



OBD II ***CP9135*** ***AutoScanner™***

**Performs diagnostics on OBD II
compliant vehicles 1994 and
newer**

Instructions in English, Spanish, and French
Instrucciones en Inglés, Español, y Francés
Instructions en Anglais, Espagnol, et les Français

Voltage: 16V
Tension: 16V
Tension de 16V

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4. If possible, return the product in its original package with cables and accessories.
5. Print the RMA number and your return address on the outside of the package and send to the address provided by your Customer Service representative.
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SAFETY PRECAUTIONS

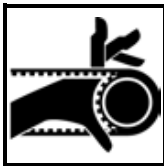
To prevent accidents that could possibly result in serious injury and/or damage to vehicles and/or test equipment, carefully follow all safety rules and test procedures when working on vehicles.



Always wear ANSI approved eye protection.



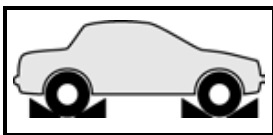
Always operate the vehicle in a well-ventilated area. Do not breath exhaust gases — they are very hazardous.



Always keep yourself, tools and test equipment away from all moving or hot engine parts.

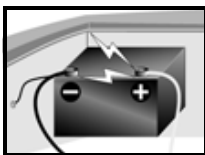


Always make sure the vehicle is in **Park** (automatic transmission) or **Neutral** (manual transmission). Ensure the **parking brake is firmly set**.



Block the drive wheels.

Never leave vehicle unattended while testing.



Never lay tools on vehicle battery. You may short the terminals together causing harm to yourself, the tools or the battery.



Always use caution when working around the ignition coil, distributor cap, ignition wires, and spark plugs. These components can produce **High Voltage** while the engine is running.

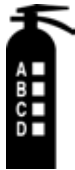


Battery electrolyte is sulfuric-acid and is extremely caustic. If contacted, rinse with water or neutralize with a mild base (i.e. baking soda). If contacted in eyes, flush with water and call a physician immediately.



Never smoke or have open flames near vehicle. Vapors from gasoline and the battery during charge are highly flammable and explosive.

Never use the AutoScanner™ if internal circuitry has been exposed to any moisture. Internal shorts could cause fire and damage to the tool.



Always keep a fire extinguisher suitable for gasoline/electrical/chemical fires readily available.

- When performing road tests, **never** operate the tool while driving the vehicle. **Always** have one person drive the vehicle and an assistant operate the AutoScanner™.
- Always turn ignition key OFF when connecting or disconnecting electrical components, unless otherwise instructed.
- Some vehicles are equipped with safety air bags. You **MUST** follow vehicle service manual cautions when working around the air bag components or wiring. If the cautions 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's battery is disconnected) because of a special energy reserve module.
- Always follow vehicle manufacturer's warnings, cautions and service procedures.

Section I

Quick Start

1.1 Introduction

Congratulations!

You've purchased an automotive scanner that can unlock the fault code information stored in the on-board computer(s) of your car or light truck. This information gives you the power to identify and repair problems that may arise with the operation of your vehicle's engine.

Cars and trucks cannot completely diagnose their problems, and no scanner available can tell you with pinpoint accuracy what is wrong with the vehicle.

Once you have retrieved the diagnostic information from the computer, you have taken the first step in finding and fixing the problem. Now it is time to continue with the rest of the diagnostic process.

Important points to remember:

- Diagnostic Trouble Codes (DTCs) warn us of a symptom or problem with a particular engine system, not a specific part.
- The computer can only report DTCs based on what its sensors are telling it.
- Sometimes, sensors appear to be bad when in fact, they are not.
 - A poor connection, broken wire or short circuit may be preventing the sensor signal from reaching the computer.
 - A malfunction in one system may cause a sensor in another system to report a value that is too high or too low.
- We recommend the use of a vehicle specific service manual to assist you with the diagnostic process.
- Some of the vehicle computer's sensors and actuators can be pretty expensive; it is best to make sure they are defective prior to replacing them!

The next step in the diagnostic process is to test systems and parts that are suspected to be defective. This testing process may include:

- Sensors
- Fuel injection system
- Ignition system
- Vacuum & Pressure systems

Even when working on modern, computer-controlled vehicles there is no substitute for good old-fashioned troubleshooting.

Once you have isolated and repaired the failed problem(s), you can use your AutoScanner to clear the codes from the computer's memory. This will also turn off your Malfunction Indicator Lamp (MIL), or Check Engine Light, and may reset all Inspection/Maintenance (I/M) monitor statuses to "Not Ready".

The following Quick Start section will help you begin to use your OBD II AutoScanner right away. Subsequent sections of this manual contain more detailed information to help you get the most out of your scanner. If you have questions not covered in the manual, please call our Technical Support line at **1-800-228-7667** (8:00 - 6:00 EST Monday - Friday), or send an email to **tech_support@actron.com**.

1.2 Quick Start

Connect the OBD II AutoScanner to the vehicle's Data Link Connector (DLC) which is normally located under the dash on the driver's side. Once the connection is made, the tool will turn on, boot, and then display the *Main Menu*. If the display is hard to read, adjust the contrast using the **Tool Setup/Test** function.

All AutoScanner functions can be performed with the Key On-Engine Off (KOEO). The **ERASE** function cannot be done with the Key On-Engine Running (KOER).

To retrieve Diagnostic Trouble Codes (DTCs), press the **READ** key on the AutoScanner. This function can be performed with the KOEO or KOER.



```
Main Menu
1)Read Codes
```

If DTCs are present, they will appear on the display. Use the **▲** or **▼** keys to view the codes. The definition will continuously scroll to the left if it is longer than the display (20 characters). To freeze the scrolling message, press and hold the **ENTER** key. When done, press the **BACK** key to return to the *Main Menu*.




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

To erase DTCs, press the **ERASE** key on the AutoScanner. This function must be performed with the KOEO - Do not START engine.



 **Note:** *In addition to clearing DTCs, the Erase Codes function may reset the status of the I/M System Monitors to “Not Ready.”*

If DTCs are found, the tool will display the quantity and ask the user “Erase Codes? (Y/N).” Pressing the **NO** key will display the message “Cancelled, Erase Not Performed.” Pressing the **YES** key will display a scrolling message on the bottom line. Press the **BACK** key to return to the *Main Menu*.

 *“Hard” codes are codes that can be removed only by repairing the faults that they cause; therefore, hard codes will remain in the computer’s memory until the condition is repaired.*

The **MIL Status** function displays the status of the computer module that commanded the MIL to turn on. If the **MIL Status** is ON and the MIL is not illuminated with the engine running, then a problem exists in the MIL circuit.

Select the **MIL Status** function and press the **ENTER** key. The MIL Status of the computer will display on the AutoScanner. Press the **BACK** key to return to the *Main Menu*.



The **I/M (Inspection and Maintenance) Monitors** function displays the state of the vehicle’s OBD II Monitors. Monitors test 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.

Select **I/M Monitors** from the *Main Menu* and press the **ENTER** key. Use the **▲** or **▼** keys to scroll through the list. Note the Monitors present and their status. When done, press the **BACK** key to return to the *Main Menu*.

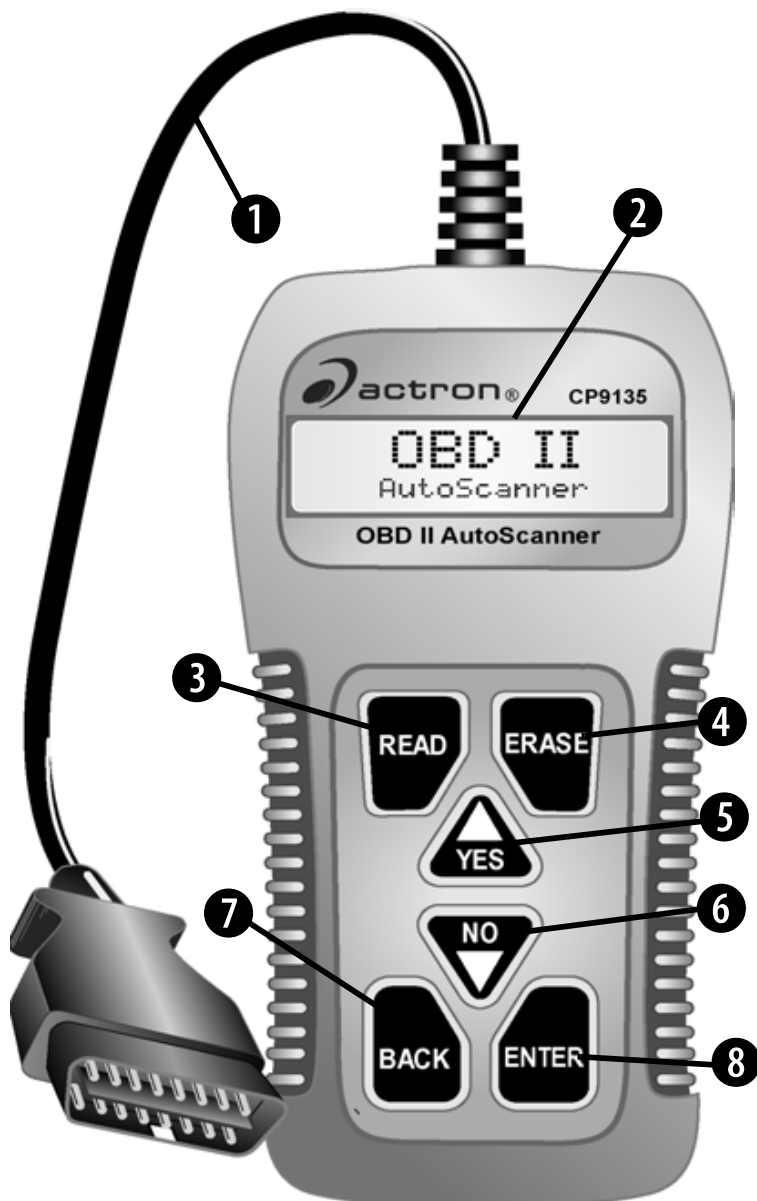


Detailed instructions are provided in **Section 3** and OBD II background information is provided in **Appendix B**.

Section 2 *Tool Basics*

2.1 Tool Features

The **OBD II AutoScanner** was developed by experts in the automotive service industry to help diagnose vehicles and assist in troubleshooting procedures. The AutoScanner will perform OBD II functions on compliant vehicles 1994 and newer. No batteries are needed; power is provided from the vehicle's data link connector (DLC).



- 1 OBD II connector & cable with strain-relief.
- 2 Two-line LCD display.
- 3 **READ** key - performs the Read Codes function.
- 4 **ERASE** key - performs the Erase Codes function.
- 5 **▲ YES** key - to scroll up and answer YES.
- 6 **▼ NO** key - to scroll down and answer NO.
- 7 **BACK** key - go to the previous screen or level.
- 8 **ENTER** key- selects displayed items.

2.1.1 *Display*

The AutoScanner uses a two-line liquid crystal display (LCD). The top line contains 10 characters to show function headings, numbers and user prompts. The bottom line contains 20 characters to display selections and code information. Messages longer than the lines will scroll continuously across the display from right to left. Display contrast adjustment is accessed from the *Tool Setup/Test* menu.

2.1.2 *OBD II (J1962) Connector*

Connects the AutoScanner to the vehicle for power and communication. The AutoScanner will automatically communicate with the vehicle using a protocol built into the software

After initiating a function, the AutoScanner will link with the vehicle.



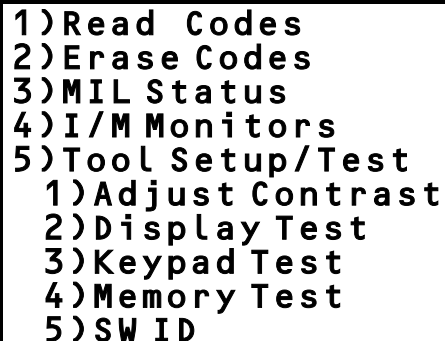
Linking
* Please Wait *

2.1.3 *Cleaning*

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.

2.2 Lists and Menus

The AutoScanner is designed for ease in navigation and operation. All menu and lists operate the same way. Five functions are selectable by the user. The **Read Codes** and **Erase Codes** function can be run using the keys identified in **Section 2.1-Tool Features**.



1) Read Codes
2) Erase Codes
3) MIL Status
4) I/M Monitors
5) Tool Setup/Test
1) Adjust Contrast
2) Display Test
3) Keypad Test
4) Memory Test
5) SW ID

Use the ▲ or ▼ keys to scroll and the **ENTER** key to select the function or item. An arrow icon will be displayed on the right of the bottom line to indicate the scrolling direction available; up (⬆), down (⬇) or both (↕).



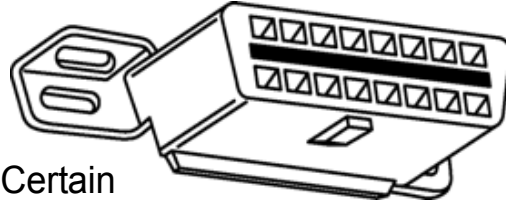
Main Menu
1) Read Codes ⬆

To return to previous screens, press the **BACK** key.

The AutoScanner may ask a question which requires a YES or NO response from the user. Press either the **YES** key or **NO** key when the condition arises.

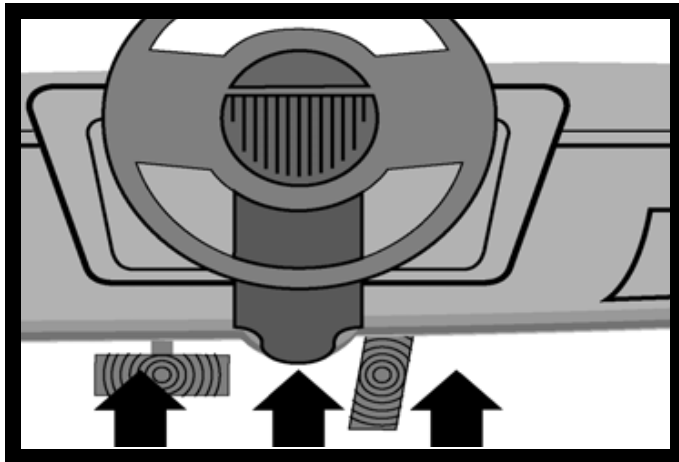
2.3 Diagnostic Link Connector and Location

The AutoScanner communicates with the vehicle's computer modules via a Diagnostic Link Connector (DLC).



OB2 II regulations define the physical and electrical specification for the DLC. Certain pins in the connector are dedicated for power and ground. The DLC is also referred to as a J1962 connector. The term J1962 is taken from a physical and electrical specification number assigned by SAE (Society of Automotive Engineers). The standard ensures that all vehicles with OB2 II systems use the same connector.

The J1962 specification defines the location of the DLC in the vehicle. 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.

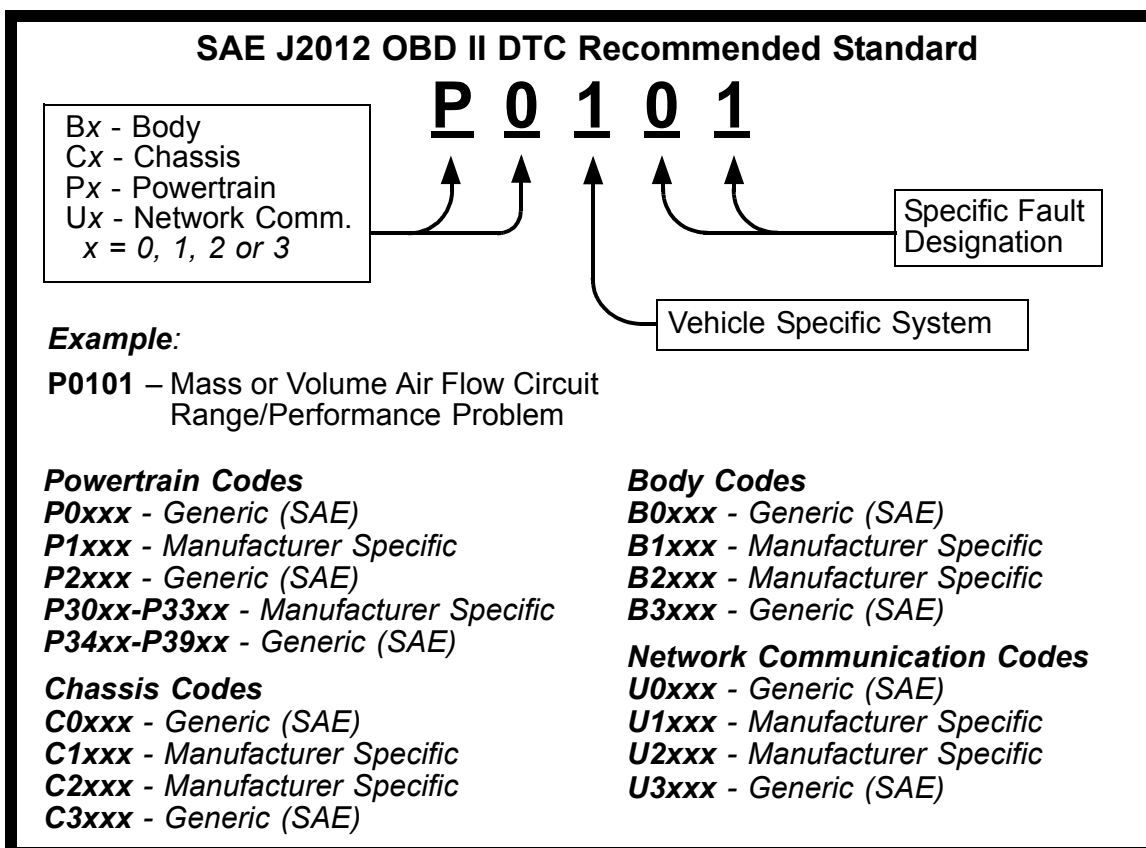


2.4 Diagnostic Trouble Codes (DTCs)

Diagnostic Trouble Codes (DTCs) consist of a three-digit code preceded by an alphanumeric designator. 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 the user determine the root cause of a problem. The format and type of DTCs is summarized on the next page.

J2012 is a standard for all DTCs established by the Society of Automotive Engineers (SAE). Codes and the definitions assigned by this specification are known as Generic (or Global) 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. from Model Year 1996 and newer. Codes not reserved by the SAE are reserved for the manufacturer and referred as Manufacturer Specific.

Periodically, new DTCs are developed and approved by the SAE. Upon approval of the new codes, the AutoScanner's software will be updated. There is no established time period that updates are made to the database. For more information regarding DTC updates, please call our Technical Support line at **1-800-228-7667** (8:00 - 6:00 EST Monday - Friday), or send an email to **tech_support@actron.com**.



2.5 This Manual

This manual provides step-by-step procedures to operate the OBD II AutoScanner. Specific diagnostics for the vehicle may be found in applicable service manuals listed in **Section 2.6**. Information about OBD II can be found in **Appendix B - OBD II Background**.

Warnings, Cautions and Notes

These are identified with the following symbols. Please read and understand the Safety Precautions and adhere to them while testing the vehicle.



The Warning symbol identifies hazards that may cause serious harm and injury.



The Caution symbol alerts the operator of potential noncritical harm or damage to equipment.



This symbol identifies special information.

2.6 Vehicle Service Information

Vehicle service manuals containing additional diagnostic information are available at most auto parts stores or the local library. If unable to locate them at those locations, write the below listed publishers for availability and pricing. Please be sure to specify the make, model and year of vehicle.

Vehicle Service Manuals

***Chrysler, Plymouth, Dodge,
Jeep, Eagle:***

**Dymet Distribution Service
Publications**

12200 Alameda Drive
Strongsville, OH 44136
www.techauthority.daimlerchrysler.com

Ford, Lincoln & Mercury:

**Ford Publication Department
Helm Incorporated**

P.O. Box 07150
Detroit, MI 48207
www.helminc.com

***Buick, Cadillac, Chevrolet,
GEO, GMC, Oldsmobile,
Pontiac;***

***Acura, Honda, Isuzu, Suzuki,
Kia, Hyundai & Saab:*
Helm Incorporated**

P.O. Box 07130
Detroit, MI 48207
www.helminc.com

Saturn:

**Adistra Corporation
c/o Saturn Publications**

101 Union St.
P.O. Box 1000
Plymouth, MI 48170

Chilton Book Company

Chilton Way
Radnor, PA 19089
www.edmunds.com/edweb/Chilton

Mitchell Manuals, Inc.

Cordura Publications
P.O. Box 26260
San Diego, CA 92126
www.mitchellrepair.com

Haynes Publications Inc.

861 Lawrence Drive
Newbury Park, CA 91320
www.haynes.com

Haynes Publications Inc.

1299 Bridgestone Parkway
LaVergne, TN 37086
www.haynes.com

JENDHAM, Inc.

13230 Evening Creek Drive,
Suite #202
San Diego, CA 92128
www.jendham.com

Motor's Auto Repair Manual

Hearst Company
250 W. 55th Street
New York, NY 10019

Suitable manuals have titles such as:

- "Electronic Engine Controls"
 - "Fuel Injection and Electronic Engine Controls"
 - "Emissions Control Manual"
- ... or similar titles

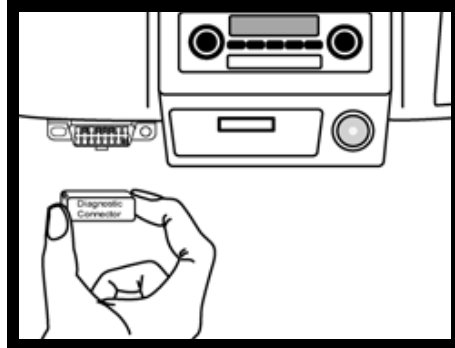
Section 3 *Using the Tool*

3.1 AutoScanner Connection and Power-Up

Locate the DLC. If not found, refer to **Section 2.3**.

The AutoScanner will not harm the vehicle.

Remove the protective cap and connect the AutoScanner's 16-pin J1962 connector. The AutoScanner will immediately power-up.



The AutoScanner displays its name for a brief period and then begins "Loading Software."

OBD II
Auto Scanner

Loading Software.....

If the ▲ key is pressed and held while software is loading, the Software ID will display until the key is released, and then the *Main Menu* will display.

Software ID: 392A

Main Menu
1)Read Codes !!

When the *Main Menu* displays, the AutoScanner is ready to use.

Refer to **Section 3.6 - Tool Setup/Test** and **Section 4 - Troubleshooting** if problems occur.

More information about OBD II can be found in **Appendix B - OBD II Background**.

3.2 Read Codes

The **Read Codes** function retrieves Diagnostic Trouble Codes (DTCs) from the vehicle's computer modules. This function can be performed with the KOEO or KOER.



There are two types of codes, Malfunction Indicator Lamp (MIL) codes and Pending codes. An icon (P_a) will be displayed next to DTCs that are 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". The computer will illuminate the MIL when the engine is running and 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.



Changing any part without first isolating the circuit or system may result in the replacement of good components.



*Before performing this function, read and understand the **Safety Precautions** and **Section 2 - Tool Basics**.*



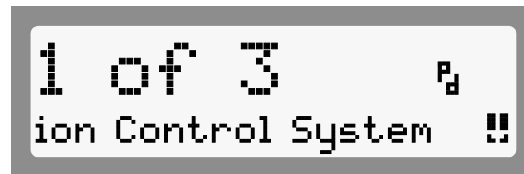
CAUTION! Avoid Cooling Fan! It May Turn On During Test.

Press the **READ** key to initiate the **Read Codes** function. The AutoScanner will retrieve the DTCs stored in the vehicle's computer module(s). This function can also be run by selecting **Read Codes** from the *Main Menu*.



*If a **Link Error** message displays, 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. If the problem still exists, refer to **Section 4: Troubleshooting**.*

If one DTC is retrieved, the AutoScanner will display the DTC number and type (MIL or pending) on the top line, and the definition on the bottom. If more than one DTC is present, the top line will also display the code index (n/x), i.e. 1 of 3. This and the DTC number will alternate on the display while the bottom line shows the definition.



If the definition is longer than the display, it will continuously scroll to the left. To freeze the scrolling message, press and hold the **ENTER** key. Use the **▲** or **▼** keys to view each DTC. When done, press the **BACK** key to return to the *Main Menu*.

- Definitions for Generic (or Global) DTCs will be displayed on the bottom line. These definitions can be found in the vehicle's service manual (refer to **Section 2.6 - Vehicle Service Information or on the enclosed product CD**).

If no DTCs are present, the message "PASS, No Codes Returned" will display. Press the **BACK** key to return to the *Main Menu*.



Do not disconnect the AutoScanner until codes have been recorded. When power is removed, the AutoScanner's memory is cleared.

3.3 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 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 resets the status of the I/M System Monitors to "Not Ready."*

To **Erase Codes**, press the **ERASE** key. This function can also be run by selecting Erase Codes from the *Main Menu*.



Main Menu
2) Erase Codes

Before erasing codes, the AutoScanner will perform the **Read Codes** function and display the number of DTCs stored in the vehicle's computer memory.



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

If no DTCs are present, then press **ENTER** to return to the *Main Menu*.



No Codes
Press ENTER To Exit

If DTCs are found, the tool will display the quantity and ask the user "Erase Codes? (Y/N)." Pressing the **NO** key will display the message "Cancelled, Erase Not Performed."



5 Codes
Erase Codes? (Y/N)

Press the **BACK** key to return to the *Main Menu*.

Pressing the **YES** key will display a scrolling message on the bottom line. Turn key On, engine Off and then press the **ENTER** key.



Verify Engine Off, Key

The AutoScanner will perform **Read Codes** again to check the number of DTCs erased.

If all DTCs have been erased, a message "No Codes Remain (Press ENTER)" will scroll across the bottom line.



ERASE DONE
No Codes Remain (Pres

If DTCs still exist, the number will be displayed. The faults must be repaired to remove these DTCs. Press **ENTER** to return to the *Main Menu*.



"Hard" codes are codes that can be removed only by repairing the faults that they cause; therefore, hard codes will remain in the computer's memory until the condition is repaired.

3.4 MIL Status

The **MIL** (Malfunction Indicator Lamp) **Status** function displays the state of the computer module that commanded the MIL to turn on. A request is sent to the computer module(s) to state whether they are commanding the MIL to turn ON. If the **MIL Status** is ON and the MIL is not illuminated with the engine running, then a problem exists in the MIL circuit. Refer to “Diagnostic Circuit Check” in the service repair manual.



Some manufacturers will turn the MIL Off if a certain number of drive cycles occur without the same fault being detected. The DTCs related to a MIL are erased from the computer's memory after 40 warm-up cycles if the same fault is not detected.

Select the **MIL Status** function and press the **ENTER** key.



The **MIL Status** will display on the top line and a scrolling message on the bottom indicating if the MIL lamp should be ON or OFF.



When done, press the **BACK** key to return to the *Main Menu*.

3.5 I/M Monitors

The **I/M Readiness** (Inspection and Maintenance) function is used to check the operations of the Emission System on OBDII vehicles. **I/M Readiness** is an excellent function to use prior to having a vehicle inspected for compliance to a state emissions program.

During normal driving conditions, the vehicle's computer scans the emission system. After a specific amount of drive time (depending on vehicle), the computer's "monitors" will decide if the vehicles emission system is working correctly or not. When the "monitors" record:

- **"READY" and check engine light has not come on** - vehicle will likely pass emissions test and the system being checked is working properly.
- **"NOT READY" (Incomplete)** - vehicle was not driven enough and needs to be driven until monitors record "READY."
- **"NOT APPLICABLE"** - vehicle does not support that monitor.



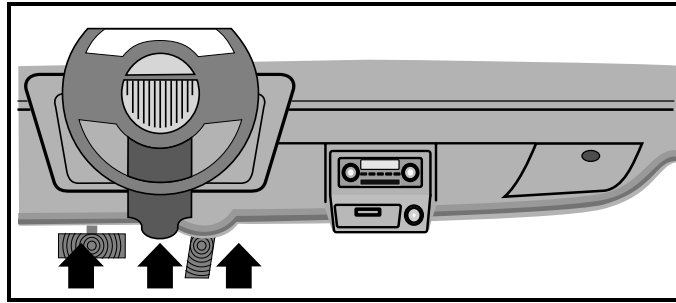
*Some states **MAY NOT** require all monitors to be listed as **"READY"** to pass the emissions test. Check with state testing site for exact requirements. All states will fail a vehicle who has the "check engine light" lit at time of test.*



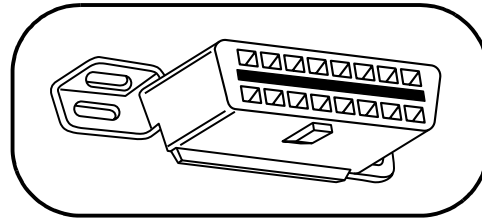
Depending on vehicle, disconnecting or a discharged battery may erase trouble codes and clear status monitors.

3.5.1 To Operate I/M Readiness:

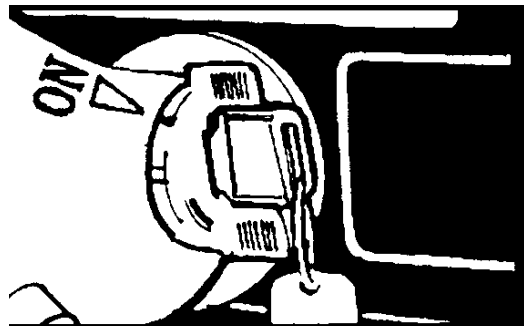
- 1 Connect Scan Tool to vehicle to connector under driver-side dashboard.



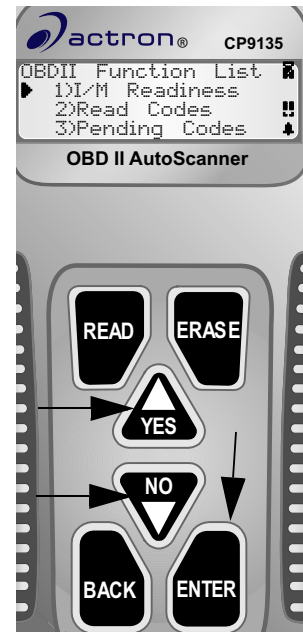
If connector is not located under driver side of dashboard a label should tell location of connector.



- 2 Place key in ignition and start vehicle.



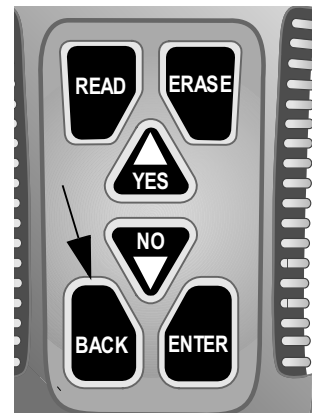
- 3 Using ▲ (UP) or ▼ (DOWN) arrows on Scan Tool select **I/M Readiness** and press **ENTER**.



- 4 Use ▲ (UP) or ▼ (DOWN) arrows on Scan Tool to view status of the following monitors.

| • 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 |

- 5 Press **BACK** key on Scan Tool to return to Main Menu.



3.6 Tool Setup/Test

The **Tool Setup/Test** functions allow the user to adjust the display's contrast and perform self-tests.

A screenshot of the Scan Tool's LCD display. The text on the screen reads "Main Menu" on the top line and "5)Tool Setup/Test" on the bottom line. A small icon resembling a double vertical bar is visible on the right side of the bottom line.

3.6.1 *Changing Display Contrast*

The contrast is displayed as a percent value ranging from 100% to 5% and can be changed by 5% intervals .

In the *Tool Setup/Test* menu, the first function is **Adjust Contrast**. Press the **ENTER** key and then use the ▲ or ▼ keys to increase or decrease the contrast. Holding down the ▲ or ▼ keys changes the contrast in that direction in 5% steps. When done, press the **ENTER** key to return to the *Tool Setup/Test* menu.

A screenshot of the Scan Tool's LCD display. The text on the screen reads "Change" on the top line and "90% ENTER When Done" on the bottom line. A small icon resembling a double vertical bar is visible on the left side of the top line.

Contrast settings are not saved after the tool is turned OFF. Contrast is reset to the manufacturers setting when powered-up.



*To quickly change the contrast after powering the AutoScanner, press the ▼ key four (4) times and then the **ENTER** key twice.*

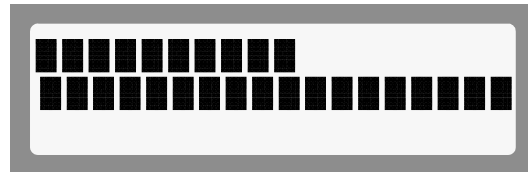
3.6.2 Display Test

This is a self-test to inspect the AutoScanner's LCD display. The test will turn every pixel black.

Select **Display Test** from the *Tool Setup/Test* menu and press **ENTER**.



The display will toggle between the two following screens every 3 seconds. Look for missing spots in the solid black characters. When done, press the **BACK** key to return to the *Tool Setup/Test* menu.



3.6.3 Keypad Test

The **Keypad Test** is used to check the functionality of the AutoScanner's Keypad.

Select **Keypad Test** from the *Tool Setup/Test* menu and press the **ENTER** key.



Each time you press a key, its name should appear on the display. For example, if you press the **▲ / YES** key, the screen will display "UP / YES." If key's name does not display, then the key is not working. Press the other keys to verify proper operation.



Check the **BACK** key last. When the **BACK** key is pressed, the AutoScanner will return to the *Tool Setup/Test* menu. If you are not returned to this menu, then the **BACK** key is not working.



3.6.4 Memory Test

If the AutoScanner has trouble performing functions, the **Memory Test** should be performed.

From the *Tool Setup/Test* menu, select the **Memory Test** option and press **ENTER** to begin.

```
Tool Setup
4)Memory Test  ii
```

As the memory is tested, its address is displayed on the bottom line. After the memory test is done, either a “TEST PASS” or “TEST FAIL” message is displayed.

```
ROM Test
Testing Addr a500
```

```
TEST PASS
Press Any Key
```

Press any key to return to the *Tool Setup/Test* menu.

3.6.5 Software Identification (SW ID)

The Software Identification is needed when contacting customer support. Note this in the manual for reference.

From the *Tool Setup/Test* menu, select the **SW ID** option and press **ENTER**. Note this in the manual for reference.

```
Tool Setup
5)SW ID  ii
```

```
SW ID: 47H5
Press Any Key
```

Press any key to return to the *Tool Setup/Test* menu.

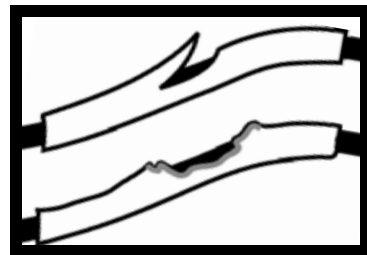
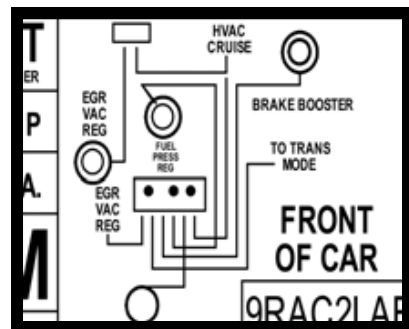
Section 4

Troubleshooting

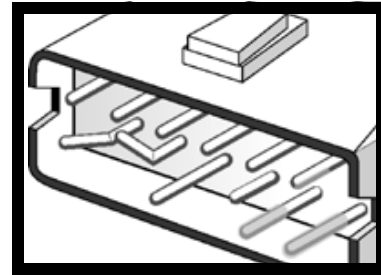
4.1 Vehicle Inspection

Many problems can be found by performing a visual and “hands-on” under-the-hood inspection before starting any diagnostic procedure.

- Has the vehicle been serviced recently? Sometimes things are reconnected in the wrong place, or not at all.
- Do not take shortcuts. Inspect hoses and wiring which may be difficult to see because of location (under air cleaner housing, alternators and similar components).
- Inspect the air cleaner and ductwork for defects.
- Check sensors and actuators for damage.
- Inspect all vacuum hoses for:
 - Correct routing. Refer to vehicle service manual, or Vehicle Emission Control Information (VECI) decal located in the engine compartment.
 - Pinches and kinks.
 - Splits, cuts or breaks.
- Inspect electrical wiring for:
 - Damaged insulation caused by sharp objects (a common problem) or by hot surfaces such as engine and exhaust manifold.
 - Corroded and broken wires.



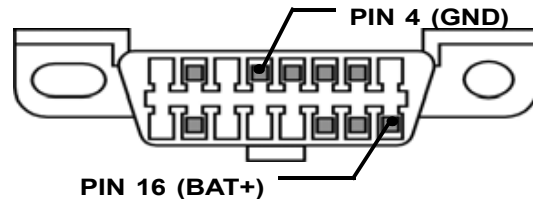
- Carefully inspect electrical connectors for:
 - Corrosion or foreign debris on pins.
 - Bent or damaged pins.
 - Recessed contacts not seated properly in housing.
 - Bad wire crimps to terminals.



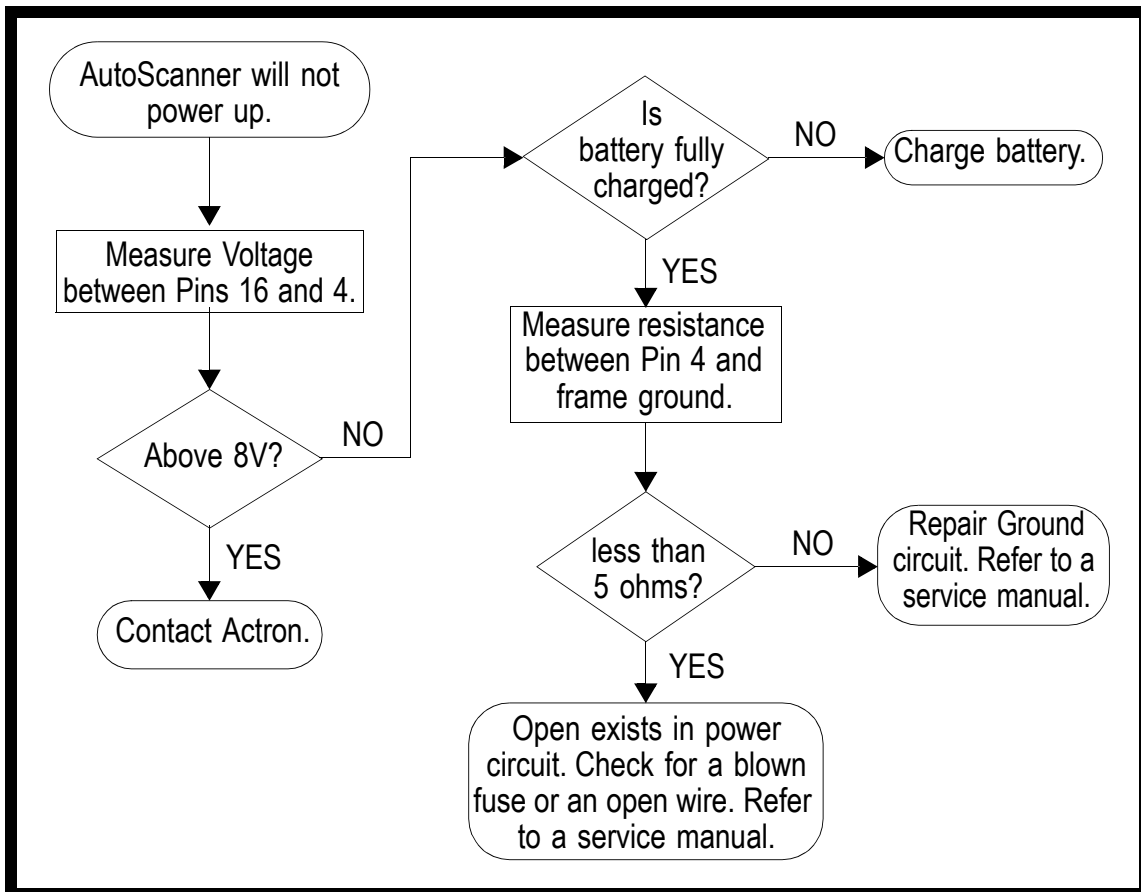
Connector problems are common in vehicles. Inspect carefully. Some connectors use a special grease, called dielectric grease, on the contacts to prevent corrosion. Do not remove. If required, apply more grease to the connector. The grease can be obtained from a dealership or auto parts store.

4.2 AutoScanner Does Not Power Up

- Make sure the AutoScanner's DLC is connected correctly to the vehicle's DLC. Verify the pins are clean and fully seated in the DLC.
- The AutoScanner requires a minimum of 8 volts between pin 16 (BAT+) and pin 4 (GND) to power up. Use the flowchart provided below to troubleshoot.



WARNING! Never Lay Tools On Vehicle Battery. You May Short The Terminals Together Causing Harm To Yourself, The Tools Or The Battery.



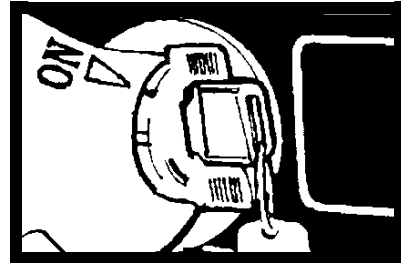
4.3 Link Errors or Erroneous Data

A **Link Error** occurs if the vehicle's computer(s) stops communicating with the AutoScanner. When this happens, the AutoScanner prompts the user to try again. Press the **YES** key to try again or the **NO** key to return to the *Main Menu*.

Link Error
Try Again?

If the AutoScanner displays Link Errors when attempting to read or erase codes, check the following:

- Verify ignition key is ON - not in the ACCESSORIES position.
- Make sure the AutoScanner's 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 the vehicle for blown fuses . The computer and DLC usually use separate fuses. If the fuse for the computer fuse is blown, it cannot transmit data. The fuses may be located on the fuse block in the passenger compartment.
- Make sure the computer has a good ground. If the computer has a ground directly to the case, clean the connection and apply a conductive (dielectric) grease to the mating surfaces.
- With the KOEO, verify the battery voltage is at least 10.5V; 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.



4.4 Technical Support

If the AutoScanner is not working correctly after the checks and corrections above, contact technical support personnel at **1-800-228-7667** (8:00 - 6:00 EST Monday - Friday), or send an email to **tech_support@actron.com**. Be prepared to provide the AutoScanner's Software ID.

Appendix A

Glossary

A/C:

Air Conditioning.

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.

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.

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**, **Sensor 1**, **Sensor 2**.

BARO:

Barometric Pressure Sensor. See **MAP Sensor**.

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.

CARB:

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

CKP REF:

Crankshaft Position Reference.

CKP:

Crankshaft Position. See **CPS**.

Closed Loop (C/L):

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.

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”.

Data Link Connector (DLC):

The interface port between the vehicle’s on-board computer and a diagnostic tool. 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**.

DTC:

Diagnostic Trouble Code. Indicates a malfunction flagged by the vehicle’s computer.

DI/DIS:

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

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.

ECT:

Engine Coolant Temperature sensor. See **CTS**.

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.

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.

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**.

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.

ICM:
Ignition Control Module.

I/M:
Inspection and Maintenance.

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.

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.

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.

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 Light. Also labeled Service Engine Soon, Power Loss or Power Limited.

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**.

ODM:

Output Device Monitor.

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.

Open Loop (O/L):

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.

P/N:

Park/Neutral Switch. This switch 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.

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).

PROM:

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

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.

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.

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.

SAE:

Society of Automotive Engineers.

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.

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**.

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.

ST:

Short Term fuel trim.

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.

TDC:

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

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.

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.

Appendix B About OBD II

OBD II

In 1994, manufacturers began equipping vehicles with a new class of computer technology which puts more processing power in the vehicle than ever before. It is called On-Board Diagnostics, Second Generation (OBD II) and offers increased system monitoring and diagnostic information. Beginning January 1, 1996, vehicles sold in the U.S. are required to be OBD II compliant. However, a few vehicles were exempt since no changes were made to the engine. Most domestic manufacturers began using this system on some vehicles beginning as early as 1994.

OBD II systems are designed to meet or exceed standards and regulations to improve air quality. These standards and regulations are primarily set forth by the Environmental Protection Agency (EPA) Clean Air Act of 1990. Most of the standards and regulations were developed by the California Air Resources Board (CARB). OBD II systems are unique in that they possess the capability of monitoring the performance of emission related systems and their components; to detect hard and intermittent faults that may cause a vehicle to pollute.

This new system stores a large library of general trouble codes along with manufacturer-specific codes, some of which can be accessed with the tool. These codes cover:

| | | | |
|-------------------|-----------------|-------------------|------------------------|
| B-Codes | Body Systems | U-Codes . | Network Communications |
| C-Codes | Chassis Systems | P-Codes | Powertrain Systems |

Now, basic terms are standardized and all generic (global) codes share a common format and terminology established by the manufacturers and the Society of Automotive Engineers (SAE).

Basics of Computer-Controlled Vehicles

This section explains the engine computer control system, the types of sensors and how the computer controls engine fuel delivery, idle speed and timing. Additional information may be found in technical support books at your local library or auto parts store. The more you know about the computer system, the better you can diagnose vehicle computer problems.

Computer controls were originally installed on vehicles to meet federal government regulations for lower emissions levels and improved fuel economy. This began in the early 1980's when basic mechanical systems were no longer able to accurately control key engine parameters. A computer could be programmed to control the engine under various operating conditions, making the engine more reliable. While these early systems were very limited in the scope of their control, providing only 10 to 14 trouble codes, they did help guide the vehicle repair process.

Today, computer controls have made cars and trucks faster, cleaner, and more efficient than ever before.

What does the computer control

The main control areas of the vehicle computer are fuel delivery, idle speed, spark advance, and emission controls. Some on-board computers may also control the transmission, brakes, and suspension systems as well.

What has not changed

A computer-controlled engine is very similar to the older, non-computerized engine. It is still an internal combustion engine with pistons, spark plugs, valves, and camshaft(s). The ignition, charging, starting, and exhaust systems are very similar as well. You test and repair these systems just as before. The technical manuals for these components show you how to perform the tests. Additionally, compression gauges, vacuum pumps, engine analyzers, and timing lights will continue to be useful.

The engine computer control system

The vehicle's on-board computer is the "heart" of the system. It is sealed in an enclosure and connected to the rest of the engine by a wiring harness. The computer is located, in most cases, in the passenger compartment, behind the dashboard or in the "kick panel" position, although some manufacturers locate the computer control module in the engine compartment area. Most computers can withstand a lot of vibration and are built to live in a rugged environment.

The computer is programmed by the manufacturer. The program is a complex list of lookup tables and instructions telling the computer how to control the engine based on various driving conditions. To do its job, the computer uses sensors to know what is happening and then provides instructions back to a network of switches and actuators throughout the vehicle.

Sensors (computer inputs)

Sensors are devices which measure operating conditions and translate them into signals the computer can understand. Some examples of sensors: thermistors (for temperature readings), potentiometers (like a throttle position sensor), and signal generators (such as an O₂ sensor).

Relays and actuators

Relays and Actuators are electric devices energized by the computer to perform a specific function. A relay is an electromagnetic device (or switch) for remote or automatic control that is actuated by the computer or another device. Actuators might include solenoids (such as fuel injector valves) and small motors (such as the Idle Speed Control). Not all of the computer's outgoing signals are routed to relays and actuators. Sometimes information is sent to other system computers like transmission, brakes, ignition modules, and trip computers. These signals are also called "outputs."

How the Computer Controls Fuel Delivery

Engine operation and emissions performance depend upon precise fuel delivery and ignition control. Early computer systems controlled fuel by electronically adjusting the carburetor metering and jet systems. Soon, however, this was replaced by the more precise fuel delivery of fuel injection.

In an electronically carbureted system, the computer simply controls fuel flow based on how far the throttle is opened by the driver. The computer "knows" how much air can flow through the carburetor at various throttle openings, and adds the appropriate amount of fuel to the mixture at the carburetor.

Fuel injection is some what more sophisticated in the way it delivers fuel. The computer still adds an appropriate amount of fuel to the entering air, but now

it uses fuel injectors (either in a throttle body or at each intake port). Fuel injectors are far more precise than carburetor jets, and create a much finer fuel “mist” for better combustion and increased efficiency. In addition, most fuel injection systems have ways of measuring exactly how much air is entering the engine, and can calculate the proper air/fuel ratio using lookup tables. Computers no longer have to “estimate” how much air the engine is using.

In many modern systems, the computer also uses information provided by sensors to give it an idea of how well it is doing its job, and how to do it better. Sensors can tell the computer how warm the engine is, how rich or lean the fuel mixture is, and whether accessories (like the air conditioner) are running. This feedback information allows the computer to “fine tune” the air/fuel mixture, keeping the engine operating at its peak.

What the computer needs to know

- **Engine operating condition.** Sensors used are: coolant temperature, throttle position, manifold pressure (vacuum), air flow and RPM.
- **Air intake.** Sensors used are: mass air flow, manifold absolute pressure, manifold air temperature and RPM.
- **Air/fuel mixture status.** Sensors used are: oxygen sensor(s).

Open and closed loop modes

Open or closed loop operation refers to the way the computer is deciding how much fuel to add to the air entering the engine. During cold start and other low temperature situations, the computer operates in **open loop** mode. This means that it is relying on a set of internal calculations and data tables to decide how much fuel to add to the incoming air. It uses sensors such as the coolant temperature sensor (CTS), the throttle position sensor (TPS), and the manifold absolute pressure sensor (MAP) to determine optimum mixtures. The important difference here is that it *does not* check to see if the mixtures are correct, leaving the computer adjustment loop **open**.

In **closed loop** mode, the computer still decides how much fuel to add by using the sensors listed above, and by looking up the appropriate numbers on a data table. However, it now checks itself to determine whether the fuel mixture is correct. It is able to check itself by using the information provided by the oxygen sensor(s) (O2S) in the exhaust manifold. The O2S will tell the computer if the engine is running rich or lean, and the computer can take steps to correct the situation. In this way, the computer **closes** the adjustment loop by checking itself and making necessary corrections. It should be noted that the O2S must be at a very high operating temperature (650°F) before they begin sending information to the computer. This is why open loop mode is necessary—to give the O2 sensors time to warm up to operating temperature.

As long as the engine and O2 and Coolant Temperature Sensors are at operating temperature, the computer can operate in the closed loop mode. Closed loop mode constantly corrects to obtain an air/fuel mixture at the ideal 14.7:1. But in stop and go cycles, the O2 sensor may in fact cool down enough that the computer will need to rely on a set of internal parameters and go into open loop mode again. This may happen during extended periods of idling. Many newer vehicles now use heated O2 (HO2S) sensors to prevent this condition.

In many vehicles, the computer controls other systems related to open and closed loop modes, including idle speed, electronic spark control, exhaust gas recirculation, and transmission torque converter clutches. In open loop mode, some of these systems will be adjusted to speed the warming of the engine and get the computer into closed loop mode as quickly as possible.

About Diagnostic Trouble Codes (DTCs)

Engine computers can *find* problems

The computer systems in today's vehicles do more than control engine operations—they can help you find problems, too! Special testing abilities are permanently programmed into the computer by engineers. These tests check the components connected to the computer which are used for (typically): fuel delivery, idle speed control, spark timing, emission systems, and transmission shifting. Mechanics have used these tests for years. Now you can do the same thing by using your OBD II AutoScanner!

Engine computers perform special tests

The engine computer runs the special tests, depending on the manufacturer, engine, model year, etc. There is no “universal” test that is the same for all vehicles. The tests examine INPUTS (electrical signals going INTO the computer) and OUTPUTS (electrical signals coming OUT of the computer), as well as internal calculations made by the computer. Input signals which have “incorrect” values, or output circuits which do not operate properly are noted by the test program and the results are stored in the computer's memory. These tests are important. The computer cannot control the engine properly if it has incorrect input information or faulty output circuits.

Code numbers reveal malfunctions

Malfunctions are stored by using code numbers, usually called “diagnostic trouble codes” or “DTCs.” For example, a code P0122 might mean “throttle position sensor signal voltage is too low.” Generic code meanings are a part of your OBD II AutoScanner's software. Manufacturer specific DTCs will require the use of a vehicle service manual. See **page 2-5** for more information on ordering service manuals or on the enclosed product CD.

Read trouble codes

To find the cause of the problem yourself, you need to perform special tests called “diagnostics.” These procedures are in the vehicle's service manual. There are many possible causes for any problem. For example, suppose you turned on a wall switch in your home and the ceiling light did not turn on. Is it the bulb, light socket, wiring, or wall switch? Maybe there is no power coming into the house! As you can see, there are many possible causes. The diagnostics written for servicing a particular trouble code take into account all the possibilities. If you follow these procedures, you should be able to find the problem causing the code and fix it yourself.

Using the OBD II AutoScanner is fast and easy. Trouble codes give you valuable knowledge - whether you go for professional service or do it yourself. Now that you know what trouble codes are and where they come from, you are well on your way to fixing today's computer-controlled vehicles! Once you have read the DTCs, you can either:

- Have your vehicle professionally serviced, or
- Repair the vehicle yourself using the diagnostic trouble codes to help locate the source of the problem.

With the OBD II AutoScanner, you can also monitor the operation of systems in the vehicle, helping to pinpoint the system where there may be a problem.

About the Malfunction Indicator Lamp (MIL)

All OBD II compliant vehicles have a “Malfunction Indicator Lamp” or MIL. In the past, the MIL has been referred to as a “Check Engine” or “Service Engine Soon” light.

Normal operation

The engine computer turns the MIL ON and OFF as needed. This dashboard message is either amber or red, and maybe labeled with “Check Engine”, “Service Engine Soon”, “Service Engine Now”, or marked with a small engine picture or diagram

The MIL is normally OFF when the engine is RUNNING.

NOTE: *The MIL will turn on when the ignition key is in ON position, but the engine is OFF prior to starting the vehicle. This is a normal test of all the dashboard message lights.*

Problem spotted

If the MIL does not come on during this test, you may have an electrical problem which needs repair. Refer to the “Diagnostic Circuit Check” steps of your vehicle service manual.

Current problem

When the MIL remains ON after the engine is RUNNING, the computer sees a problem that does not go away (known as a “current” failure). The light will stay on as long as the problem is present and a trouble code is stored in the computer’s memory. Use the OBD II AutoScanner at the earliest convenient time to obtain codes.

Intermittent problem

When the MIL comes ON and then goes OFF while the engine is RUNNING, the computer saw a problem, but the problem went away (known as an “intermittent” failure). Though the MIL went OFF because the problem went away, the code stays in memory. Use the OBD II AutoScanner at the earliest convenient time to obtain codes.

NOTE: *The computer will automatically erase these codes after repeated restarts if the problem does not return.*

Poorly running engine, no MIL

Most likely, this condition is not due to computer system failures, but reading codes can still be useful as part of a basic troubleshooting procedure. Check wiring and bulb for “Check Engine” light failures. Refer to vehicle service manual for additional diagnostic information.

On OBD II vehicles, the MIL also signals an emissions-control related failure. The vehicle may not run any differently, but the OBD II system is designed to note very small changes in the engine’s operation which could lead to emissions damage or failure.



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