then freeze frame data may not be stored in vehicle memory.

Select **View Freeze Data** from the ***OBDII Function List*** and press **ENTER**. The scan tool generates a PID list before displaying the data.

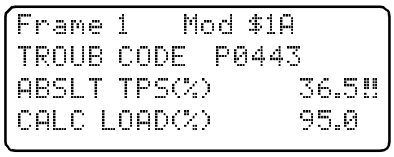




Use the **UP**/**DOWN** arrow keys to move through the list.



If more than one computer module responds with freeze frame data, then the frame number and module display on the first line. Press the **LEFT**/**RIGHT** key to change freeze frame data.

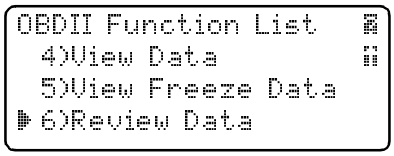


When done, press the **BACK** key to return to the ***OBDII Function List***.

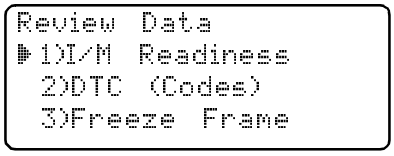
REVIEW DATA

The **Review Data** function allows you to review the information stored in the Scan Tool's memory. The scan tool does not require power from the vehicle to perform this function. Internal battery power can be used.

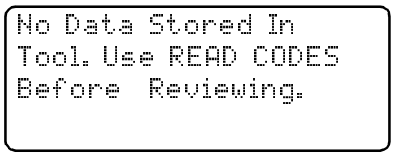
Select **Review Data** from the ***OBDII Function List*** and press **ENTER**.



In the ***Review Data*** screen, use the **UP**/**DOWN** arrow keys to select and press **ENTER**.



If data does not exist for the function you selected to review (for example **DTC (Codes)**), a message informs you to run the **Read Codes** function first.



3

Part 4 - GM Historic Diagnostics

✓ Some 1994 and 1995 vehicles use the 16-pin OBD II connector, but are not OBD II compliant. They still use the OBD I application software. Refer to "**Appendix A - Data Link Connectors**".

✓ If an **Operating Error** message displays, make sure the cables and adapters are securely attached and the ignition key is ON. Cycle the ignition key to OFF for 10 seconds, then ON. Attempt the test selected again. If the problem remains, refer to "**Error Messages**" on page 7-2.

READ CODES

The **Read Codes** function is used to retrieve all stored Diagnostic Trouble Codes (DTCs) from the control module(s). This can be performed KOEO or KOER. Two types of codes were used by GM in the Historic System: Current codes and History codes. Prior to 1986, all codes were referred as Current Codes. From 1986 through 1995, both codes were used as the PCM was able to differentiate them.

The tool automatically displays the type of codes that pertain to the vehicle under test. The DTC types are defined as follows:

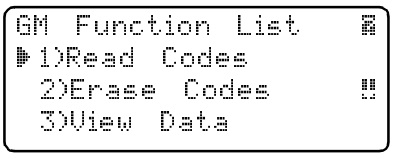
- **History Codes** — intermittent codes placed in the vehicle's memory when the trouble originally occurred, and will remain there even if the trouble has been corrected. If no trouble after 50 engine warm-up cycles, the DTC erases.
- **Current Codes** — codes transmitted through the PCM's data stream when a trouble condition is active and cannot be erased. The problem must be repaired to remove the DTC.

✓ On some vehicles, all codes are Current Codes, because the PCM cannot distinguish Current Codes from History Codes. The only way to determine this is to erase the code and then drive the vehicle to see if the code returns.

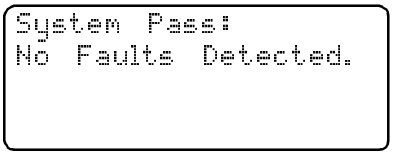
Perform the following:

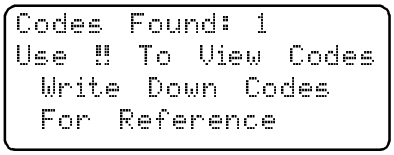
1) Set Parking Brake
2) Turn Key On-Engine Off or Running.
3) Put Transmission In Park Or Neutral.

Select **Read Codes** from the ***GM Function List*** and press **ENTER**. The tool will retrieve the DTCs.

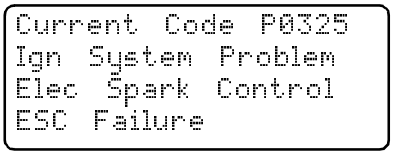


One of two screens displays: If the diagnostic checks are working correctly and no DTCs have been stored in vehicle's memory, a SYSTEM PASS message displays. If not, the tool displays a screen indicating the number DTCs.





Use the **UP**/**DOWN** arrow keys to scroll through the codes. Note the codes and press **BACK** to return to the ***GM Function List***.



Erase Codes

The **Erase Codes** function deletes the DTCs from the vehicle's computer memory. Perform this function with KOEO — Do not START engine. This function should be performed only after the systems have been checked completely and DTCs have been documented.

After servicing the vehicle, erase the stored DTCs, perform a road test, and then verify no new codes have been stored. If DTCs return, the problem has not been corrected or other faults are present.

✓ Some codes can only be removed by repairing the faults that caused them. Therefore, these codes will remain in the vehicle's memory until the condition is repaired.

✓ Not all trouble codes can be automatically erased using the scan tool. Some vehicles require a manual erasing procedure. If possible, the tool performs the appropriate **Erase Codes** procedure for your vehicle.

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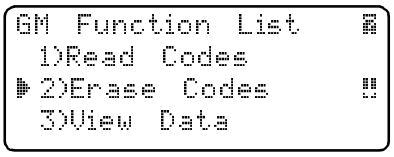
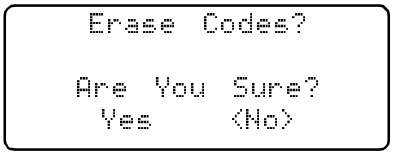
Select **Erase Codes** and press the **ENTER** key.

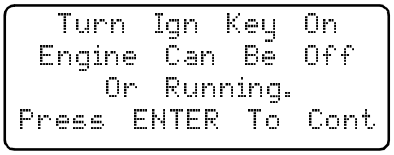


A message appears asking if you are sure. Press **LEFT**/**RIGHT** to move the brackets to the desired response and press **ENTER**.

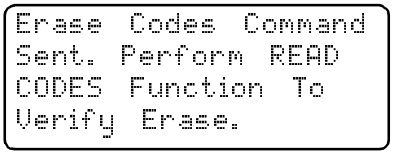


Selecting NO and pressing **ENTER** returns you to the ***GM Function List***.

Selecting YES displays a screen prompting you to turn ignition ON. Turn ignition key ON. Engine can be off or running. Press **ENTER** to continue.



A message confirming that the **Erase Codes** command was successful displays. Press **ENTER** to return to the ***GM Function List***.



Manual Erase Methods

Alternate Method 1:

1) Turn Ignition Key Off.
2) Locate Fuse Box and Remove ECM Fuse.
3) Wait 20 seconds.
4) Replace the Fuse.

Alternate Method 2:

1) Turn Ignition Key Off.
2) Remove Power from Scan Tool.
3) Disconnect Scan Tool from Vehicle.
4) Remove Negative (–) Battery Cable. Wait 30 seconds, then replace the cable.

✓ The computer has a "learning" ability to compensate for minor variations in engine operation. Whenever power is removed from the PCM, the computer must "relearn" various functions. Vehicle performance may be noticeably different until this is accomplished. This is a temporary situation and is normal. The "learning" process takes place during warm engine driving.

VIEW DATA

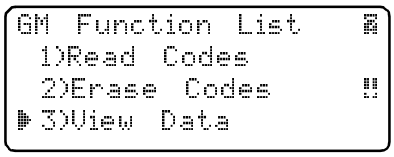
The **View Data** function allows the user to view the vehicle Parameter Identification Data (PIDs) in real time. As the PCM monitors PIDs, they are simultaneously transmitted to the scan tool. The PIDs are continuously updated at the PCM's rate.

In addition to reading codes, **View Data** is the most useful diagnostic function for isolating the cause of a vehicle operation problem. Viewing data is also used for observing sensor data and the ON/OFF state of switches, solenoids, and relays.

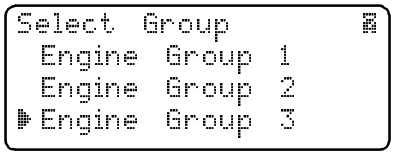
View Data can be performed with the ignition key On-Engine Off or Running.

⚠WARNING **Never operate the tool while driving. Have another person ASSIST WITH THE OPERATION OF the tool.**

Select **View Data** from the ***GM Function List*** and press **ENTER**. The data displays within 3 minutes unless a ***Select Group*** screen appears.



Some vehicles display a ***Select Group*** screen for viewing data. In these cases, only one group of data can be viewed at a time. Select and press **ENTER.**



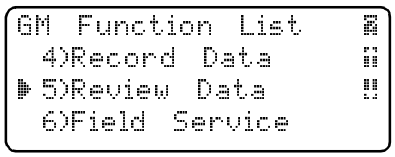
Use the **UP**/**DOWN** arrow keys to scroll through the PIDs.

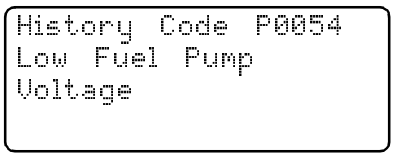
The "Vehicle Data List" header marks the beginning.

Press the **BACK** key to return to the ***GM Function List***. If multiple engine groups were available, then pressing **BACK** displays the ***Select Group*** screen.

REVIEW DATA

The **Review Data** function allows you to review the **Read Codes** data. Select **Review Data** and press **ENTER**.





Codes will be noted as History or Current. Use **UP**/**DOWN** arrow keys if more than one DTC exists. Press **BACK** to return to the ***GM Function List***.

FIELD SERVICE

Field Service is a special diagnostic mode to monitor fuel system operation and read DTCs. Some GM service manuals may refer to this mode as the Field Service Mode Check. This mode works on vehicles equipped with a 12-pin ALDL connector with a wire present in Pin-B, Diagnostic or Test Enable. The scan tool enters this mode by grounding Pin-B: shorting Pin-B to Pin -A (ground).

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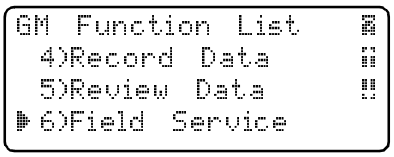
Field Service Mode can be operated with the ignition Key On-Engine Off (KOEO) or with the Key On-Engine Running (KOER).

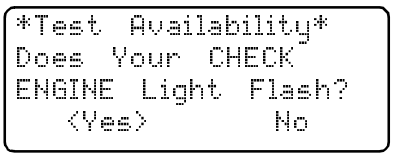
✓ Vehicles equipped with climate control computers do not use Field Service.

✓ Some 1994 & 1995 vehicles equipped with a 12-pin ALDL connector with pins A and B shorted will not cause the CHECK ENGINE light to flash codes.

Select **Field Service** from the ***GM Function List*** and press **ENTER**.



Turn ignition Key On, but do not start engine. The Check Engine light should flash. Select YES to continue. If the light does not illuminate, either the vehicle does not support this test mode, the lamp is burned-out or circuit problems exist.



✓ It is difficult to know exactly which GM vehicles use the Field Service mode. It is possible to have the Field Service mode function on the Function List, and it not be applicable.

If Check Engine light operates, the ***Field Service*** screen displays. Pressing **ENTER** toggles the short to Pins A & B On and Off as indicated on the tool's screen.

Continue with either the KOEO procedure or KOER procedure. When done, press **BACK** to return to the ***GM Function List***.

✓ While in **Field Service** mode, no new trouble codes are stored in the vehicle's memory.

KOEO Procedure

With the KOEO (key On engine Off), **Field Service** can check relays, solenoids and the idle speed motor, and obtain DTCs using the CHECK ENGINE light.

1) Turn ignition Key ON but DO NOT Start Engine.
2) On scan tool, place **Field Service** On.
3) The Check Engine light will begin to flash codes. Each DTC is displayed three (3) times. The DTCs are displayed starting with the lowest numbered one. After all DTCs are displayed, the sequence keeps repeating until the ignition key or **Field Service** mode is turned OFF.
   - Count CHECK ENGINE Light Flashes to obtain trouble codes. The first digit is sent first. A short pause separates digits while a long pause separates each DTC. All codes contain 2 digits.
   - DTC 12 (No RPM reference pulse) should display first, since the engine is not running. If not, problems exist in the PCM or Check Engine light circuit.

   Code 12 will look like:

   FLASH-pause-FLASH-FLASH — long pause.

   Code 23 will look like:

   FLASH-FLASH-pause-FLASH-FLASH-FLASH — long pause.
4) When Field Service Mode is ON, most computer controlled Relays and Solenoids will be turned ON, except for the fuel pump relay and fuel injectors. Toggle the Field Service Mode On and Off.
   - Use a voltmeter to measure Relays and Solenoids input voltage to verify On/Off conditions. An ohmmeter could be used to check the continuity between the relay's switch terminals.
   - The Idle Air Control (IAC) valve is fully seated to the zero position by the PCM.
   - The Exhaust Gas Recirculation (EGR) solenoid is energized for 25 seconds.

KOER Procedure

With the engine running, the **Field Service** mode can be used to measure base timing, check open loop/closed loop operation, and determine if the engine is running rich or lean.

1) Engage parking brake and block drive wheels.
2) Verify engine is cold. If engine is **hot** or **warm**, allow it to cool.
3) On scan tool, place Field Service On.
4) Start engine and place transmission in Park or Neutral. The Check Engine light will flash once.
5) Warm the engine by idling for 2 minutes at 2000 RPM.
6) Observe Check Engine light.
   - If Check Engine light flashes 2.5 times a second, the on-board computer is operating in Open Loop.
   - When the engine warms up to normal operating temperature, the on-board computer is now operating in Closed Loop. The Check Engine light should flash once a second. The on-board computer is now operating in Closed Loop.
   - If Check Engine light...
     — flashes equally ON/OFF, then the fuel system is running normally.
     — is mostly ON, then the fuel system is running Rich.
     — is mostly OFF, then the fuel system is running Lean.
7) On some engines, the spark advance timing is fixed during **Field Service** Mode. This allows the technician to measure the engine base timing.

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Part 5 - Ford Historic Diagnostics

IMPORTANT **This section covers Ford vehicles equipped with EEC-IV and MECS system from 1984 – 1995. Some Ford trucks still used the EEC-IV system after 1995. Refer to "Appendix A - Data Link Connectors".**

Due to different processor calibrations, the Ford Function List for a particular vehicle may or may not appear as shown. Based on the vehicle information entered at the ***Vehicle Setup*** menu, the tool automatically recognizes the computer system installed.

✓ If an **Operating Error** message displays, make sure the adapter cable is securely attached and the ignition key is ON. Cycle the ignition key to OFF for 10 seconds, then ON. This may be required because the Ford system allows only one Self-Test function to be performed for each Key ON. Attempt the test selected again and if the problem remains, refer to "**Error Messages**" on page 7-2.

READ KOEO CODES

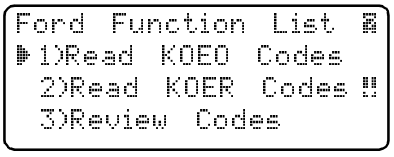
The **Read KOEO Codes** function activates the KOEO (Key On Engine Off) and Continuous Memory self-tests which retrieves KOEO and Continuous Memory DTCs from the PCM.

- **KOEO DTCs** are transmitted through the PCM data link when a trouble condition is active. KOEO codes remain until the trouble condition becomes inactive – usually when the fault is repaired.
- **Continuous Memory DTCs** are stored in vehicle's memory at the time of occurrence during continuous self-test monitoring. They will remain there until the problem does not reoccur within 40 warm-up cycles, Fast KOEO codes have been read, or the Erase Codes function has been run. Continuous memory codes follow the KOEO codes in the data stream.

The DTCs are transmitted in two format; both transmit the same information:

- **Slow Codes** are regular service codes that allow the user to identify the faults with an analog voltmeter or the check engine light. Slow codes are transmitted within 3 minutes.
- **Fast Codes** are transmitted within seconds and must be read with a diagnostic tool. Retrieving Fast Codes erases Continuous Memory Codes, Slow Codes does not. **Fast Codes** do not apply to MECS vehicles.

Select **Read KOEO Codes** from the ***Ford Function List*** and press **ENTER**.



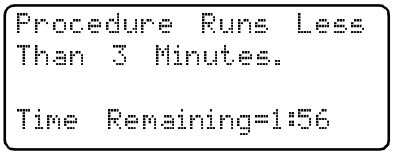
Select **Fast Codes** or **Slow Codes** and press **ENTER**. Follow the instructions step-by-step.

1) Set Parking Brake.
2) Put Transmission In Park Or Neutral.
3) Turn A/C Off.
4) Start Engine — Let Idle Until Hot.
5) Turn Ign Key Off.
6) Wait 10 Seconds. Turn Key On-Engine Off. Do Not Start Engine.

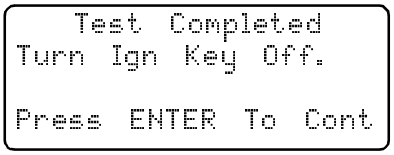
⚠CAUTION **Avoid Cooling Fan! It May Turn On During Test.**

While waiting for the codes to transmit, the PCM cycles the following system components On and Off:

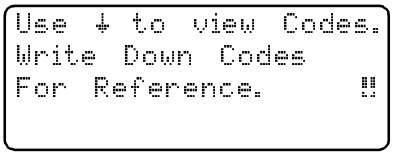
- Electric radiator cooling fan
- Fuel pump
- Check engine light or Malfunction Indicator Light (MIL) – slow codes only.
- Idle speed control solenoid



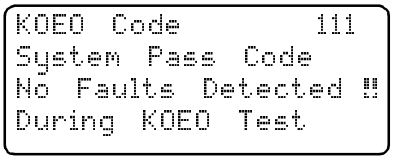
After performing these steps, wait for the tool to retrieve DTCs. When the test is done, turn Ign Key OFF and press **ENTER**.



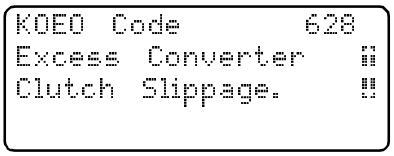
The KOEO codes transmit before the Continuous Memory codes. Use the **DOWN** arrow key to begin viewing codes.



If no problems exist, Code 11 or 111 will be displayed.



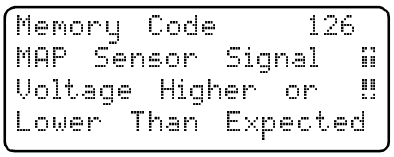
If vehicle problems exist, codes are set. Use **UP**/**DOWN** arrow keys to view codes. Write down codes for reference.



✓ Continuous Memory Codes (codes set previously under normal driving conditions) are available after reading KOEO Codes. They are indicated as Memory Codes by the scan tool and are transmitted after KOEO Codes.

After viewing and noting the KOEO codes, use the **DOWN** arrow key to view Continuous Memory codes.

When done, press **BACK** to return to the ***Ford Function List***.



READ KOER CODES

The **Read KOER Codes** function activates the KOER (Key-On-Engine-Running) self-test which retrieves KOER DTCs that are present when the engine is running.When the trouble condition is inactive, the KOER Code will no longer be sent through the data stream. This function also performs a **Computed Timing Check** for EEC-IV vehicles manufactured from 1984 through 1991.

The DTCs are transmitted in two formats which transmit the same information:

- **Slow Codes** are regular service codes that allow the user to identify the faults with an analog voltmeter or the check engine light. Slow codes are transmitted within 3 minutes.
- **Fast Codes** are transmitted within seconds and must be read with a diagnostic tool. MECS vehicles do not support Fast Codes.

⚠CAUTION
⚠CAUTION
⚠CAUTION

Exhaust gases are harmful or lethal. Always Operate vehicle in a well-ventilated area.
The KOER test is done with the engine running. Do not over-rev engine. Observe all safety precautions.
Avoid Cooling Fan! It May Turn On During Test.

Select **Read KOEO Codes** from the ***Ford Function List*** and press ENTER.

```
Ford Function List
 1)Read KOEO Codes
▶2)Read KOER Codes
 3)Review Codes
```

Fast or Slow Codes

Select **Fast Codes** or **Slow Codes** and press ENTER.

```
Select Code Type
▶1)Fast Codes
 2)Slow Codes
```

Follow the instructions step-by-step. Failure to perform these steps may set a false DTC in the PCM — observe the display.

1) Set Parking Brake.
2) Transmission In Park Or Neutral.
3) Turn A/C Off.
4) Start Engine — Let Idle Until Hot.
5) Turn Ign Key Off.
6) Wait 10 Seconds. Start Engine — Let Idle.
7) If Vehicle Has A Manual Transmission, Release Clutch.

Press ENTER to activate the self-test.

✓ The following actions do not apply to MECS vehicles.

- ❒ For a 7.3L Diesel, depress the throttle until test is done.
- ❒ If Applicable, set Octane Switch To Premium.

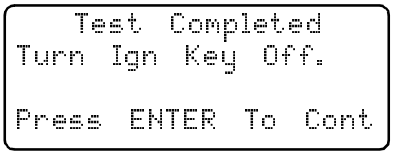
The tool will prompt the user to:

- ❒ Work Steering Wheel
- ❒ Pump Brake Pedal & Cycle OD (overdrive) Cancel Switch.

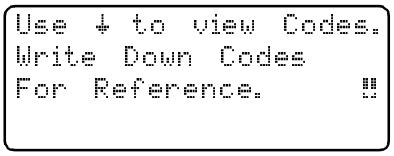
✓ Observe Screen for Prompt to Perform the next action.

- ❒ Quickly Press And Release Throttle. One Time Only!

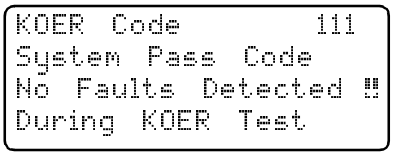
After performing these steps, wait for the tool to retrieve DTCs. When the test is done, turn Ign Key OFF and press ENTER.



Use the DOWN arrow key to begin viewing codes.



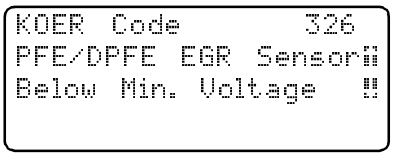
If no problems exist, Code 11 or 111 will be displayed.



If vehicle problems exist, codes are set.

Use UP/DOWN arrow keys to view codes. Write down codes for reference.

When done, press BACK to return to the ***Ford Function List*** screen.



5

Computed Timing Check (1984-1991 EEC-IV Vehicles)

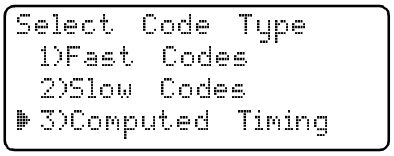
This option of the **KOER Read Codes** function allows you to check both the "Base" engine timing (no computer adjustment) and the ability of the computer to control spark advance.

✓ This does not apply to 7.3L diesel vehicles.

Connect a **Timing Light** to the vehicle in accordance with the manufacturer's instructions. (For 2.3L dual plug engines, use exhaust side plug. Refer to ignition system section in vehicle service manual for specific instructions.)

Select **Computed Timing** and press ENTER.

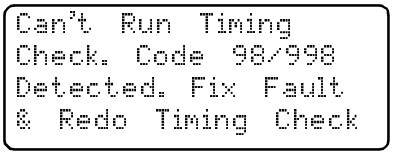
Follow the instructions step-by-step. Failure to perform these steps may set a false DTC in the PCM — observe the display.



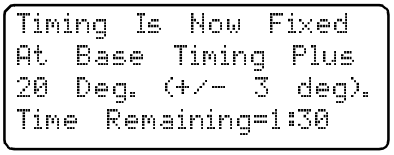
CAUTION **Avoid Cooling Fan! It May Turn On During Test.**

1) Set Parking Brake.
2) Transmission In Park Or Neutral.
3) Turn A/C Off.
4) Start Engine — Let Idle Until Hot.
5) Turn Ign Key Off.
6) Wait 10 Seconds. Start Engine — Let Idle.
7) If Vehicle Has A Manual Transmission, Release Clutch.

If a KOER code of 98 or 998 is detected, then the fault must be fixed before performing this function. Press the BACK key to return to the ***Ford Function List***.



Otherwise, the timing remains fixed for 90 seconds to allow you to measure it with the Timing Light.



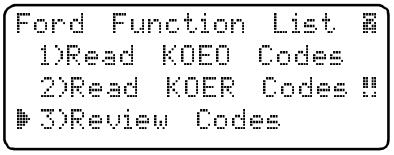
Computed timing is equal to the base timing plus 20 degrees BTDC (Before Top Dead Center) with 3 degrees tolerance. The base timing value is printed on the Vehicle Emission Control Information (VECI) decal.

Press ENTER when done.

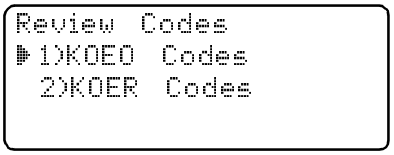
REVIEW CODES

After reading DTCs, reviewing the codes is possible, even after returning to the ***Ford Function List***. The codes acquired during the KOEO and KOER tests are stored in the Scan Tool's memory. This is a safeguard to make sure that all codes have been viewed.

*S*elect **Review Codes** from the ***Ford Function List*** and press ENTER to display the ***Review Codes*** screen.

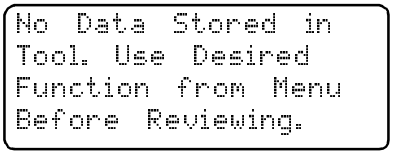


Select the codes to be viewed and press ENTER. Use the UP/DOWN arrow keys to scroll through the lists.



✓ These will be the same codes read in earlier tests. If no new tests, then no new codes. If the tests required to read codes have not been performed, there will be no codes stored in the tool memory, and a message will be displayed.

Press BACK to return to the ***Ford Function List*** or BACK to the ***Review Codes*** screen.



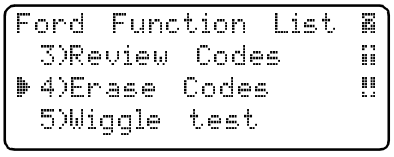
ERASE CODES

The vehicle service manual may recommend erasing Continuous Memory Codes from vehicle's memory, and then drive vehicle to duplicate the malfunction before beginning a diagnostic test. If KOEO codes were read using Fast Codes, the memory codes have already been erased.

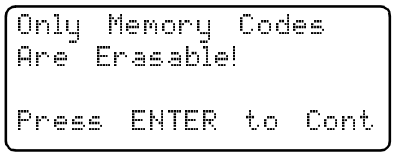
Only Continuous Memory Codes can be erased from the vehicle without repairing the fault. To remove KOEO and KOER Codes, the fault must be repaired since they only exist when a fault exists.

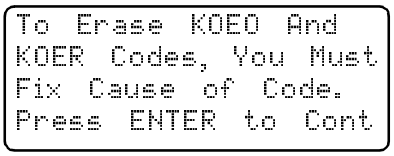
EEC-IV Erase Codes

Select **Erase Codes** from the ***Ford Function List*** and press ENTER.



Press ENTER after each message.



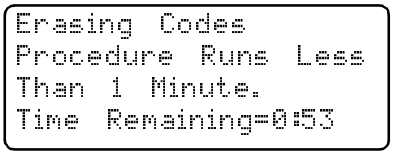


Follow all instructions on the display.

1) Turn Ign Key Off.
2) Transmission In Park Or Neutral.
3) Wait 10 Seconds.
4) Turn Ign Key On.

5

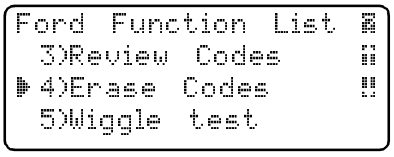
Press ENTER to begin erasing the codes. The procedure takes less 1 minute to run.



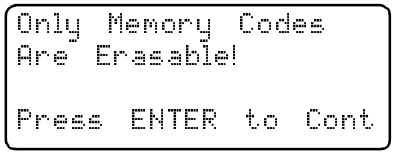
Press BACK to return to the ***Ford Function List***.

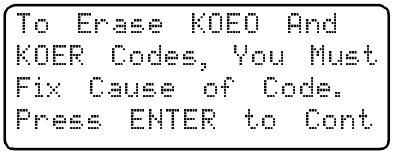
MECS Erase Codes

Select **Erase Codes** from the ***Ford Function List*** and press ENTER.



Press ENTER after each message.





⚠CAUTION **Never Lay Tools On Vehicle Battery. Tools May Create Shorts And Causing Harm To User And Damage To Tools, Battery And Electrical System.**

Follow all instructions on the display.

1) Turn Ign Key Off.
2) Remove Negative (–) Battery Cable.
3) Hold Down Break Pedal for 10 Seconds.
4) Reattach Negative (–) Battery Cable.

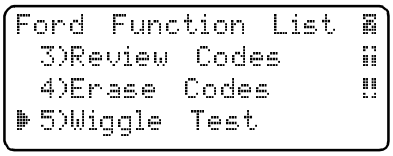
All continuous memory codes should be erased. Press BACK to return to the ***Ford Function List***.

WIGGLE TEST (EEC-IV VEHICLES)

The **Wiggle Test,** often referred to as the Continuous Monitor Test, is used to locate intermittent electrical faults on EEC-IV vehicles. When the test is activated, the tool will beep and display a message when a fault is present. If the problem is fixed or goes away, the tone and message goes away. Refer to the applicable vehicle service manual for circuits that can be tested.

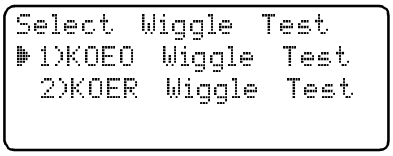
✓ If the Audio Alert was turned off in the tool Setup menu, it will be automatically activated for the **Wiggle Test**. Once the **Wiggle Test** is complete, the audio alert returns to its previous setting.

Select **Wiggle Test** from the ***Ford Function List*** and press ENTER.



5

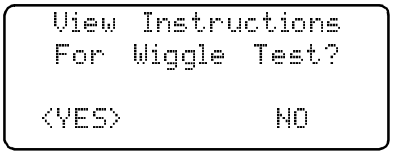
Either a KOEO or KOER Wiggle Test can be run. If the vehicle problem occurs while driving, the KOER Wiggle Test is recommended. After selecting, press ENTER.



Follow the tool's instructions.

1) Set Parking Brake.
2) Put Transmission In Park Or Neutral.
3) Turn A/C Off.
4) Turn Ign Key Off. Wait 10 Seconds.
5) KOEO: Turn Key On. Engine Off. Do Not Start Engine.
6) KOER: Turn Key On. Engine On and let Idle.

Instructions are available for viewing. The default is YES. If NO is selected, the test will begin to initialize.

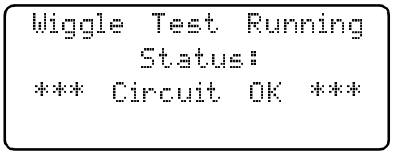


If YES is selected, the following instructions will appear.

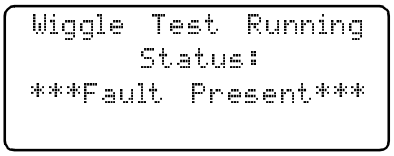
- ❒ Gently tap and shake the sensor.
- ❒ Wiggle the sensor connectors.
- ❒ Twist and shake the wiring between the sensor and the PCM.

Press ENTER to continue. The next instruction states: Beeper sounds and message displayed while fault exists. Press ENTER to Test and the test will begin to initialize.

After the 10-second initialization period, the tool is ready for the **Wiggle Test**. Locate the suspect sensor or circuit according to the above instructions.



If a fault is detected, the tool will beep and display a FAULT PRESENT message. A DTC(s) will be stored in the PCM and in the tool. When done, press BACK to return to the ***Ford Function List***.



Perform the "**Read KOEO Codes**" on page 5-1 to retrieve the DTC(s) set during wiggle test. After making all repairs, perform "**Erase Codes**" on page 5-5 to clear the memory.

OUTPUT SWITCH TEST (EEC-IV VEHICLES)

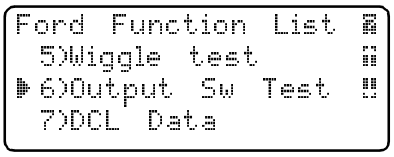
The **Output Sw (Switch) Test**, also known as the Output State Check, is used to check the operation of the computer-controlled relays and solenoids on EEC-IV vehicles. The user can troubleshoot circuits using a voltmeter to measure voltage at the relays and solenoids in both energized and non-energized conditions. All measurements should be recorded for reference.

✓ Fuel injectors are NOT energized during this test.

✓ On vehicles equipped with Integrated Vehicle Speed Control (IVSC), failure to disconnect the vacuum supply hose from the Speed Control Servo energizes the Speed Control Solenoids.

5

Select **Output Sw Test** from the ***Ford Function List*** and press ENTER.

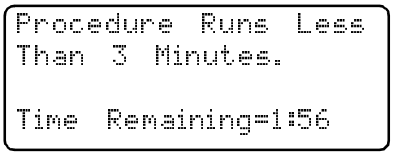


Observe the screens and follow the instructions.

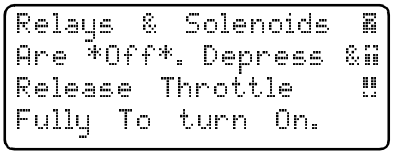
1) Set Parking Brake.
2) Put Transmission In Park Or Neutral.
3) Turn A/C Off.
4) Start Engine — Let Idle Until Hot.
5) Turn Ign Key Off.
6) Wait 10 Seconds. Turn Key On-Engine Off. Do not Start Engine.

CAUTION **Avoid Cooling Fan! It May Turn On During Test.**

The test screen indicates the time remaining. Do not touch vehicle or tool keys during this time until the next screen appears.



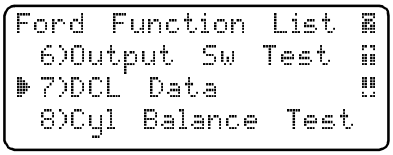
Depress the accelerator pedal fully to turn ON relays and solenoids. Do the same to turn them OFF. This can be repeated as many times as required to locate the fault. When done, turn key Off and press BACK twice to return to the ***Ford Function List***.



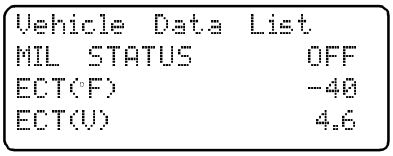
DCL DATA FUNCTIONS (EEC-IV VEHICLES)

The **DCL Data** (Data Communication Link) functions allows you to view engine data transmitted from EEC-IV vehicles beginning in 1990. This function allows viewing of data parameters in real time to pinpoint problems when they occur.

Select **DCL Data** from the ***Ford Function List*** and press **ENTER**.



A Vehicle Data List header marks the beginning of the data list. Use the **UP**/**DOWN** arrow keys to scroll through the PIDs.



When done, press **BACK** to return to the ***Ford Function List***.

CYL BALANCE TEST (EEC-IV VEHICLES)

✓ The **Cyl Balance Test** (Cylinder Balance Test) is only applicable to engines equipped with EEC-IV Sequential Electronic Fuel Injection (SEFI or SFI) .

5

The **Cyl Balance Test** identifies a weak cylinder(s) on EEC-IV vehicles. A weak cylinder may be caused by low compression, poor valve seating, fouled spark plugs, damaged fuel injectors, and other cylinder faults. The PCM shuts off the fuel supply to each cylinder and measures the RPM drop. The PCM then calculates variations between cylinders thus identifying the weak ones.

⚠CAUTION **Exhaust gases are harmful or lethal. Always operate vehicle in a well-ventilated area.**

⚠CAUTION **The Cyl Balance Test is done with the engine running. Do not over-rev engine. Observe all safety precautions.**

Select **Cyl Balance Test** from the ***Ford Function List*** and press **ENTER**.

⚠CAUTION **Keep hands and tools away from fan and engine during test.**

Follow the instructions on the tool screen that prompt the user to:

1) Set Parking Brake.
2) Put Transmission In Park Or Neutral.
3) Turn A/C Off.

4) Start Engine — Let Idle Until Hot.
5) Turn Ign Key Off.
6) Wait 10 Seconds. Start Engine — Let Idle.
7) If Vehicle Has A Manual Trans., Release Clutch.

After pressing **ENTER** to continue, the scan tool prompts the PCM for the Cylinder ID. The PCM has 15 seconds to respond. If no ID was received, the tool prompts the user to try again.

Once the ID is received, a Read KOER Self-Test begin. Follow all user prompts:

❒ Work Steering Wheel
❒ Pump Brake Pedal & Cycle OD (overdrive) Cancel Switch.

✓ Observe Screen for Prompt to Perform the next action.

❒ Quickly Press And Release Throttle. One Time Only!

If no DTC is present, continue with the paragraph following the note below. If any DTC(s) are present, the **Cyl Balance Test** stops and the tool displays the screen to the right.

```
Correct All Faults
Rerun Test
View Fault Codes?
   <YES>        NO
```

Select YES to review the DTC(s), then turn engine off. Record them and make repairs before repeating the **Cyl Balance Test**.

5

In the next step, Do Not touch any vehicle or tool keys while the test is running. Allow engine to idle. Engine speed may drop or become uneven — this is normal.

With no DTCs present, the tool prompts the user to depress the Throttle Halfway and release within the next 1.5 minutes. Press **ENTER** to continue. Do not move the throttle.

```
Running Test.
Don't Move Throttle
Test Under 5 Min.
Time Remaining=4:45
```

If the throttle was moved, the tool displays an error message indicating that the test failed due to throttle movement. It prompts the user to retest the vehicle or return to the ***Ford Function List***.

✓ Noise from the Throttle Position Sensor may cause the test to abort even though the throttle was not moved.

If the engine operates properly, the screen to the right displays. Press **ENTER** to continue.

```
Stage 1 Completed.
Code 90: Cylinder
Balance Test Passed.
Press ENTER To Cont
```

If a problem exists with one or more cylinders, the tool displays a list of failed cylinder(s). Press **ENTER** to continue.

```
Stage 1 Completed.
Failed Cylinders:
1
Press ENTER To Cont
```

Refer to the applicable vehicle service manual for cylinder numbering sequence. Cylinder failure may be caused by faulty injectors, sparks plugs, or wiring.

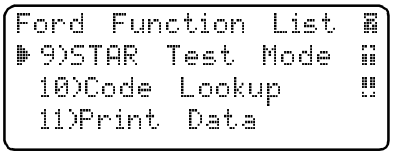
Turn the ignition key Off and press **ENTER** to continue — the tool prompts the user to retest (up to three times). If required, rerun the test to double check the results, or to check for weaker or dead cylinders.

When done, press **BACK** to return to the ***Ford Function List***.

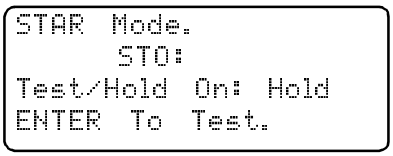
STAR TEST MODE

The **STAR Test Mode** can be used to retrieve DTCs from the PCM or other STAR (Self-Test Automatic Readout) compatible controllers installed in the vehicle. **STAR Test Mode** functions largely the same way and serves the same purpose as running KOEO and KOER tests. It is generally used as a last resort to check for DTCs in systems which may not be covered by KOEO and KOER testing (i.e. - Computer Ride Control suspension systems).

Select **STAR Test Mode** from the ***Ford Function List*** and press **ENTER**

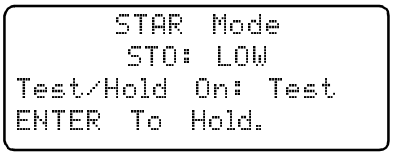


Follow the instructions on the tool screen to access DTCs from the PCM. Pressing **ENTER** begins test.



5

The TEST/HOLD parameter indicates the state the STI (Self-Test Input). The **ENTER** key toggles this state from TEST to HOLD.



With the STI in the TEST state, the self-test begins. The STO (Self-Test Output) parameter flashes either a HIGH or LOW. A beep will accompany each LOW flash. Write down the 2– digit or 3 – digit code for reference.

✓ Disregard the blink which may occur when ignition key is turned ON. Depending on the vehicle being tested, determines if a three digit or two digit code used. If required, refer to the vehicle service manual for applicable code structure.

- ❒ A digit consists of consecutive LOW flashes or beep — count the number of LOWs for the digit
- ❒ A short HIGH (short pause) occurs between digits.
- ❒ A long HIGH (long pause) occurs between codes.
- ❒ There is no flash for the digit 0 (zero).

After all codes are sent, the series will repeat once and then stop. An example is shown below.

A Three-Digit DTC (214) will Flash as follows:	
STO: LOW-LOW	=**2**XX (Hundreds Place =2)
STO: HIGH	Short Pause
STO: LOW	=2**1**X (Tens Place =1)
STO: HIGH	Short Pause
STO: LOW-LOW-LOW-LOW	=21**4** (Ones Place =4)
Two-Digit DTCs (12, 42) will Flash as follows:	
STO: LOW	=**1**X (Tens Place =1)
STO: HIGH	Short Pause
STO: LOW-LOW	=1**2** (One's Place =2)
STO: HIGH	Long Pause (Between DTCs)
STO: LOW-LOW-LOW-LOW	=**4**X (Tens Place =4)
STO: HIGH	Short Pause
STO: LOW-LOW	=4**2** (Ones Place =2)

If necessary, refer to an appropriate vehicle service manual for procedure on how to use **STAR Test Mode** for specific vehicle under test.

Part 6 - Chrysler Historic Diagnostics

IMPORTANT **This section covers most non-OBD II (OBD I) compliant Chrysler vehicles manufactured from 1989 – 1995.**

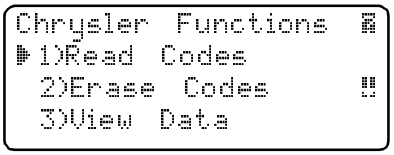
✓ Due to different processor calibrations used, the function list for a particular vehicle may or may not appear as shown. Based on the vehicle information entered, the tool automatically detects the computer system installed.

✓ If an **Operating Error** message displays, make sure the adapter cable is securely attached, and the ignition key is ON. Cycle the ignition key to OFF for 10 seconds, then ON. This may be required to reset the computer. If required, select YES to try again. If the problem still exists, refer to "**Error Messages**" on page 7-2.

READ CODES

The **Read Codes** function enables the tool to retrieve and display any specific emission-related Diagnostic Trouble Codes (DTC) stored in vehicle's memory. This function also retrieves DTCs that failed one trip but did not turn on the MIL light. The function can be performed KOEO or KOER.

Select **Read Codes** from the ***Chrysler Functions*** list and press **ENTER**.

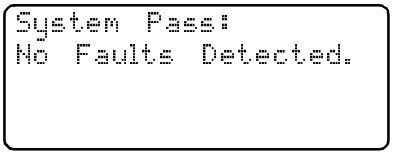


Perform the following.

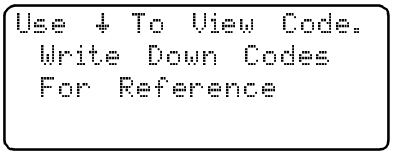
1) Set Parking Brake
2) Turn Key On-Engine Off or Running.
3) Put Transmission In Park Or Neutral.

CAUTION **Keep hands and Tools away from fan and engine during test.**

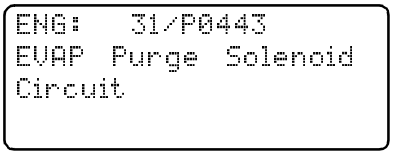
If no DTCs have been stored in vehicle's memory, a System Pass screen displays.



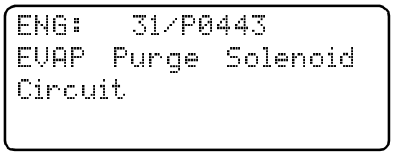
If not, press the **DOWN** arrow to view the DTCs.



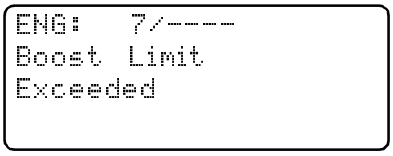
Use the **UP**/**DOWN** arrow keys to scroll through the codes. Write down the codes for reference or print them later.

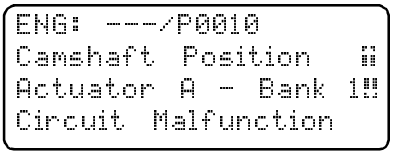


The Chrysler MIL code (3-digit) and SAE code (5-digit) follow on the first line.



There may be times where only one or both display. Dashes display if the DTC type does not exist.





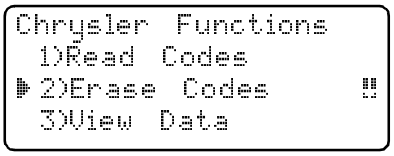
When done, press **BACK** to return to the ***Chrysler Functions*** list.

ERASE CODES

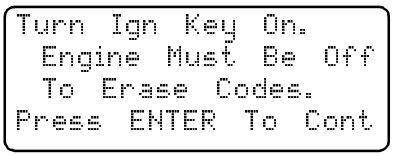
The **Erase Codes** function deletes the DTCs from the vehicle's computer memory. Perform this function only after the systems have been checked completely and DTCs have been documented. This function should be performed KOEO. Do not START engine.

After servicing the vehicle, erase the stored DTCs, perform a road test, and then verify no new codes have been stored. If DTCs return, the problem has not been corrected or other faults are present.

Select **Erase Codes** and press the **ENTER** key.



Follow the instructions and press **ENTER**.

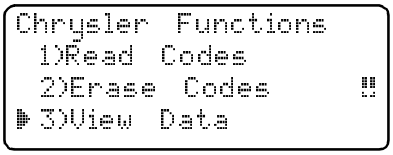


A message confirms the codes are erased. Press **ENTER** to return to the ***Chrysler Functions*** menu.

VIEW DATA

The **View Data** function allows the mechanic to view the vehicle's parameter identification data (PIDs) in real time. As the PCM monitors the PIDs, they are sent to the scan tool. Apart from **Read Codes**, **View Data** is the most useful diagnostic function for isolating the cause of a vehicle operation problem. Viewing data is also used for observing sensor data and the ON/OFF state of switches, solenoids, and relays.

Select **View Data** from the ***Chrysler Functions*** list and press **ENTER**.



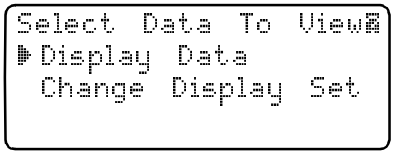
Perform the following.

1) Set Parking Brake
2) Turn Key On-Engine Off or Running.
3) Put Transmission In Park Or Neutral.

Press **ENTER** when done.

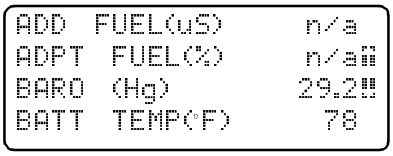
CAUTION **Keep hands and Tools away from fan and engine during test.**

The ***Select Data To View*** menu displays. Select **Display Data** to view the PIDs or **Change Display Set** to change the number of lines displayed on the screen. Selecting fewer lines provides faster update rates. The default is four lines.



Press **ENTER** to establish a communication link.

Use the **UP**/**DOWN** arrow keys to scroll through the PIDs. A "n/a" or "- - -" indicates the PID is not used by the vehicle.



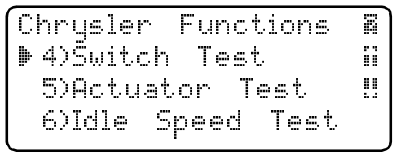
Press **BACK** to return to the ***Select Data To View*** menu. Press **BACK** again to display the ***Chrysler Functions*** list.

SWITCH TEST

The **Switch Test** is used to test the operation of switches on various Chrysler vehicle systems. These systems may include cruise control, A/C, braking, and the shift lever position.

✓ Because of differences in vehicle designs, the **Switch Test** may not test the same switches in every car.

Select **Switch Test** and press **ENTER**.



Select a switch to be tested from the list and press **ENTER**.

To test a switch, press the switch and check the tool display. If the switch is available for testing, the tool displays the current status of the switch.

To finish testing switch, press the switch again. The switch status on the bottom should change if the switch is working.

To test another switch, press the **BACK** key to return to the ***Select SW to Test*** screen. To return to the ***Chrysler Functions*** list, press the **BACK** key.

ACTUATOR TEST

The **Actuator Test** is used to check the operation of many of the computer-controlled relays and solenoids. This is also helpful for checking voltages and output signals. Use a voltmeter to check the output signals at each relay and solenoid to verify their operation. To do this, take voltage readings at relays and solenoids before beginning this test. Then activate the test to energize the relays and solenoids. Check voltages again to determine if they are functioning properly. Remember to write down readings for reference.

✓ Not all vehicles have the same actuators. The tool will not allow the test of actuators not present on the vehicle.

6

⚠CAUTION

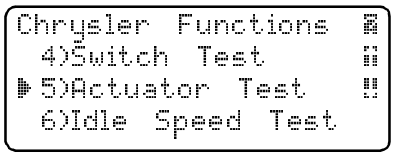
Some Actuator Tests may activate the fuel pump. Do not disconnect any fuel lines or remove fuel injectors unless it is required by the vehicle service manual. Be sure to reconnect all lines when testing is complete.

⚠CAUTION

Gasoline leaking onto hot engine and exhaust parts can cause fire or other hazardous conditions.

Select **Actuator Test** and press **ENTER**.

Follow all instructions on the tool screen. It will prompt the user when to turn the ignition key ON, do not start the engine.

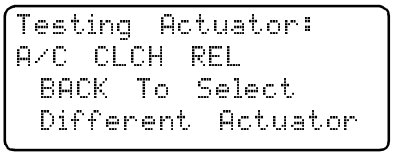


✓ Actuators for the Engine and Transmission are combined into one list when applicable.

Select an actuator to be tested from the list and press **ENTER**.

If the actuator selected is not available for the vehicle under test, the tool will indicate so. If the actuator is available, the tool will energize that actuator

Use a voltmeter to test the actuator for correct operation. To test another actuator on the list, press the **BACK** key.

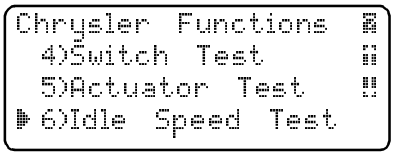


To return to the ***Chrysler Functions*** list, press the **BACK** key.

IDLE SPEED TEST

The **Idle Speed Test** is used to test the functionality of the vehicle idle speed control system. The test allows the user to enter the desired engine speed. The test vehicle should respond by matching the speed commanded. If the vehicle matches the demanded engine speed, the idle speed control system is functioning properly.

Select **Idle Speed Test** from the ***Chrysler Functions*** list and press **ENTER**.



The tool instructions may vary depending on the vehicle information entered. However, in all cases it will instruct the user to perform the following:

1) Set the Parking Brake.
2) Turn A/C off.
3) Start engine and let idle.

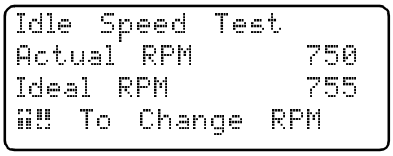
⚠WARNING

Keep hands and Tools away from fan and engine during test.

⚠WARNING

Carbon monoxide (CO) and other vehicle emissions are harmful or fatal to personnel. Always operate vehicle in a well ventilated area.

Use the **UP**/**DOWN** arrow keys to change the Ideal RPM (engine speed). The vehicle should respond by matching the Ideal RPM.

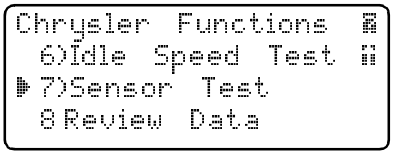


Press the **BACK** or **BACK** key to end the test and return to the ***Chrysler Functions*** list.

SENSOR TEST

The **Sensor Test** is used to view the sensor outputs of some monitored vehicle systems. The **Sensor Test** is similar to **View Data**, as it allows the user to read the current output of various sensors throughout the vehicle.

Select **Sensor Test** from the ***Chrysler Functions*** list and press **ENTER**.



Turn ignition key On — Engine can be Off or Running. Press **ENTER** and the scan tool will build a list of sensors and display them.

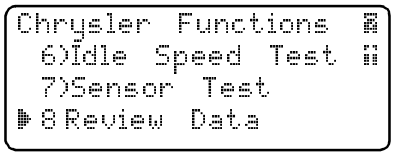
One sensor will be displayed per screen. Use the **UP**/**DOWN** arrow keys to scroll through the supported sensors. The tool displays the status of the sensor.

Press the **BACK** key to end the test and return to the ***Chrysler Functions*** list.

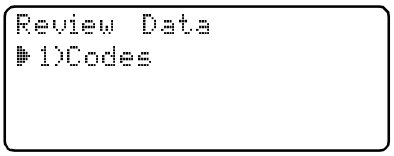
REVIEW DATA

The **Review Data** function allows you to review the information stored in the Scan Tool's memory. The scan tool does not require power from the vehicle to perform this function. Internal battery power can be used.

Select **Review Data** from the ***Chrysler Functions*** list and press **ENTER**.

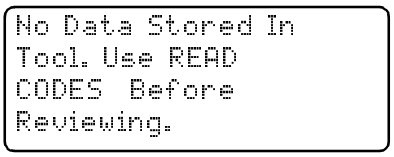


In the ***Review Data*** screen press **ENTER** to display the data.



Use the **UP**/**DOWN** arrow keys to scroll through the DTCs.

If data does not exist, a message informs you to run the **Read Codes** function first.

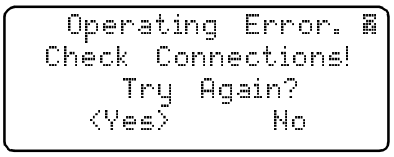


Press **BACK** twice to return to the ***Chrysler Functions*** list.

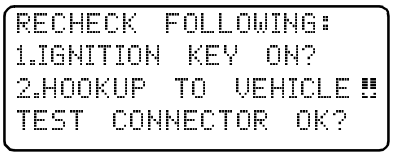
Part 7 - Help & Troubleshooting

HOW TO USE ON-LINE HELP

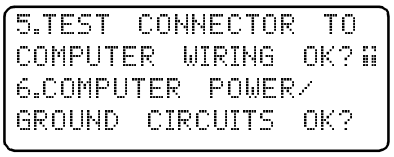
The software contains **On-Line Help** for specific tool screens, functions, and error messages. When the icon (▦) appears in the upper right-hand corner of the display, On-Line Help is available.



To enter **On-Line Help**, press the **HELP** key. For the screen above, the help message would look like this



The text in **On-Line Help** screens are in CAPITAL LETTERS. This is an indication that you are viewing **On-Line Help** screens and not screens associated with a function of the ***Function List***.



Some messages are longer than one screen. Use the **UP**/**DOWN** arrow keys to scroll through the screens.

To exit **On-Line Help** and return to the original screen, press the **BACK** key.

TOOL DOES NOT POWER UP

✓ Review the "**Safety Precautions**" before troubleshooting.

If the tool will not power up, communicate with your vehicle's PCM, pass Tool Self-Tests, or functions incorrectly in any other way, then try these Troubleshooting Tips below before consulting Actron.

Though the tool requires at least 6.5V to power up, the vehicle's control modules require a minimum of 8.0V to power up and operate.

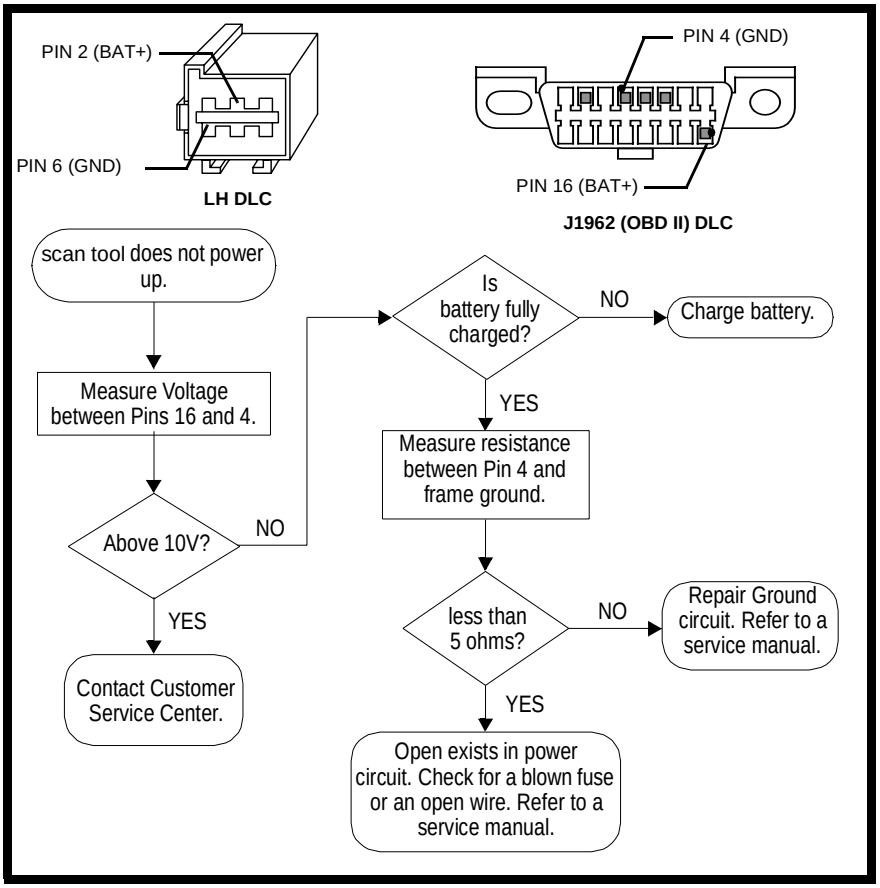
Check the following:

• Using Non-OBD II Adapter Cables

- ❒ The cigarette lighter adapter is hooked up. Make sure the cigarette lighter end is firmly held in the cigarette lighter socket.
- ❒ Verify that the vehicle's cigarette lighter fuse is OK. Some vehicles must have the key on for the cigarette lighter socket to be on.

• Using J1962 (OBD II) or Chrysler LH Adapter Cable

- ❒ Make sure the tool's DLC is connected correctly to the vehicle's DLC. Verify the pins are clean and fully seated in the DLC.
- ❒ At least 8.0V must be present between the power and ground pins to power the computer module(s) and communicate.
- ❒ Use the following flowchart to troubleshoot the problem.



7

ERROR MESSAGES

• Vehicle Communication Fault

If the tool exhibits a problem when communicating with the vehicle, a message displays. The vehicle's control module(s) enters into an unrecoverable state. Press **ENTER** and the tool resets.

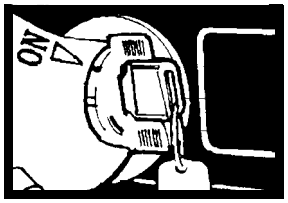
```
Vehicle Comm Fault.
 Turn Key Off For
10 Sec, Then Press
ENTER To Reset Tool
```

• Operating Error or Erroneous Data

An **Operating Error** or **Erroneous Data** occurs if the vehicle's computer(s) stops communicating with the tool. When this happens, the tool prompts you to select YES to try again of NO to return to the ***Function List***, or **HELP** to display Help messages and then press the **ENTER** key.

```
   Operating Error
Check Connections!
      Try Again?
  <YES>        NO
```

Check the following if an error message displays:



- ❒ Verify ignition key is ON — not in the ACCESSORIES position.
- ❒ Make sure the tool's adapter cable is securely connected to the vehicle's DLC.
- ❒ Examine the DLC closely and check for cracked or recessed pins, or for any substance that could prevent a good electrical connection.
- ❒ Verify that the vehicle you are testing is an OBD II-compliant vehicle. Just because it has the OBD II J1962 DLC does not mean the vehicle is OBD II compliant. Inspect the vehicle's VECI decal for a statement of OBD II compliance.
- ❒ Test for continuity between the DLC wiring and the computer. In an extreme case, there may be a broken wire.
- ❒ With the KOEO, check for blown fuses. The computer and DLC usually use separate fuses. If the fuse for the computer is blown, data cannot be transmitted. The fuses may be located on the fuse block in the passenger compartment.
- ❒ Make sure the computer 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 KOEO, verify the battery voltage is at least 10.0V; the minimum voltage to power the computer.
- ❒ As a last resort, the computer may be defective. Refer to the vehicle service manual to diagnose the computer.

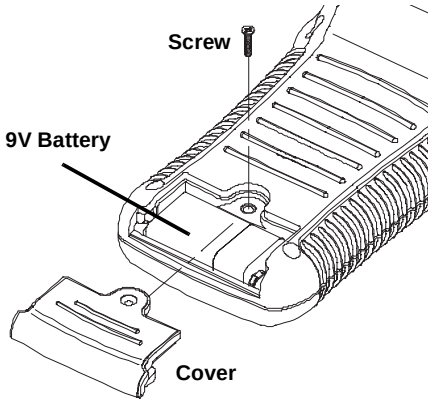
BATTERY REPLACEMENT

The tool requires a 9V (type 6LR61) alkaline battery to operate independent of vehicle and AC power. When the batteries need to be replaced, the low-battery icon ( ) displays.

- ❒ Rechargeable batteries do not last as long alkaline types and are not recommended.
- ❒ Non-rechargeable Lithium (Li) batteries can be used. Though Lithium types last longer than the alkaline types, they are more expensive.

Follow these steps to replace the batteries:

1) Place the tool with the display facing down on a non-abrasive surface.
2) Remove the battery cover screw.
3) Slide the battery cover off.
4) Remove discharged batteries and properly discard.
5) Install new battery.
6) Slide battery cover on.
7) Install screw — ***do not overtighten***.

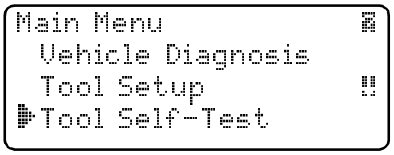


TOOL SELF-TESTS

If you experience problems when performing the **Tool Self-Tests**, contact technical support at **1-800-228-7667** (8:00 – 6:00 EST Monday – Friday) or send an email to **tech_support@actron.com**

Tool Self-Tests check the display, keypad, internal memory, and RS-232 interface.

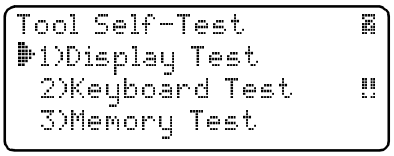
After powering up the tool, the ***Main Menu*** displays four choices. Select **Tool Self-Test** with the **UP**/**DOWN** arrow keys and press **ENTER**.



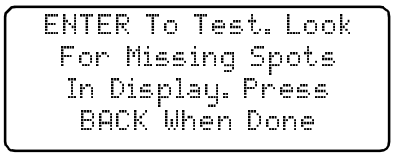
From the ***Tool Self-Test*** menu, choose from **Display Test, Keyboard Test, Memory Test** or **Printer Test**.

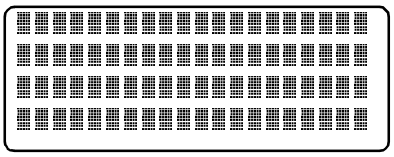
• Display Test

The **Display Test** is used to check the LCD. The test fills every pixel of the LCD display with a solid black character. Select **Display Test** and press **ENTER**.



Press **ENTER** again to start the test. Look for pixels that are not black. In other words, look for missing spots in the solid black characters. When done, press the **BACK** key.





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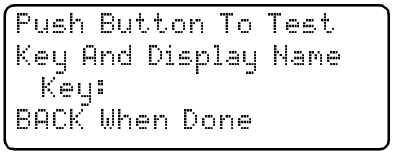
• Keyboard Test

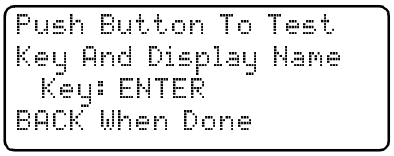
The **Keyboard Test** is used to verify the keys are functioning properly.

Select **Keyboard Test** from the ***Tool Self-Test*** menu to display the ***Keyboard Test*** screen.

When you press a **KEY**, the key name or scroll direction should appear on the display.



For example, if you press the **ENTER** key, then **Key: ENTER** displays on the third line of the screen. If the name does not display, then the key is not working.



The only exception is the **BACK** key. When the **BACK** key is pressed, the ***Tool Self-Test*** menu returns.

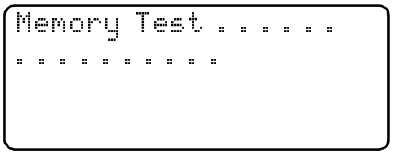
If the ***Tool Self-Test*** menu does not return, then the **BACK** key is not working.

• Memory Test

If the tool has trouble playing back recorded data, displaying trouble code definitions, or doing any other function that uses internal memory, then it is a good idea to run the **Memory Test**.

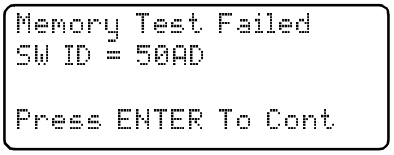
From the ***Tool Self-Test*** menu, select **Memory Test** and press **ENTER**.

A MEMORY TEST message displays and the screen fills with dots as the internal memory is tested.



✓ The **Memory Test** may take several minutes to complete.

If no problems were detected, then a MEMORY TEST PASSED! message displays on the screen. If a problem was detected, then a MEMORY TEST FAILED! message and the software identification (SW ID) display on the screen.



Press the **ENTER** key to return to the ***Tool Self-Test*** menu.

• Program Mode

The **Program Mode** is accessed from the ***Main Menu***. This mode is used for updating the tool software. Instructions are provided with the new software.

TECHNICAL SUPPORT

- Toll-Free Number: **1-800-228-7667**
- e-mail: **tech_support@actron.com**
- visit website: www.actron.com

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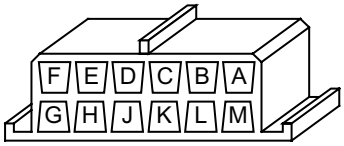
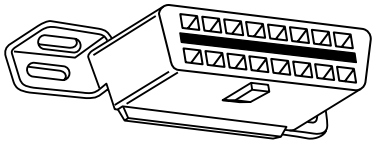
7

Appendix A - Data Link Connectors

GM Cars, Light Trucks & Vans–



ALDL Connector



OBD II (J1962) Connector

94-95 GM Cars (Used only ALDL prior to 1994)

Make/Model	Engine	VIN	RPO	Year	DLC Adapter
Achieva	2.3L DOHC PFI	A, D	LG0,LD2	94	ALDL
		D	LD2	95	OBD II
	2.3L SOHC PFI	3	L40	94	ALDL
	3.1L SFI	M	L82	94-95	ALDL
Aurora	4.0L SFI	C	L47	95	OBD II
Beretta/Corsica	2.2L TBI	4	LN2	94-95	ALDL
	2.3L DOHC	A	LG0	94	ALDL
	3.1L PFI	M	L82	94-95	ALDL
Camaro, Firebird, Trans Am	3.4L PFI OHV	S	L32	94-95	ALDL
	3.8L SFI	K	L36	95	16-Pin
	5.7L PFI	P	LT1	94	ALDL
				95	ALDL/OBD II
Caprice / Impala	5.7L TBI, MFI	P	LT1	94, 95	ALDL, OBD II
	4.3L V-8 MFI	W	L99	94-95	ALDL
Cavalier	2.2L TBI, SFI	4	LN2	94, 95	ALDL, OBD II
	2.3L DOHC	D	LD2	95	OBD II
	3.1L SFI	T	LH0	95	ALDL
Century	2.2L	4	LN2	95	ALDL
	3.1L	M	L82	94-95	ALDL
Concours	4.6L OHC	Y, 9	LD8, L37	94-95	ALDL
	4.9L SFI	B	L26	94	ALDL
Corvette	5.7L OHC (ZR-1)	J	LT5	94-95	OBD II
	5.7L PFI, SFI	P	LT1	94-95	OBD II
Cutlass Ciera	2.2L PFI	4	LN2	94-95	ALDL
	3.1L SFI	M	L82	94-95	ALDL
Cutlass Supreme	3.1L MFI, SFI	M	L82	94-95	ALDL
	3.4L OHC SFI	X	LQ1	94-95	ALDL
DeVille/Concours	4.6L OHC	Y, 9	LD8, L37	94-95	ALDL
	4.9L PFI	B	L26	94-95	ALDL
Eighty-Eight, Ninety-Eight, Park Avenue, Bonneville	3.8L SFI	L, K	L27, L36	94-95	OBD II
	3.8L SFI SC	1	L67	95	OBD II
Eldorado, Seville	4.6L OHC	Y, 9	LD8, L37	94-95	ALDL
Fleetwood	4.6L OHC	Y, 9	LD8, L37	94-95	ALDL
	5.7L TBI, SFI	P	LT1	94-95	ALDL
Grand Am	2.3L PFI DOHC	A, D	LD2	94-95	ALDL
	2.3L PFI SOHC	3	L40	94	ALDL
	3.1L SFI	M	L82	94-95	ALDL

Note: *Data Link connectors (DLC) are located under the dash, near the steering wheel.*

94-95 GM Cars (Used only ALDL prior to 1994)

Make/Model	Engine	VIN	RPO	Year	DLC Adapter
GrandPrix	2.3L DOHC	D	LD2	94-95	OBD II
	3.1L MFI	M	L82	94-95	ALDL
	3.4L PFI OHC	X	LQ1	94-95	ALDL
LeSabre	3.8L MFI	L	L27	94-95	OBD II
Lumina, Monte Carlo	3.1L PFI, SFI	M, T	L82, LH0	94-95	ALDL
	3.4L MFI OHC	X	LQ1	94-95	ALDL
Regal	3.1L MFI	M	LH0, L82	94-95	ALDL
	3.8L SFI, MFI	L	L27	94-95	ALDL
Riviera	3.8L MFI	K	L36	95	OBD II
	3.8L SFI SC	1	L67	95	OBD II
Roadmaster	5.7L	P	LT1	94-95	ALDL
Saturn SC1, SL, SL1, SW1	1.9L SOHC	8	L24	94-95	ALDL
Saturn SC2, SL, SL2, SW2	1.9L DOHC	7	LL0	94-95	ALDL
Skylark	2.3L DOHC	D	LD2	95	ALDL
	2.3L SOHC	3	L40	94	ALDL
	3.1L	M, T	L82, LH0	94-95	ALDL
	3.8L MFI	K	L36	95	OBD II
Sunbird	3.1L PFI	T	LH0	94	ALDL
Sunfire	2.0L TBI OHV	H	LE4	94	ALDL
	2.2L MFI	4	LN2	95	OBD II
	2.3L PFI DOHC	D	LD2	95	OBD II

Note: *Data Link connectors (DLC) are located under the dash, near the steering wheel.*

94-95 GM Light Trucks & Vans

Make/Model	Code	RPO	Engine	Year	DLC
C Series 4x2 & K series 4x4 ***Conventional Cab*** Pickup, Sierra, Blazer, Suburban, Yukon & Tahoe	Z	LB4	4.3L TBI	94-95	ALDL
	H	LO3	5.0L TBI	94-95	ALDL
	K	LO5	5.7L TBI	94-95	ALDL
	P	L49	6.5L Diesel	94-95	ALDL
	F	L65, L56	6.5L Turbo diesel	94-95	ALDL
	N	L19	7.4L TBI	94-95	ALDL
G series 4x2 ***Van (full size)*** Chevy van, Sport van, GMC Vandura and Rally	Z	LB4	4.3L TBI	94-95	ALDL
	H	LO3	5.0L TBI	94-95	ALDL
	K	LO5	5.7L TBI	94-95	ALDL
	P, Y	L49, L57	6.5L Diesel	94-95	ALDL
	N	L19	7.4L TBI	94-95	ALDL
M series 4x2 & L series 4x4, ***Small Van,*** Astro, Safari	W	L35	4.3L CPI	94-95	ALDL
	Z	LB4	4.3L TBI	94	ALDL

Note: *Data Link connectors (DLC) are located under the dash, near the steering wheel.*

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94-95 GM Light Trucks & Vans

Make/Model	Code	RPO	Engine	Year	DLC
P series 4x2 ***Forward Contro****l* Parcel/Delivery commercial vans, Motorhomes	Z	LB4	4.3L TBI	94-95	ALDL
	K	LO5	5.7L TBI	94-95	ALDL
	Y	L57	6.5L Diesel	94	ALDL
	F	L65	6.5L Turbo Diesel	94-95	ALDL
	N	L19	7.4L TBI	94-95	ALDL
S series 4x2 & T series 4x4 ***Small Conventional Cab***, Blazer, Bravada, Jimmy, Pickup & Sonoma	4	LN2	2.2L MFI	94-95	OBD II
	W	L35	4.3L CPI	94 95	ALDL OBD II
	Z	LB4	4.3L TBI	94 95	ALDL OBD II
U & X series 4x2 ***All Purpose Vehicle,*** Lumina APV, Silhouette, Trans Sport	D	LG6	3.1L TBI	94-95	ALDL
	L	L27	3.8L PFI	94-95	ALDL

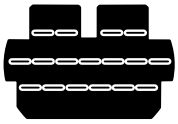
Note: *Data Link connectors (DLC) are located under the dash, near the steering wheel.*

A

Ford Cars, Light Trucks & Vans

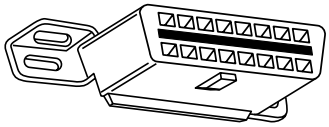
EEC-IV Connector

MECS 7-Pin Connector



MECS 17-Pin Connector

MCU Connector



OBD II (J1962) Connector

Ford and Lincoln/Mercury Cars, Light Trucks & Vans

MODEL	ENGINES	DLC	YEAR	LOCATION
Aspire	1.3L	MECS 17	94-95	Engine compartment, left rear corner
Capri / XR2	1.6L, 1.6L T	MECS 7	91-94	Engine compartment, right rear corner.
	2.3L, 2.3L T, 3.8L, 5.0L, 5.0LHO	EEC IV	84-86	Engine compartment, left rear corner.
Continental	3.8L, 4.6L, 5.0L	EEC IV	88	Engine compartment, right corner near firewall.
			89-94	Right rear of engine compartment.
	4.6L	EEC V	95	Below instrument panel right of steering wheel.
Contour	2.0L, 2.5L	EEC IV	95	Engine compartment, left side by shock tower.
Cougar	2.3L, 2.3L T, 3.8L, 5.0L, 5.0LHO	EEC IV	84-85	Right inner fender of engine compartment
			86-90	Engine compartment, in front of left shock tower.
			91-95	Engine compartment, in front of right shock tower.
	4.6L	EEC V	94-95	Below instrument panel to right of steering wheel.
Escort / XR3i/Lynx/ EXP/ LN7	1.6L, 1.6L Turbo, 1.9L	EEC IV*	84-90	Right fender apron near firewall and shock tower.
		EEC IV	91-95	Engine compartment, left rear corner.
Escort	1.8L	MECS 17	91-95	Engine compartment, left rear corner near firewall.
Festiva	1.3L	MECS 7	90-93	Engine compartment, left rear corner.
Grand Marquis, Crown Victoria, Colony Park, Country Squire	4.6L, 5.0L	EEC IV*	84	Above right wheel well.
			85-94	Front Left fender apron above wheelwell.
	4.6L	EEC V	95	Below instrument panel to right of steering wheel.
Grand Marquis/ Crown Victoria (Police)	5.8L	MCU	84	Above right wheel well.
			85-91	Front of left fender apron above wheelwell.
Marquis/LTD	2.3L, 3.8L	EEC IV	84-86	Engine compartment, left rear corner.
Mark VII	5.0L, 5.0L HO	EEC IV*	84-89	Engine compartment, right corner near firewall
			90-92	Front of right fender apron.

***** Early models are equipped with the EEC III diagnostic system which is not supported by this tool.

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Ford and Lincoln/Mercury Cars, Light Trucks & Vans

MODEL	ENGINES	DLC	YEAR	LOCATION
Mark VIII	4.6L	EEC IV	93-95	Engine compartment on top of left wheel well.
Mustang	2.3L,2.3L Turbo, 5.0L, 5.0L HO, 5.0L SHP	EEC IV	84-85 86-93 94-95	Center of left fender apron. Left rear corner of engine compartment on shock tower. Rear of right shock tower.
	3.8L	EEC IV	84-85 86-93	Center of left fender apron. Left rear corner of engine compartment on shock tower.
	3.8L	EEC V	94-95	Below left side of glove compartment.
Mystique	2.0L, 2.5L	EEC IV	95	Left side of engine compartment near shock tower.
Probe	2.0L (A/T only in 93)	MECS 17 EEC IV	93 93-95	Left rear of engine compartment near strut tower. Left rear of engine compartment near strut tower.
	2.2L, 2.2L Turbo	MECS 7	89-92	Left rear of engine compartment near strut tower.
	2.5L	MECS 17	93-95	Left front of engine compartment near battery.
	3.0L	EEC IV	91-92	Left rear of engine compartment near strut tower.
Sable	3.0L, 3.8L	EEC IV	86-87 88-95	Engine compartment near alternator. Right rear corner of engine compartment.
Scorpio	2.9L	EEC IV	88	Engine compartment, right rear corner.
Taurus	2.5L, 3.0L FF, 3.0L, 3.0L SHO, 3.2L, 3.8L	EEC IV	86-87 88-95	Engine compartment near alternator. Right rear corner of engine compartment.
Tempo / Topaz	2.3L HSC, 2.3L HSO, 3.0L	EEC IV	84-92 93-94	Right rear corner of engine compartment. Left strut tower.
Thunderbird	2.3L, 2.3L T, 3.8L, 3.8L SC, 5.0L, 5.0L HO	EEC IV	84-85 86-90 91-95	Right inner fender of engine compartment Engine compartment, in front of left shock tower. Engine compartment, in front of right shock tower.
	4.6L	EEC V	94-95	Below instrument panel to right of steering wheel.
Town Car	4.6L	EEC V	95	Below instrument panel right of steering wheel.
	4.6L, 5.0L	EEC IV*	84 85-90 94-94	Above right wheel well. Left fender apron, near or above wheelwell. Above left wheel well.
Tracer	1.8L 1.8L	MECS 7 MECS 17	88-89 91-95	Engine compartment, left rear corner near firewall. Engine compartment, left rear corner near firewall.
	1.9L	EEC IV	91-95	Engine compartment, left rear corner.
XR4Ti	2.3L Turbo	EEC IV	85-88	Engine compartment, right fender apron above wheel well.
Aerostar	2.3L, 2.8L, 3.0L, 4.0L	EEC-IV	86-92 93-95	Left front fender below starter relay. Left rear engine compartment on firewall.
Bronco	4.9L*, 5.0L*, 5.8L* *84-85 A/T Only	EEC-IV	84-87 88-95	Right inner fender near starter relay. Left front corner of engine compartment.

***** Early models are equipped with the EEC III diagnostic system which is not supported by this tool.

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Ford and Lincoln/Mercury Cars, Light Trucks & Vans

MODEL	ENGINES	DLC	YEAR	LOCATION
Bronco II	2.8L, 2.9L	EEC-IV	84-88 89-90	Right inner fender near starter relay. Right fender panel below engine compartment fuse block.
E-Series, Econoline Van	4.9L, 5.0L, 5.8L, 7.3L D, 7.3L TD	EEC-IV	84-91 92-95	Right front fender near starter relay. Left front corner of engine compartment.
	7.5L Calif. >14,000 GVW	EEC-IV	96	Left front corner of engine compartment.
	7.5L 49 States	EEC-IV	96	Left front corner of engine compartment.
	5.8L > GVW	EEC-IV	96	Left front corner of engine compartment.
Explorer	4.0L	EEC-IV	91-95	Right rear of engine compartment.
F-Series Pickup	4.9L, 5.0L, 5.8L, 7.3L D, 7.3L TD, 7.5L	EEC-IV	84-87 88-95	Right inner fender near starter relay. Left front fender apron in rear of engine compartment.
	5.8L > 8500 GVW	EEC-IV	96-98	Left rear of engine compartment.
	7.0L	EEC-IV	91-96	Left rear of engine compartment.
	7.0L > 14,000 GVW	EEC-IV	97-98	Left rear of engine compartment.
	7.5L W/Fed Emiss	EEC-IV	96	Left rear of engine compartment.
	7.5L > 8,500 GVW 49 States	EEC-IV	97-98	Left rear of engine compartment.
	7.5L > 14,000 GVW	EEC-IV	97-98	Left rear of engine compartment.
Ranger	2.3L	MCU	84	Right front inner fender panel.
	2.3L, 2.8L, 2.9L, 3.0L, 4.0L	EEC-IV	84-85 86-92 92-94	Right front inner fender panel. Right rear fender apron near fuel pump relay. Left front inner fender by fuse/relay block.
	2.3L, 3.0L, 4.0L	EEC-V	95	Below instrument panel, right of steering wheel.
Windstar	3.0L, 3.8L	EEC-V	95	Below instrument panel, right of steering wheel.

***** Early models are equipped with the EEC III diagnostic system which is not supported by this tool.

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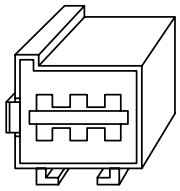
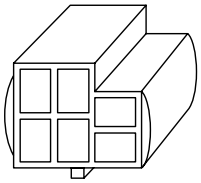
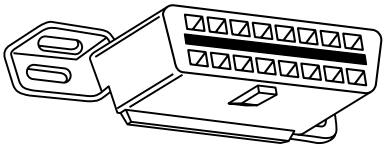
Chrysler Cars, Light Trucks & Vans



LH Connector



SCI Connector



OBD II (J1962) Connector

Chrysler Cars, Light Trucks & Vans

Make/Model	Year	Engine	DLC	Location
Acclaim	89-95	ALL	SCI	Front of left shock/strut tower, near the SBEC/SMEC module.
Aries K, Reliant	89	ALL	SCI	At front of left shock/strut tower.
Caravan, Grand Caravan	89-91	ALL	SCI	In front of left fender panel below relays.
	92-93	ALL	SCI	In engine compartment near PCM module.
	94-95	ALL	SCI	In engine compartment on left side of firewall.
Cherokee	91-95	ALL	SCI	In front of left fender apron behind air cleaner.
Cirrus	95	ALL	OBD II	Left of steering column under dash on body control module
Comanche	91-92	ALL	SCI	In front of left fender apron behind air cleaner.
Concorde, Intrepid, Vision	93-95	ALL	LH	Right of steering column under dash.
Dakota	91	ALL	SCI	Engine compartment, right corner of firewall
Daytona	89-93	ALL	SCI	At front of left shock/strut tower.
Dynasty	89-93	ALL	SCI	Front of left shock/strut tower near SBEC/PCM.
Fifth Avenue, Imperial	90	ALL	SCI	In engine compartment near air filter housing.
	91-93	ALL	SCI	On front of left fender panel by SMEC/SBAC.
Grand Cherokee, Grand Wagoneer	93-	ALL	SCI	Right rear of engine compartment.
Horizon, Omni	89-90	ALL	SCI	Front of left side shock tower by relays & SMEC.
Lancer	89	ALL	SCI	At front of left shock/strut tower.
LeBaron Coupe, Convertible	89-95	ALL	SCI	At front of left shock/strut tower.
LeBaron Sedan, GTS	89-95	ALL	SCI	Front of left shock/strut tower near SBEC/PCM.
LHS	94-95	ALL	LH	Right of steering column under dash.
Monaco, Premier	91-92	ALL	SCI	On left fender pane next to SBEC.
Neon	95	ALL	OBD II	Under left side of dash.

A

Chrysler Cars, Light Trucks & Vans

Make/Model	Year	Engine	DLC	Location
New Yorker	89-93	ALL	SCI	Front of left shock tower near the SBEC/SMEC module.
	94-95	ALL	LH	Right of steering column under dash.
Pickup D/W, RAM series	89-95	5.2L, 5.9L	SCI	On left side of firewall near master cylinder.
	89-95	3.9L, 5.9L Diesel	SCI	In engine compartment on right side of firewall.
	94-95	8.0L	SCI	In engine compartment on right side of firewall.
Ram Wagon/Van, B-Van	89-90	5.2L, 5.9L	SCI	On left side of firewall below cowl.
	91-95	5.2L, 5.9L	SCI	On center of firewall next to SBEC/PCM.
	92-95	5.2L CNG	SCI	Under center of dash panel.
	89-95	3.9L	SCI	In engine compartment on right side of firewall.
Ramcharger	89-90	ALL	SCI	On left side corner of firewall below cowl.
	91-93	ALL	SCI	In engine compartment, near master cylinder.
Sebring Coupe/Avenger	95	ALL	OBD II	Under left side of dash, right side of steering column.
Shadow, Sundance	89-95	ALL	SCI	Front of left shock/strut tower near SBEC/PCM.
Spirit	89-95	ALL	SCI	Front of left shock/strut tower near SBEC/PCM.
Stealth	94-95	ALL	OBD II	Under left side of dash, right side of steering column.
Stratus	95	ALL	OBD II	Left of steering column under dash on body control module
Summit, Colt	94-95	ALL	OBD II	Under left side of dash, right side of steering column.
Talon	95	ALL	OBD II	Under left side of dash, right side of steering column.
Town & County	90-91	ALL	SCI	On front of left fender panel below relays.
	92-93	ALL	SCI	In engine compartment near PCM module.
	94-95	ALL	SCI	In engine compartment on left side of firewall.
Voyager, Grand Voyager	89-91	ALL	SCI	In front of left fender panel below relays.
	92-93	ALL	SCI	In engine compartment near PCM module.
	94-95	ALL	SCI	In engine compartment near PCM module on left side of firewall.
Wrangler	91-95	ALL	SCI	In front of left fender apron behind air cleaner near SBEC.

A

Appendix B - Engine Application Chart

GM Cars

Make/Model	Code	RPO*	Engine	Years
Buick				
Century	4	LN2	2.2L	93-96
	R	LR8	2.5L	84-92
	X, W	LE2, LB6	2.8L	86, 87-89
	E	LK9	3.0L	84, 85
	M	L82	3.1L	94-99
	N	LG7	3.3L	89-93
	3, B(86)	LG3, LG2	3.8L	84-88
	T, V	LT7, LT6	4.3L Diesel	85
Electra, Park Ave	E	LK9	3.0L	85
	3, B(86), C	LG3, LG2, LN3	3.8L	85-88, 89-90
	4	LC4	4.1L	84
	Y	LV2	5.0L	84, 85
	N	LF9	5.7L Diesel	84, 85
Park Avenue	L, K	L27, L36	3.8L MFI	91-94, 95-99
	1	L67	3.8L Supercharged	92-99
	C	LN3	3.8L SFI	90
Estate Wagon	Y	LV2	5.0L	86-90
LeSabre	L	LN7	3.0L	86
	A	LD5	3.8L 2BBL	84, 85
	B, 3, C	LG2, LG3, LN3	3.8L SFI	86, 87-88, 89-91
	L, K	L27, L36	3.8L MFI	92-95, 96-99
	4	LC4	4.1L	84
	Y	LV2	5.0L	84, 85
	M	LF9	5.7L Diesel	84, 85
Reatta	C	LN3	3.8L SFI	88- 91
Regal	W	LB6	2.8L	88, 89
	T, M	LH0, L82	3.1L MFI	89-94, 95-97
	A	LD5	3.8L 2BBL	84-87
	9, 7	LM9, LC2	3.8L SFI Turbo	84-85, 86-88
	L, K	L27,L36	3.8L SFI, MFI	91-95, 96-99
	1	L67	3.8L SFI super-charged	98, 99
	4	LC4	4.1L	84
	T, V	LT7, LT6	4.3L Diesel	85
	Y	LV2	5.0L	86, 87
	N	LF9	5.7L Diesel	85

***Regular Production Option (RPO) for Engine**

GM Cars

Make/Model	Code	RPO*	Engine	Years
Riviera	B, 3, C, L	LG2, LG3, LN3, L27	3.8L SFI	86, 87, 88-91, 92-93
	9	LM9	3.8L SFI Turbo	84, 85
	K	L36	3.8L MFI	95-99
	1	L67	3.8L SFI super-charged	95-99
	4	LC4	4.1L	84
	Y	LV2	5.0L	84, 85
	N	LF9	5.7L Diesel	84, 85
Roadmaster	E	LO3	5.0L	91, 92
	P	LT1	5.7L	92-95
Skyhawk	0, J	LH8, LA5	1.8L, 1.8L Turbo	84-86
	P,1,K(87-88)	LQ5, LL8, LT2	2.0L TBI	84-86, 87-89
	M	LT3	2.0L MFI Turbo	87
Skylark, Somerset	D	LD2	2.3L DOHC	88-93, 95
	3	L40	2.3L SOHC	92-94
	T	LD9	2.4L	96-98
	R, U	LR8, L68	2.5L TBI	84-85, 86-91
	X/Z, X/W	LE2/LH7, LE2/LB6	2.8L	84, 85
	L	LN7	3.0L	85-88
	M, T	L82, LH0	3.1L	94, 94-98
	N	LG7	3.3L	89-93
	K	L36	3.8L	95-97
Cadillac				
Allante	5	LR6	4.5L	88-92
	9, Y	L37, LD8	4.6L OHC	93
Brougham	Y	LV2	5.0L 4BBL	87-90
	E	LO3	5.0L TBI	91-92
	7	LO5	5.7L TBI	90-92
Catera	R	L81	3.0L SFI	97-99
Cimarron	P	LQ5	2.0L TBI OHV	84-86
	W	LB6	2.8L MFI	85-88
	Y, 9	LD8, L37	4.6L OHC	94-99
	B	L26	4.9L SFI	94
Deville/Conours	8	LT8	4.1L DFI	84-87
	T	LT7	4.3L Diesel	85
	3	LW2	4.5L PFI	90
	5	LR6	4.5L DFI	88-89
	3	LW2	4.5L PFI	90
	Y, 9	LD8, L37	4.6L OHC	94-99
	B	L26	4.9L PFI	91-95
	N	LF9	5.7L Diesel	84

***Regular Production Option (RPO) for Engine**

GM Cars

Make/Model	Code	RPO*	Engine	Years
Eldorado	8	LT8	4.1L DFI	84-87
	5, 3	LR6, LW2	4.5L DFI, PFI	88-89, 90
	Y, 9	LD8, L37	4.6L OHC	94-99
	B	L26	4.9L PFI	91-93
	N	LF9	5.7L Diesel	84-85
Fleetwood	8	LT8	4.1L DFI	85-87
	T	LT7	4.3L Diesel	85
	5, 3	LR6, LW2	4.5L DFI, PFI	89, 90
	Y, 9	LD8, L37	4.6L OHC	94-99
	B	L26	4.9L PFI	91-92
	Y	LV2	5.0L 4BBL	86
	7, P	LO5, LT1	5.7L TBI, SFI	93, 94-96
	N	LF9	5.7L Diesel	84-85
	9	L62	6.0L DFI	84
Seville	8	LT8	4.1L DFI	84-87
	5, 3	LR6, LW2	4.5L DFI, PFI	88-89, 90
	Y, 9	LD8, L37	4.6L OHC	94-99
	B	L26	4.9L PFI	91-93
	N	LF9	5.7L Diesel	84-85
Sixty Special	B	L26	4.9L PFI	93
Chevrolet				
Beretta/Corsica	1	LL8	2.0L OHV	87-89
	4	LN2	2.2L TBI	90-96
	A	LG0	2.3L DOHC	90-94
	W	B6	2.8L MFI	87-89
	T, M	LH0, L82	3.1L PFI	90-96
Camaro	2	LQ9	2.5L TBI	84-86
	1, L, Z	LC1, LL1, LH7	2.8L 2BBL	84
	S	LB8	2.8L MFI	85-89
	T	LH0	3.1L PFI	90-92
	S	L32	3.4L PFI OHV	93-95
	K	L36	3.8L SFI	95-99
	G, H	LG4, L69	5.0L 4BBL	84-87
	E, F	LO3, LB9	5.0L MFI, TBI	85-92
	8, P, G	L98, LT1, LS1	5.7L PFI	87-92, 93-97, 98-99
Caprice/Impala	9, A	LC3, LD5	3.8L 2BBL	84-85
	W	L99	4.3L V-8 MFI	94-96
	Z	LB4	4.3L V-6 TBI	85-93
	H, E	LG4, LV2	5.0L (305) 4BBL, TBI	84-88, 89-93
	Y	LV2	5.0L (307) 4BBL	86-90
	6, 7	LM1, LB9	5.7L 4BBL (POLICE)	86-88, 89
	7, P	LO5, LO3	5.7L TBI, MFI	90-93, 94-96
	N	LF9	5.7L Diesel	84-85

***Regular Production Option (RPO) for Engine**

GM Cars

Make/Model	Code	RPO*	Engine	Years
Cavalier	P, 1	LQ5, LL8	2.0L TBI	84-86, 87-89
	G, 4	LM3, LN2	2.2L TBI, SFI	90-91, 92-99
	D	LD2	2.3L DOHC	95
	W	LB6	2.8L MFI	85-89
	T	LH0	3.1L SFI	90-94, 96-99
Celebrity	R	L68	2.5L TBI	84-90
	X, Z	LE2, LE7	2.8L 2BBL, HO	84-86
	W	LB6	2.8L MFI	86-89
	T	LH0	3.1L PFI	90
	T	LT7	4.3L Diesel	84-85
Chevette	C	L17	1.6L 2BBL	84-87
	D	LJ5	1.8L Diesel	84-86
Citation	R	L68	2.5L TBI	84-85
	Z, X, W	LH7, LE2, LB6	2.8L 2BBL	84-85
Corvette	8, 8, P, G	L83, L98, LT1, LSI	5.7L PFI, SFI	84, 85-91, 92-95, 96-99
	J	LT5	5.7L OHC (ZR-1)	89-95
Lumina	4	LN2	2.2L PFI	93
	R	LR8	2.5L TBI	90-92
	T, M	LH0, L82	3.1L PFI, SFI	90-94, 95-99
	X	LQ1	3.4L MFI OHC	91-97
	K	L36	3.8L SFI	98-99
Malibu	T	LD9	2.4L SFI	97-99
	M	L82	3.1L SFI	97-99
Monte Carlo	M	L82	3.1L MFI	95-97
	X	LQ1	3.4L MFI	95-97
	K	L36	3.8L SFI	98-99
	9, A	LC3, LD5	3.8L 2BBL	84, 84-87
	Z	LB4	4.3L TBI	85-88
	G, H	L69, LG4	5.0L 4BBL	84-88
	N	LF9	5.7L Diesel	84
	M	L82	3.1L MFI	95-97
	X	LQ1	3.4L MFI	95-97
Nova	4	LC9	1.6L 2BBL OHC	85-88
	5	LW0	1.6L MFI OHC	88
Spectrum	K, 7	LC5	1.5L 2BBL	85-88
	9	LC0	1.5L EFI Turbo	87-88
Oldsmobile				
Delta 88/88 Royale/88	L	LN7	3.0L MFI	86
	A	LD5	3.8L 2BBL	84-85
	B, 3, C, L, K	LG2,LG3,LN3, L27,L36	3.8L SFI	86, 87-88, 88-91, 92-94, 95-99
	1	L67	3.8L SFI supercharged	95-96
	Y	LV2	5.0L 4BBL	84-85
	N	LF9	5.7L Diesel	84-85

***Regular Production Option (RPO) for Engine**

GM Cars

Make/Model	Code	RPO*	Engine	Years
98/98 Regency	E	LK9	3.0L 2BBL	85
	3, C, L, K	LG3,LN3,L27,L36	3.8L SFI	85-88, 88-90, 91-94, 95-96
	1	L67	3.8L SFI super-charged	92-95
	T	LT7	4.3L Diesel	85
	Y, 9	LV2, LG8	5.0L 4BBL	84
	N	LF9	5.7L Diesel	84
Achieva	T	LD9	2.4L SFI	96-98
	A, D	LG0, LD2	2.3L DOHC PFI	92-95
	3	L40	2.3L SOHC PFI	92-94
	M	L82	3.1L SFI	94-98
	N	LG7	3.3L SFI	92-93
Aurora	C	L47	4.0L SFI	95-99
Custom Cruiser	A	LD5	3.8L 2BBL	85
	Y, E	LV2, LO3	5.0L 4BBL	84-90, 91-92
	7	LO5	5.7L TBI	92
	N	LF9	5.7L Diesel	84-85
Cutlass	T	LD9	2.4L SFI	97
	M	L82	3.1L SFI	97-99
	A	LD5	3.8L 2BBL	84-87
	V	LT6	4.3L Diesel	84
	Y, 9	LV2, LG8	5.0L 4BBL	84-87
	N	LF9	5.7L Diesel	84-85
Cutlass Calais, Calais	D, A	LD2, LG0	2.3L DOHC	88-91, 90-91
	U	L68	2.5L TBI	85-91
	L	LN7	3.0L MFI	85-88
	N	LG7	3.3L SPFI	89-91
Cutlass Ciera/Cruiser	4	LN2	2.2L PFI	93-95
	R	LR8	2.5L TBI	84-92
	W	LB6	2.8L MFI	84-85, 87-89
	E	LK9	3.0L 2BBL	84, 85
	M	L82	3.1L SFI	94, 95
	N	LG7	3.3L SPFI	89-93
	3, B	LG3, LG2	3.8L SFI	84-88, 86
	V	LT6	4.3L Diesel	84-85
Cutlass Supreme/ Classic	A, D	LG0, LD2	2.3L DOHC	90, 90-92
	W	LB6	2.8L MFI	88-89
	T, M	LH0, L82	3.1L MFI, SFI	89-93, 94-97
	X	LQ1	3.4L OHC SFI	91-96
	Y	LV2	5.0L 4BBL	88
Firenza	O	LH8	1.8L OHC TBI	84-86
	P, 1/K	LQ5, LL8/LT2	2.0L OHV TBI	84-86, 87-88
	W	LB6	2.8L MFI	85-87
Intrigue, LSS & Regency	H	LX5	3.5L SFI	98-99
	K	L36	3.8L SFI	97-99
	1	L67	3.8L SFI super-charged	96-99

***Regular Production Option (RPO) for Engine**

GM Cars

Make/Model	Code	RPO*	Engine	Years
Omega	R	LR8	2.5L TBI	84
	X, Z	LE2, LH7	2.8L 2BBL	84
Toronado, Trofeo	B, 3, C	LG2, LG3, LN3	3.8L SFI	86, 86-92
	4	LC4	4.1L 4BBL	84
	Y, 9	LV2, LG8	5.0L 4BBL	84-85
	N	LF9	5.7L Diesel	84-85
Pontiac				
6000	R	LR8	2.5L TBI	84-91
	X, Z	LE2, LH7	2.8L 2BBL	84
	W	LB6	2.8L MFI	85-89
	T	LHO	3.1L MFI	88-91
	T	LT7	4.3L Diesel	84-85
Bonneville	A	LD5	3.8L 2BBL	84-86
	3, C, L, K	LG3, LN3, L27, L36	3.8L MFI, SFI	87-88, 88-91, 92-95, 96-99
	1	L67	3.8L SFI super-charged	92-99
	Z	LB4	4.3L TBI	86
	H	LGH	5.0L 4BBL	84-86
	N	LF9	5.7L Diesel	84
GrandPrix	D	LG0	2.3L DOHC	91-96
	W	LB6	2.8L MFI	88-89
	T, M	LH0, L82	3.1L MFI	89-93, 94-99
	V	LG5	3.1L PFI Turbo	90
	X	LQ1	3.4L PFI OHC	91-96
	A	LD5	3.8L 2BBL	84-87
	K	L36	3.8L SFI	97-99
	1	L67	3.8L SFI super-charged	97-99
	Z	LB4	4.3L TBI	86-87
	H	LGH	5.0L 4BBL	84-87
	N	LF9	5.7L Diesel	84
Fiero	R	LR8	2.5L TBI	84-88
	9	L44	2.8L MFI HO	85-88
Firebird	2	LQ9	2.5L TBI	84-86
	1, L	LC1, LL1	2.8L 2BBL	84
	S	LB8	2.8L MFI	85-89
	T	LH0	3.1L PFI	90-92
	S	L32	3.4L SFI OHV	93-95
	K	L36	3.8L SFI	95-99
	G, H	LG4, L69	5.0L 4BBL	84-87
	E, F	LO3, LB9	5.0L MFI, TBI	85-92
	8, P, G	L98, LT1, LS1	5.7L PFI, SFI	87-92, 93-97, 98-99
Firefly (Canada)	M/ 5, 6	LY9, LP2	1.0L 3cyl 2BBL, TBI	85-88, 89-99
	2	LS3	1.0L MFI Turbo	87-91
	9, 2	L72, LY8	1.3L SOHC TBI, SFI	89-97, 98-99

***Regular Production Option (RPO) for Engine**

GM Cars

Make/Model	Code	RPO*	Engine	Years
Grand Am	M	LT3	2.0L MFI Turbo	87-89
	A, D	LG0, LD2	2.3L PFI DOHC	88-95
	3	L40	2.3L PFI SOHC	94
	T	LD9	2.4L SFI	96-99
	U	L68	2.5L TBI	85-91
	L	LN7	3.0L MFI	85-87
	M	L82	3.1L SFI	94-99
	N	LG7	3.3L SFI	92-93
	E	LA1	3.4L SFI	99
Sunbird, 2000 Sunbird	O	LH8	1.8L TBI OHC	84-86
	J	LA5	1.8L MFI Turbo	84-86
	P, K, H	LQ5, LT2, LE4	2.0L TBI OHV	84-86, 87-91, 92-94
	M	LT3	2.0L PFI Turbo	87-90
	T	LH0	3.1L PFI	91-94
LeMans	6	LT3	1.6L TBI	88-93
	K	LT2	2.0L TBI OHC	89-90
Parisienne	A	LD5	3.8L 2BBL	84-85
	Z	LB4	4.3L TBI	85-86
	H	LG4	5.0L 4BBL (305)	84-86
	Y	LV2	5.0L 4BBL (307)	86
	N	LG7	3.3L SFI	92-93
Phoenix	R	LR8	2.5L TBI	84
	X, Z	LE2, LH7	2.8L 2BBL	84
Safari Wagon	Y	LV2	5.0L 4BBL	87-89
Sunfire	4	LN2	2.2L MFI	95-99
	D	LD2	2.3L PFI DOHC	95
	T	LD9	2.4L SFI	96-99
T1000	C	L17	1.6L 2BBL	84-87
	D	LJ5	1.8L Diesel	84-86
Saturn				
SC	8/7	L24/LL0	1.9L SOHC, DOHC	91-92
SC1, SL	9, 8	LK0, L24	1.9L SOHC	93-94, 95-99
SC2, SL	7	LL0	1.9L DOHC	93-99
SL1	9, 8	LKO, L24	1.9L SOHC	91-94, 95-99
SL2	7	LL0	1.9L DOHC	91-99
SW1	9, 8	LK0, L24	1.9L SOHC	93-94, 95-99
SW2	7	LL0	1.9L DOHC	93-99

***Regular Production Option (RPO) for Engine**

GM Light Trucks and Vans

Make/Model	Code	RPO*	Engine	Years
C Series 4x2 & K series 4x4 Conventional Cab [1] *Pickup, Sierra, Silverado*	D	LE3	4.1L 2BBL	84
	N, Z, W	LB1, LB4, L35	4.3L 4BBL, TBI, CSI	85-86, 86-95, 96-99
	T	L25	4.8L 1BBL	85-86
	F/H, H, M	LF3/LE9, LO3, L30	5.0L 4BBL, TBI, CSI	84-87, 88-95, 96-99
	E/K	LP9/LT9	5.7L 2BBL/LPG	84
	L/M, K, R	LS9/LT9, LO5, L31	5.7L 4BBL, TBI, CSI	85-86, 87-95, 96-99
	C, J	LH6, LL4	6.2L Diesel	84-93
	P	L49	6.5L Diesel	94-95
	F, S	L65, L56	6.5L Turbo diesel	92-99, 94-98
	W, N, J	LE8, LI9, L29	7.4L 4BBL, TBI, CSI	88-89, 88-95, 96-99
R series 4x2 & V series 4x4 Conventional Cab [1]	Z	ZB4	4.3L TBI	87
	T	L25	4.8L 1BBL	87-88
	H	LO3	5.0L TBI	87
	M, K	LT9, LO5	5.7L 4BBL, TBI	87-88, 87-91
	C, J	LH6, LL4	6.2L Diesel	87-91
	W, N	LE8, LI9	7.4L 4BBL, TBI	88-89, 88-91
S series 4x2 & T series 4x4 Small Conventional Cab [2]	A	LR1	1.9L 2BBL (ISUZU)	84-85
	Y	LQ2	2.0L 2BBL	84
	4	LN2	2.2L MFI/SFI	94-99
	S	LQ7	2.2L Diesel	84-85
	E, A	LN8, L38	2.5L TBI	85-91, 91-93
	B, R	LR2, LL2	2.8L 2BBL, TBI	84-86, 86-93
	Z	LB4	4.3L TBI/PFI	88-95
	W, X	L35, LF6	4.3L CPI, CSI	92-99, 96-99
G series 4x2 Van (Full Size) [2]	D	LE3	4.1L 2BBL	84
	N, Z, W	LB1, LB4, L35	4.3L 4BBL, TBI, CSI	85-86, 86-95, 96-99
	F/H, H, M	LF3/LE9, LO3, L30	5.0L 4BBL, TBI, CSI	84-86, 87-95, 96-99
	E/K	LP9/LT9	5.7L 2BBL/LPG	84
	L/M, K, R	LS9/LT9, LO5, L31	5.7L 4BBL, TBI, CSI	85-87, 87-95, 95-99
	8	L98	5.7L PFI	90-91
	C, J	LH6, LL4	6.2L Diesel	84-93
	P, Y	L49, L57	6.5L Diesel	94-95, 94-99
	S, F	L56, L65	6.5L Turbo diesel	97, 98-99
	W, N, J	LE8, LI9, L29	7.4L 4BBL, TBI, CSI	88-89, 88-95, 96-99

1. Includes Blazer, Jimmy, Suburban, Yukon, Tahoe and Escalade.
2. Includes Blazer, Jimmy, Bravada, Envoy, Pickup, Sonoma, Syclone, S10 and Typhoon
3. Chevy van, Sport van, Astro, GMC Vandura, Safari and Rally, Express, G-van, Savana
** Regular Production Option (RPO) for Engine*

GM Light Trucks and Vans

Make/Model	Code	RPO*	Engine	Years
P series 4x2 Forward Control Parcel, commercial vans, Motorhomes, Cutaway and Express Vans	D	LE3	4.1L 2BBL	84
	N, Z, W	LB1, LB4, L35	4.3L 4BBL, TBI, CSI	85-86, 86-95, 96-99
	T	L25	4.8L 1BBL	89
	F/H, H, M	LF3/LE9, LO3, L30	5.0L 4BBL, TBI, CSI	84-86, 87-95, 96-99
	E/K	LP9/LT9	5.7L 2BBL/LPG	84
	L/M, K, R	LS9/LT9, LO5, L31	5.7L 4BBL, TBI, CSI	85-87, 87-95, 96-99
	C, J	LH6, LL4	6.2L Diesel	84-93
	Y	L57	6.5L Diesel	94-99
	F	L65	6.5L Turbo diesel	95-99
	W, N, J	LE8, LI9, L29	7.4L 4BBL, TBI, CSI	88-89, 88-95, 96-99
M series 4x2 & L series 4x4 Small Van [3]	E	LN8	2.5L TBI	85-90
	R	LL2	2.8L TBI	88
	N	LB1	4.3L 4BBL	85-86
	Z, B	LB4, LU2	4.3L TBI, TBI HO	86-94, 91
	W	L35	4.3L CPI/CSI	92-99
W series 4x2 El Camino & Caballero	9, A	LC3, LD5	3.8L 4BBL	84
	Z	LB4	4.3L TBI	85-87
	H, G, F	LG4, L69, LF3	5.0L 4BBL, MFI	84-87
	N	LF9	5.7L Diesel	84
U & X series 4x2 All Purpose Vehicle [4] Lumina APV, Silhouette, Trans Port, Venture, Montana	U	LG6	3.1L TBI	90-95
	E	LA1	3.4L SFI	96-99
	L	L27	3.8L PFI	92-95
	N	LF9	5.7L Diesel	

1. Includes Blazer, Jimmy, Suburban, Yukon, Tahoe and Escalade.
2. Includes Blazer, Jimmy, Bravada, Envoy, Pickup, Sonoma, Syclone, S10 and Typhoon
3. Chevy van, Sport van, Astro, GMC Vandura, Safari and Rally, Express, G-van, Savana
** Regular Production Option (RPO) for Engine*

***Regular Production Option (RPO) for Engine**

NOTE: GM Trucks and Vans - the terminology such as Tahoe, Yukon, Suburban, Jimmy, Bravada, Vandura, Safari, Astro, etc.... refer to styles of a model or packages for that model, not necessarily the model. To avoid confusion in properly choosing the correct model to test the vehicle, look at the 5th digit of the vehicle's VIN. The vehicle service manuals and the 5th digit of the VIN provide the necessary information needed to determine the appropriate GM model.

Example: The test vehicle is a 1997 Tahoe 4X4 3/4 Ton Pickup Truck with Automatic Transmission and Gross Vehicle Weight (GVW) under 8600 pounds. The 5th digit of its VIN is "K". Using the vehicle charts in General Motors service literature you will find that this is a 97 K Series 5.7L 3/4 Ton Pickup Truck with Auto and GVW < 8600. Select that vehicle from the tool Vehicle Selection menu.

B

Ford, Lincoln and Mercury Cars, Light Trucks and Vans

Model	Engine	Years
Aerostar	2.3L	1986-1987
	3.0L	1986-1997
	4.0L	1990-1997
Aspire	1.3L	1993-1997
Bronco (A/T only in 84-85)	4.9L	1984-1995
	5.0L	1984-1996
	5.8L	1988-1996
Bronco II	2.8L	1984-1985
	2.9L	1986-1990
Capri	2.3L	1984-1986
	2.3L Turbo	1984-1986
	3.8L	1984-1986
	5.0L	1984-1986
	1.6L	1991-1995
	1.6L Turbo	1991-1995
Colony Park	5.0L	1984-1991
	5.8L	1984-1991
Continental	5.0L	1984-1987
	3.8L	1988-1994
	4.6L DOHC	1995-1999
Contour	2.0L VIN 3	1995-1999
	2.0L VIN Z GFP	1996-1999
	2.5L	1995-1999
	2.5L HO	1999
Cougar	2.3L Turbo	1984-1987
	3.8L	1984-1997
	3.8L Supercharged	1989-1990
	4.6L VIN W	1994-1997
	4.6L VIN 6	1997
	5.0L	1984-1988,1991-1993
Country Squire	5.0L	1984-1991
	5.8L	1984-1991
Crown Victoria	4.6L	1992-1995
	4.6L VIN 6, 9	1996-1999
	4.6L VIN W	1995-1999
	5.0L	1984-1991
	5.8L	1984-1991
E-Series Van	4.2L	1997-1999
	4.6L	1997-1999
	4.9L	1984-1995
	5.0L	1984-1996
	5.4L	1997-1999
	5.8L	1984-1988, 1988-1995
	5.8L over 8,500 GVW (Gross Vehicle Weight)	1996
	6.8L	1997-1999
	7.3L Diesel	1989-1994
	7.3L Turbo diesel	1994-1999
	7.3L Turbo diesel Superduty	1996-1999
	7.5L	1988-1995
	7.5L 49 states except CA	1996
	7.5L Calif. over 14,000 GVW	1996
Escort	1.6L, 1.6L Turbo	1984-1985
	1.8L	1991-1995
	1.8L DOHC	1996
	1.9L	1986-1996
	2.0L VIN 3	1999
	2.0L VIN P	1997-1999

Ford, Lincoln and Mercury Cars, Light Trucks and Vans

Model	Engine	Years
EXP	1.6L, 1.6L Turbo	1984-1985
	1.9L	1986-1988
Expedition	4.6L	1997-1999
	5.4L	1997-1999
Explorer	4.0L	1994-1995
	4.0L VIN E	1997-1999
	4.0L VIN X	1996-1999
	5.0L	1996-1999
F-Series	4.2L	1997-1999
	4.6L	1997-1999
	4.6L NGV	1999
	4.9L	1994-1996
	5.0L	1994-1996
	5.4L	1997-1999
	5.4L Bi-Fuel	1999
	5.8L	1984-1985, 1988-1995
	5.8L over 8,500 GVW	1996-1999
	7.0L	1991-1996
	7.0L over 14,000 GVW	1997-1999
	7.3L Diesel	1989-1994
	7.3L DI (IDI) Diesel Turbo 8th VIN K	1994
	7.3L Turbo diesel	1994-1999
	7.5L	1988-1995
	7.5L 49 states	1996
	7.5L CA, >14,000 GVW	1996
	7.5L 49 states >8,500 GVW	1997-1999
	7.5L 50 states, >14,000 GVW	1996-1999
Grand Marquis	4.6L	1992-1995
	4.6L VIN 6	1994-1999
	4.6L NGV	1996-1997
	5.0L	1984-1991
	5.8L	1984-1990
L-Series	7.0L	1992-1995
LTD	2.3L	1984-1986
	3.8L	1984-1986
	5.0L	1984-1985
Lynx	1.6L, 1.6L Turbo	1984-1985
	1.9L	1986-1987
Mark VII	5.0L	1984-1992
Mark VIII	4.6L DOHC	1993-1999
Marquis	2.3L	1984-1986
	3.8L	1984-1986
	5.0L	1984-1985
Mountaineer	4.0L	1999
	4.6L	1995-1999
	5.0L	1997-1999
Mustang	2.3L	1984-1993
	2.3L Turbo	1984-1986
	3.8L	1984-1986, 1994-1999
	4.6L VIN 6, W	1996-1997
	4.6L DOHC, VIN X	1996-1999
	5.0L	1984-1995
Mystique	2.0L	1995-1999
	2.5L	1995-1999
Navigator	5.4L	1999

Ford, Lincoln and Mercury Cars, Light Trucks and Vans

Model	Engine	Years
Probe	2.0L	1993-1995
	2.0L DOHC	1996-1997
	2.2L	1989-1992
	2.2L Turbo	1989-1992
	2.5L	1993-1995
	2.5L DOHC	1994-1997
	3.0L	1990-1992
Ranger	2.0L	1984
	2.3L	1984-1997
	2.5L	1999
	2.8L	1984-1985
	2.9L	1986-1992
	3.0L	1991-1999
	4.0L	1990-1999
Sable	3.0L	1986-1999
	3.0L DOHC	1996-1999
	3.8L	1988-1995
Taurus	2.5L	1986-1991
	3.0L	1986-1999
	3.0L OHC (SHO)	1989-1995
	3.0L DOHC	1996-1999
	3.2L OHC (SHO)	1993-1995
	3.4L DOHC	1996-1999
	3.8L	1988-1995
Tempo	2.3L	1984-1994
	3.0L	1992-1994
Thunderbird	2.3L Turbo	1984-1988
	3.8L	1984-1997
	3.8L Supercharged	1994-1995
	4.6L OHC	1994-1997
	5.0L	1984-1988, 1991-1993
Topaz	2.3L	1984-1994
	3.0L	1992-1994
Town Car	4.6L	1991-1995
	4.6L VIN W	1995-1999
	4.6L VIN 6	1996-1999
	5.0L	1984-1990
Tracer	1.6L	1988-1989
	1.8L	1991-1995
	1.8L DOHC	1996
	1.9L	1991-1996
	2.0L	1997-1999
Windstar	3.0L	1995-1999
	3.8L	1995-1999
XR4Ti	2.3L Turbo	1986-1989

Chrysler Cars, Light Trucks and Vans

Make/Model	VIN	EO*	Engine	Years
300M	LH	R	2.7L DOHC	99
		J	3.2L SOHC	99
		G	3.5L SOHC	99
Acclaim	Y	D	2.2L TBI	89
		K	2.5L TBI	89-95
		J	2.5L MFI Turbo	89-90
		V	2.5L Flex-Fuel	93-95
		3	3.0L TBI	89-95
Aries K, Reliant	K	D	2.2L TBI	89
		K	2.5L TBI	89
Breeze	JA	C	2.0L SOHC	96-99
		X	2.4L DOHC	98-99
Caravan, Grand Caravan	K D(91) S(92) AS(94) NS(95)	B	2.4L SFI	96-99
		K	2.5L TBI	89-95
		J	2.5L MFI Turbo	89-90
		3	3.0L TBI	89-99
		R	3.3L PFI	90-99
		J, G	3.3L CNG, Flex-Fuel	94-97, 99
		L	3.8L MFI	94-99
Cherokee	XJ	P	2.5L PFI, SFI	91-99
		S	4.0L PFI, SFI	91-99
Cirrus	J JA(96)	H	2.4L MFI	95-99
		X	2.5L MFI	95-99
Comanche	MJ	P	2.5L PFI	91-92
		S	4.0L PFI	91-92
Concorde, Intrepid, Vision	L, D, D LH(96)	R	2.7L SFI	98-99
		3	3.0L MFI	95
		J	3.2L SFI	98-99
		U, R	3.3L Flex-Fuel	94, 95
		T	3.3L MFI	93-97
		F	3.5L MFI	93-97
		G	3.5L SOHC SFI	99
Dakota	N AN(94)	K, G, P	2.5L TBI,MFI, SFI	89-93, 94-95, 96-99
		X	3.9L TBI	89-99
		Y	5.2L TBI	91-99
		Z	5.9L TBI	98-99
Daytona	G	D, A	2.2L PFI, 2.2L Turbo II	89-93
		K, J	2.5L PFI. 2.5L Turbo I	89-93, 89-92
		3	3.0L FPI	90-93
		R	3.3L PFI	90
Durango	DN	X	3.9L SFI	98-99
		Y	5.2L SFI	98-99
		Z	5.9L SFI	98-99
Dynasty	C	D	2.2L PFI	89
		K	2.5L PFI	89-93
		3	3.0L PFI	89-93
		R	3.3L PFI	90-93
		U	3.3L Flex-Fuel	94
Fifth Avenue, Imperial	Y	R	3.3L PFI	90-93
		L	3.8L PFI	91-93

** Engine Option*

Chrysler Cars, Light Trucks and Vans

Make/Model	VIN	EO*	Engine	Years
Grand Cherokee, Grand Wagoneer	ZJ	S N Y	4.0L PFI, SFI 4.7L PFI, SFI 5.2L PFI, SFI	93-99 99 91-98
Horizon, Omni	L	D K	2.2L TBI 2.5L TBI	89-90 89-90
Lancer	H	D, A K, J	2.2L PFI, 2.2L Turbo II 2.5L PFI. 2.5L Turbo I	89 89
LeBaron Coupe/Convertible	J U(95)	D, A/C(90) K, J 3	2.2L PFI, 2.2L Turbo II 2.5L PFI. 2.5L Turbo I 3.0L FPI	89 89-93, 89-92 90-95
LeBaron Sedan, GTS	A H(GTS)	D, A K, J 3	2.2L PFI, 2.2L Turbo II 2.5L PFI. 2.5L Turbo I 3.0L FPI	89 89-94 90-94
LHS	C LH(96)	R J F, G	2.7L SFI 3.2L SFI 3.5L MFI, SOHC SFI	94-95 99 99
Monaco, Premier	B	U	3.0L PFI	91-92
Neon	S PL(96)	C Y	2.0L SOHC, 2.0L DOHC	95-99
New Yorker	C LH(96)	D K 3 R F	2.2L PFI 2.5L PFI 3.0L PFI 3.3L PFI 3.5L MFI	89-93 89 89-90 90-93 94-96
Pickup D/W, R & RAM series	D BR(94) BR/BE(98)	X Y Z/5 T 3,C,D,6 W	3.9L TBI 5.2L TBI 5.9L TBI, SFI 5.2L CNG 5.9L Turbo Diesel 8.0L MFI	89-99 89-99 89-99 96 90-93, 94-96, 97-98, 98-99 94-99
Ram Wagon/Van, B-Van	B AB(94)	X Y T, 2 Z, 5, W(91)	3.9L TBI, SFI 5.2L TBI, SFI 5.2L CNG, LPG 5.9L TBI, SFI	89-99 89-99 92-99, 99 89-92, 92-99, 91
Ramcharger	D	Y Z	5.2L TBI 5.9L TBI	89-93 89-93
Sebring Convertible	JX	X H	2.4L DOHC SFI 2.5L DOHC Turbo	96-99 96-99
Sebring Coupe/Avenger	U FJ22(96)	Y N	2.0L DOHC PFI 2.5L MFI	95-99 95-99
Shadow, Sundance	P	D, C K, J 3	2.2L PFI, 2.2L PFI Turbo 2.5L PFI. 2.5L Turbo I 3.0L MFI	89-94, 90-94 89-94, 89-92 93-94
Spirit	A	A K, J V 3	2.2L PFI Turbo 2.5L PFI. 2.5L Turbo I 2.5L Flex-Fuel 3.0L MFI	91-92 89-95, 89-92 93-93 89-95

** Engine Option*

Chrysler Cars, Light Trucks and Vans

Make/Model	VIN	EO*	Engine	Years
Stealth	4	H J K	3.0L MFI SOHC 3.0L MFI DOHC 3.0L MFI DOHC Turbo	94-96 94-96 94-96
Stratus	J JA(96)	C X H	2.0L SOHC 2.4L DOHC 2.5L MFI	95-99 95-99 95-99
Summit, Summit wagon & Colt	1, 6, 0	A C G	1.5L SOHC 1.8L SOHC 2.4L SOHC	94-96 94-96 94-96
Talon	G/L F24S(96)	B, Y F	2.0L DOHC PFI 2.0L DOHC Turbo	95-96, 97-98 95-98
Town & County	Y S(92) AS(94) NS(96)	R G L	3.3L PFI 3.3L Flex-Fuel 3.8L PFI	90-99 99 94-99
Voyager, Grand Voyager	K S(92) AS(94) NS(96)	B K, J 3 R T, G L	2.4L SFI 2.5L PFI. 2.5L Turbo I 3.0L FPI 3.3L PFI 3.3L CNG, 3.3L Flex-Fuel 3.8L MFI	96-99 89-95,89-90 89-99 90-99 94-96, 99 94-99
Wrangler	YJ TJ(97)	P S	2.5L PFI, SFI 4.0L PFI, SFI	91-99 91-99

** Engine Option*

Appendix C - Glossary

A/C:
Air Conditioner

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. A typical ideal A/F ratio is 14.7:1.

ABS:
Anti-lock Brake System

AC Clutch Relay:
The PCM uses this relay to energize the A/C clutch, turning the A/C system on or off.

AC Pressure Sensor:
Measures air conditioning refrigerant pressure and sends a voltage signal to the PCM.

AC 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.

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.

APP:
Acceleration Pedal Position (Sensor)

ASR:
Acceleration Slip Regulation

Bank 1:
The standard way of referring to the bank of cylinders containing cylinder #1. In-line engines have only one bank of cylinders. Most commonly used to identify the location of oxygen sensors. See**O2S**, **Sensor 1**, **Sensor 2**.

Bank 2:
The standard way of referring to the bank of cylinders opposite cylinder #1. Found on V-6, V-8, V-10, etc. and horizontally opposed engines. Most commonly used to identify the location of oxygen sensors. See**O2S**, **Sensor1**,**Sensor 2**.

BARO:
Barometric Pressure Sensor. See **MAP Sensor**.

BBV:
Brake Boost Vacuum (Sensor)

BCM:
Body Control Module

Boost Control Solenoid:
A solenoid that is energized by the PCM, in order to control 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**.

CAM:
Camshaft Position Sensor. Sends a frequency signal to the PCM in order to synchronize fuel injector and spark plug firing.

CAN:
Controller Area Network

CARB:
California Air Resources Board. Governing body for emissions control in California.

CKP REF:
Crankshaft Position Reference.

CKP:
Crankshaft Position. See **CPS**.

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.

CMP:
Camshaft Position Sensor

CO:
Carbon Monoxide

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).

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

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.

DEPS:
Digital Engine Position Sensor.

Detonation:
See **Knock**.

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

DPFE:
Differential Pressure Feedback – Exhaust Gas Recirculation Sensor

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

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 Recirculation is used only during warm engine cruise conditions. EGR flow at other times can cause stalling or no starts.

EOP:
Engine Oil Pressure (Switch)

EOT
Engine Oil Temperature (Sensor)

EPA:
Environmental Protection Agency.

ESC:
Electronic Spark Control. An ignition system function that warns the PCM when "knock" is detected. The PCM will then retard spark timing to eliminate the knocking condition.

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.

FC:
Fan Control

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

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**.

HVAC:
Heating, Ventilation & Air Conditioning (System)

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.

IMRC:
Intake Manifold Runner Control

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.

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" which are causing the air/fuel mixture to detonate prematurely.

KOEO:
Key On — Engine Off.

KOER:
Key On — Engine Running.

LCD:
Liquid Crystal Display.

LT:
Long Term fuel trim.

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.

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.

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.

NOx:
Oxides of Nitrogen. A pollutant. The EGR system 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 349×C (660×F). 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.

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 will usually operate 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.

PCM:
Powertrain Control Module. The “brains” of the engine control system 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).

Pending Codes:
Also referred to as Continuous Memory codes and Maturing Diagnostic Trouble codes. These codes are set when intermittent faults occur while driving. If the fault does not occur after a certain number of drive cycles, the code is erased from memory.

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

PNP:
Park/Neutral Position. This is 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 will operate the engine in an “idle” mode.

PROM:
Programmable Read-Only Memory. The PROM contains programming information the PCM needs to operate a specific vehicle model/engine combination.

PSPS:
Power Steering Pressure Switch

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

PZM:
Platform Zone Module

QDM:
Quad Driver Module

RAM:
Random Access Memory

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

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

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 1:
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 2:
A standard term used to identify the location of oxygen sensors. Sensor 2 is located downstream 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.

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.

ST:
Short Term fuel trim.

STS:
Service Throttle Soon

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

TDC:
Top Dead Center. When a piston is at its uppermost position in the cylinder.

TFP:
Transmission Fluid Pressure

TFT:
Transmission Fluid Temperature (Sensor)

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.

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.

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.

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.

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

WOT:
Wide-Open Throttle. The vehicle operating condition brought about when the throttle is completely (or nearly) open. The PCM will typically deliver extra fuel to the engine and de-energize the A/C compressor at this time for acceleration purposes. The PCM uses a switch or the Throttle Position Sensor to identify the WOT condition.

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