DIGITAL OBD2 CODE READER

OWNER'S MANUAL

The Easiest And Best Way To Troubleshoot 1996 and Newer OBD II Vehicles!

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CONGRATULATIONS!

on your choice of **OBD 2 Code Reader**. This powerful tool will help you take charge of your vehicle's maintenance and servicing needs.

Today's vehicles use Computer Control Systems to ensure peak per-formance and fuel efficiency while reducing pollutants in the vehicle's emissions. These systems also have the ability to perform self-testing and diagnostics on various vehicle systems and components, and provide valuable information to aid in servicing and repair.

However, these sophisticated systems often required expensive tools and test equipment in order to retrieve this information. Until now, consumers had to rely on professional service technicians to maintain their vehicles in top condition.

OBD 2 Code Reader brings the power of the technician into your hands in a cost-effective, easy-to-use package. Whether you are a "put the key in and go" consumer, hobby mechanic or skilled DIYer, Code Reader offers the features and functions you need to take control of your vehicle's testing, servicing and maintenance needs.

OBD 2 Code Reader helps you . . . .

- Save time and money by locating and identifying problems *before* servicing your vehicle
- Access the same information your mechanic has - *for less*
- Prevent future costly repairs and maintain engine per-formance with routine inspections
- See if you're ready for an emissions test (smog check)
- Check your vehicle for road trip readiness
- Turn off the "CHECK ENGINE" light
- Inspect a used vehicle before buying or selling

. . . . and more!

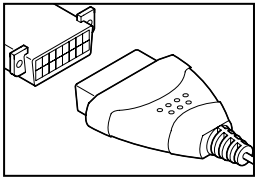
WHAT IS OBD?

OBD 2 Code Reader is designed to work on all OBD 2 compliant vehicles. All 1996 and newer vehicles (cars, light trucks and SUVs) sold in the United States are OBD 2 compliant.

One of the most exciting improvements in the automobile industry was the addition of on-board diagnostics (OBD) on vehicles, or in more basic terms, the computer that activates the vehicle's "CHECK ENGINE" light. OBD1 was designed to monitor manufacturer-specific systems on vehicles built from 1981 to 1995. Then came the development of OBD 2, which is on all 1996 and newer vehicles sold in the U.S. Like its predecessor, OBD 2 was adopted as part of a government mandate to lower vehicle emissions. But what makes OBD 2 unique is its universal application for all late model cars and trucks - domestic and import. This sophisticated program in the vehicle's main computer system is designed to detect failures in a range of systems, and can be accessed through a universal OBD 2 port, which is usually found under the dashboard. For all OBD systems, if a problem is found, the computer turns on the "CHECK ENGINE" light to warn the driver, and sets a Diagnostic Trouble Code (DTC) to identify where the problem occurred. A special diagnostic tool, such as OBD 2 Code Reader, is required to retrieve these codes, which consumers and professionals use as a starting point for repairs.

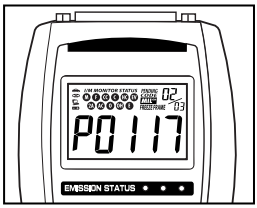
To learn more about vehicle Computer Control Systems and OBD 2, see COMPUTER ENGINE CONTROLS on page 29.

Easy To Use . . . .



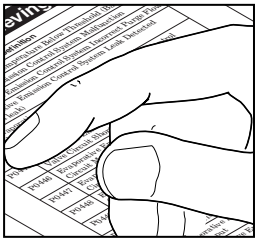
- Connect Code Reader to the vehicle's test connector.
- Turn the ignition key "On."
- DO NOT start the engine.
- Code Reader turns "On" and **LINK**s automatically.

Easy To View . . . .



- Code Reader retrieves stored codes and displays I/M Readiness status.
- Codes are displayed on Code Reader's LCD display screen; I/M Readiness status is displayed by LED indicators.

Easy To Define . . . .



- Locate fault code(s) in the Fault Code Definition list.

SAFETY FIRST!

To avoid personal injury, instrument damage and/or damage to your vehicle; do not use Code Reader before reading this manual.

This manual describes common test procedures used by experienced service technicians. Many test procedures require precautions to avoid accidents that can result in personal injury, and/or damage to your vehicle or test equipment. Always read your vehicle's service manual and follow its safety precautions before and during any test or service procedure. **ALWAYS** observe the following general safety precautions:

When an engine is running, it produces carbon monoxide, a toxic and poisonous gas. To prevent serious injury or death from carbon monoxide poisoning, operate the vehicle **ONLY** in a **well-ventilated** area.

To protect your eyes from propelled objects as well as hot or caustic liquids, **always** wear **approved** safety eye protection.

When an engine is running, many parts (such as the coolant fan, pulleys, fan belt etc.) turn at high speed. To avoid serious injury, always be aware of moving parts. Keep a safe distance from these parts as well as other potentially moving objects.

Engine parts become very hot when the engine is running. To prevent severe burns, avoid contact with hot engine parts.

Before starting an engine for testing or trouble-shooting, make sure the parking brake is engaged. Put the transmission in **park** (for automatic transmission) or **neutral** (for manual transmission). Block the drive wheels with suitable blocks.

Connecting or disconnecting test equipment when the ignition is **ON** can damage test equipment and the vehicle's electronic components. Turn the ignition **OFF** before connecting Code Reader to or disconnecting Code Reader from the vehicle's Data Link Connector (DLC).

To prevent damage to the on-board computer when taking vehicle electrical measurements, always use a digital multimeter with at least 10 megOhms of impedance.

The vehicle's battery produces highly flammable hydrogen gas. To prevent an explosion, keep all sparks, heated items and open flames away from the battery.

Don't wear loose clothing or jewelry when working on an engine. Loose clothing can become caught in the fan, pulleys, belts, etc. Jewelry is highly conductive, and can cause a severe burn if it makes contact between a power source and ground.

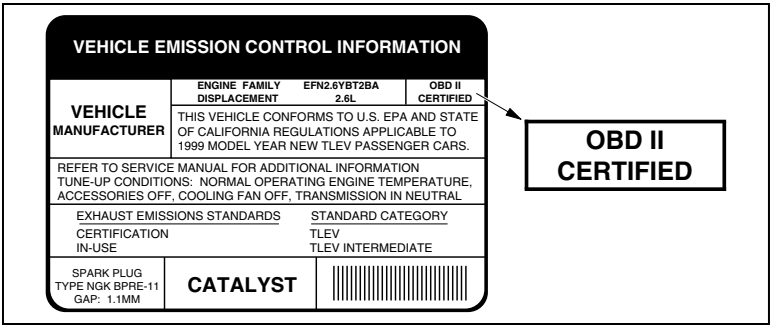
VEHICLES COVERED

OBD 2 Code Reader is designed to work on all OBD 2 compliant vehicles. All 1996 and newer vehicles (cars and light trucks) sold in the United States are OBD 2 compliant.

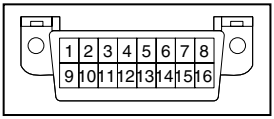
Federal law requires that all 1996 and newer cars and light trucks sold in the United States must be OBD 2 compliant; this includes all Domestic, Asian and European vehicles.

Some 1994 and 1995 vehicles are OBD 2 compliant. To find out if a 1994 or 1995 vehicle is OBD 2 compliant, check the following:

1. **The Vehicle Emissions Control Information (VECI) Label.** This label is located under the hood or by the radiator of most vehicles. If the vehicle is OBD 2 compliant, the label will state "**OBD II Certified**."



2. Government Regulations require that all OBD 2 compliant vehicles **must** have a "common" sixteen-pin **Data Link Connector (DLC)**.

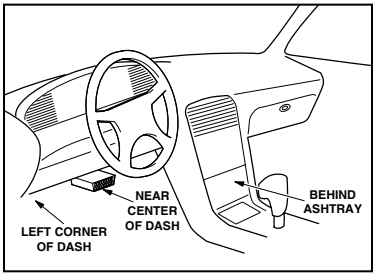


Some 1994 and 1995 vehicles have 16-pin connectors but are not OBD 2 compliant. Only those vehicles with a Vehicle Emissions Control Label stating "OBD II Certified" are OBD 2 compliant.

Beginning in 2003, a very limited number of manufacturers (including Ford, General Motors, Mazda and Saab) began using a new computer protocol called Controller Area Network (CAN) on some OBD 2 vehicles. In basic terms, CAN allows manufacturers to increase and diversify the speed at which the computer communicates with different systems in the vehicle. CAN will be mandatory on all cars by 2008. The OBD 2 Code Reader is compatible with all OBD 2 protocols, including CAN.

Data Link Connector (DLC) Location

The 16-pin DLC is usually located under the instrument panel (dash), within 12 inches (300 mm) of center of the panel, on the driver's side of most vehicles. It should be easily accessible and visible from a kneeling position outside the vehicle with the door open.



On some Asian and European vehicles the DLC is located behind the "ashtray" (the ashtray must be removed to access it) or on the far left corner of the dash. If the DLC cannot be located, consult the vehicle's service manual for the location.

BATTERY REPLACEMENT

1. Locate the battery cover on the back of Code Reader.
2. Lift the battery cover off (use your finger or a small coin).
3. Replace batteries with two AA-size batteries (for longer life, use Alkaline-type batteries).
4. Reinstall the battery cover on the back of Code Reader.

This tool has an early low battery warning. If a low battery condition is detected when the Code Reader is turned "On", the battery icon and the three LEDs will flash every second for 10 seconds to warn you that it's time to replace the batteries. It is suggested that you replace the batteries at this time. The Code Reader will not turn "On" (when disconnected from a vehicle) if the batteries go dead.

CONTROLS AND INDICATORS

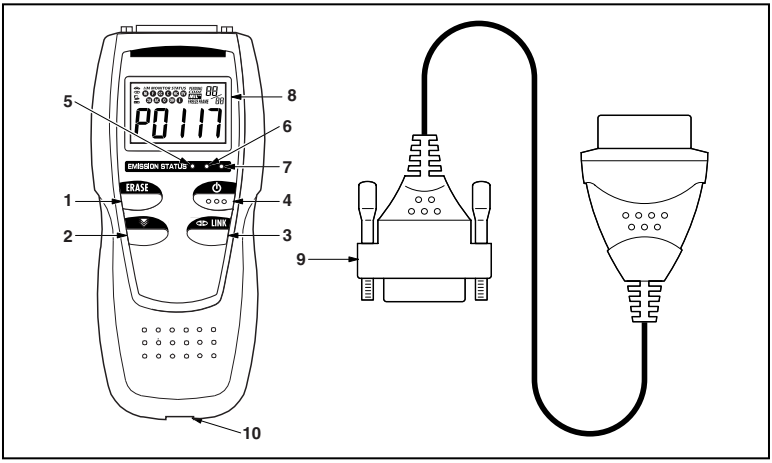


Figure 1. Controls and Indicators

See Figure 1 for the locations of items 1 through 9, below.

1. **ERASE button** - Erases Diagnostic Trouble Codes (DTCs) and "Freeze Frame" data from your vehicle's computer, and resets Monitor status.

2. **SCROLL button** - Scrolls the LCD display to view DTCs when more than one DTC is present.

3. **LINK button** - Links Code Reader with the vehicle's PCM to retrieve DTCs from the computer's memory, and to view I/M Readiness Monitor status.

4. **POWER button** - Turns Code Reader "**On**" and "**Off**."

5. ✓ **GREEN LED** - Indicates that all engine systems are running normally (all Monitors on the vehicle are active and performing their diagnostic testing, and no DTCs are present).

6. **?** **YELLOW LED** - Indicates there is a possible problem. A “Pending” DTC is present and/or some of the vehicle's emission monitors have not run their diagnostic testing.

7. ✕ **RED LED** - Indicates there is a problem in one or more of the vehicle's systems. The red LED is also used to show that DTC(s) are present. DTCs are shown on Code Reader’s LCD display. In this case, the Multifunction Indicator (“Check Engine”) lamp on the vehicle's instrument panel will light steady on.

8. **LCD Display** - Displays test results, Code Reader functions and Monitor status information. See **DISPLAY FUNCTIONS**, below, for details.
9. **Cable** - Connects Code Reader to the vehicle's Data Link Connector (DLC).
10. **USB Connector** - Used to connect USB cable when transferring data batween Code Reader and personal computer.

DISPLAY FUNCTIONS

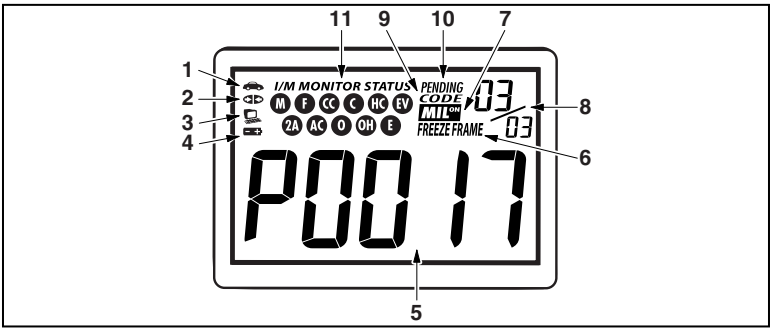


Figure 2. Display Functions

See Figure 2 for the locations of items 1 through 13, below.

1. **Vehicle icon** - Indicates whether or not Code Reader is being properly powered through the vehicle's Data Link Connector (DLC). A visible icon indicates that Code Reader is being powered through the vehicle's DLC connector.

2. **Link icon** - Indicates whether or not Code Reader is communicating (linked) with the vehicle's on-board computer. When visible, Code Reader is communicating with the computer. If the Link icon is not visible, Code Reader is not communicating with the computer.

3. **Computer icon** - When visible, indicates the Code Reader is connected to a ppersonal computer to upload or download data (PC Link is an optional accessory).

4. **Internal Battery icon** - When visible, indicates the Code Reader batteries are "low" and should be replaced.

5. **DTC Display Area** - Displays the Diagnostic Trouble Code (DTC) number. Each fault is assigned a code number that is specific to that fault.

6. **FREEZE FRAME icon** - Indicates that there is Freeze Frame data from “Priority Code” (Code #1) stored in the vehicle’s computer memory.
7. **MIL icon** - Indicates the status of the Malfunction Indicator Lamp (MIL). The MIL icon is visible only when a DTC has commanded the MIL on the vehicle's dashboard to light.
8. **Code Number Sequence** - Code Reader assigns a sequence number to each DTC that is present in the computer's memory, starting with "01.” This helps keep track of the number of DTCs present in the computer's memory. Code number "01" is always the highest priority code, and the one for which "Freeze Frame" data has been stored.

   If "01" is a "Pending" code, "Freeze Frame" data may or may not be stored in the vehicle’s computer memory.
9. **CODE icon** - Identifies the Code Number Sequence display area.
10. **Pending icon** - Indicates the currently displayed DTC is a "Pending" code.
11. **Monitor icons** - Indicates which Monitors are supported by the vehicle under test, and whether or not the associated Monitor has run its diagnostic testing (Monitor status). When a Monitor icon is solid, it indicates that the associated Monitor has completed its diagnostic testing. When a Monitor icon is flashing, it indicates that the vehicle supports the associated Monitor, but the Monitor has not yet run its diagnostic testing.

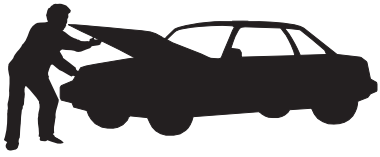
To learn more about Monitors, what they do, and how they work, see OBD 2 MONITORS on page 38.

A maximum of eleven Monitors are used on OBD 2 systems. Not all vehicles support all eleven Monitors. When Code Reader is linked to a vehicle, only the icons for Monitors that are supported by the vehicle under test are visible on the display.

Following is a list of Monitor icons and their associated Monitors.

M	=	Misfire Monitor
F	=	Fuel System Monitor
CC	=	Comprehensive Component Monitor
C	=	Catalyst Monitor
HC	=	Heated Catalyst Monitor
EV	=	Evaporative System Monitor
2A	=	Secondary Air System Monitor
AC	=	Air Conditioning System Refrigerant (R-12) Monitor
O	=	Oxygen Sensor Monitor
OH	=	Oxygen Sensor Heater Monitor
E	=	Exhaust Gas Recirculation (EGR) Monitor

BEFORE YOU BEGIN



OBD 2 Code Reader aids in monitoring electronic- and emissions-related faults in your vehicle and retrieving fault codes related to malfunctions in these systems. Mechanical problems such as low oil level or damaged hoses, wiring or electrical connectors can cause poor engine performance and may also cause a "false" fault code. Fix any known mechanical problems before performing any test. See your vehicle's service manual or a mechanic for more information.

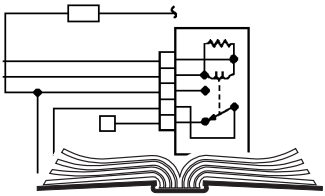
Check the following areas **before** starting any test:

- Check the engine oil, power steering fluid, transmission fluid (if applicable), engine coolant and other fluids for proper levels. Top off low fluid levels if needed.
- Make sure the air filter is clean and in good condition. Make sure all air filter ducts are properly connected. Check the air filter ducts for holes, rips or cracks.
- Make sure all engine belts are in good condition. Check for cracked, torn, brittle, loose or missing belts.
- Make sure mechanical linkages to engine sensors (throttle, gearshift position, transmission, etc.) are secure and properly connected. See your vehicle's service manual for locations.
- Check all rubber hoses (radiator) and steel hoses (vacuum/fuel) for leaks, cracks, blockage or other damage. Make sure all hoses are routed and connected properly.
- Make sure all spark plugs are clean and in good condition. Check for damaged, loose, disconnected or missing spark plug wires.
- Make sure the battery terminals are clean and tight. Check for corrosion or broken connections. Check for proper battery and charging system voltages.
- Check all electrical wiring and harnesses for proper connection. Make sure wire insulation is in good condition, and there are no bare wires.
- Make sure the engine is mechanically sound. If needed, perform a compression check, engine vacuum check, timing check (if applicable), etc.

VEHICLE SERVICE MANUALS

Always refer to the manufacturer's service manual for your vehicle before performing any test or repair procedures. Contact your local car dealership, auto parts store or bookstore for availability of these manuals. The following companies publish valuable repair manuals:

- **Haynes Publications**
  861 Lawrence Drive
  Newbury Park, California 91320
  Phone: 800-442-9637
- **Mitchell International**
  14145 Danielson Street
  Poway, California 92064
  Phone: 888-724-6742
- **Motor Publications**
  5600 Crooks Road, Suite 200
  Troy, Michigan 48098
  Phone: 800-426-6867



FACTORY SOURCES

Ford, GM, Chrysler, Honda, Isuzu, Hyundai and Subaru Service Manuals

- **Helm Inc.**
  14310 Hamilton Avenue
  Highland Park, Michigan 48203
  Phone: 800-782-4356

PRELIMINARY VEHICLE DIAGNOSIS WORKSHEET

The purpose of this form is to help you gather preliminary information on your vehicle before you retrieve codes. By having a complete account of your vehicle's current problem(s), you will be able to systematically pinpoint the problem(s) by comparing your answers to the fault codes you retrieve. You can also provide this information to your mechanic to assist in diagnosis and help avoid costly and unnecessary repairs. It is important for you to complete this form to help you and/or your mechanic have a clear understanding of your vehicle's problems.

NAME:

DATE:

VIN*:

YEAR:

MAKE:

MODEL:

ENGINE SIZE:

VEHICLE MILEAGE:

*VIN: Vehicle Identification Number, found at the base of the windshield on a metallic plate, or at the driver door latch area (consult your vehicle owner's manual for location).

TRANSMISSION:

- ❑ Automatic
- ❑ Manual

Please check all applicable items in each category.

DESCRIBE THE PROBLEM:

WHEN DID YOU FIRST NOTICE THE PROBLEM:

- ❑ Just Started
- ❑ Started Last Week
- ❑ Started Last Month
- ❑ Other:

LIST ANY REPAIRS DONE IN THE PAST SIX MONTHS:

PROBLEMS STARTING

- ❑ No symptoms
- ❑ Will not crank
- ❑ Cranks, but will not start
- ❑ Starts, but takes a long time

ENGINE QUITS OR STALLS

- ❑ No symptoms
- ❑ Right after starting
- ❑ When shifting into gear
- ❑ During steady-speed driving
- ❑ Right after vehicle comes to a stop
- ❑ While idling
- ❑ During acceleration
- ❑ When parking

IDLING CONDITIONS

- ❑ No symptoms
- ❑ Is too slow at all times
- ❑ Is too fast
- ❑ Is sometimes too fast or too slow
- ❑ Is rough or uneven
- ❑ Fluctuates up and down

RUNNING CONDITIONS

- ❑ No symptoms
- ❑ Runs rough
- ❑ Lacks power
- ❑ Bucks and jerks
- ❑ Poor fuel economy
- ❑ Hesitates or stumbles on accelerations
- ❑ Backfires
- ❑ Misfires or cuts out
- ❑ Engine knocks, pings or rattles
- ❑ Surges
- ❑ Dieseling or run-on

AUTOMATIC TRANSMISSION PROBLEMS (if applicable)

- ❑ No symptoms
- ❑ Shifts too early or too late
- ❑ Changes gear incorrectly
- ❑ Vehicle does not move when in gear
- ❑ Jerks or bucks

PROBLEM OCCURS

- ❑ Morning
- ❑ Afternoon
- ❑ Anytime

ENGINE TEMPERATURE WHEN PROBLEM OCCURS

- ❑ Cold
- ❑ Warm
- ❑ Hot

DRIVING CONDITIONS WHEN PROBLEM OCCURS

- ❑ Short - less than 2 miles
- ❑ 2 - 10 miles
- ❑ Long - more than 10 miles
- ❑ Stop and go
- ❑ While turning
- ❑ While braking
- ❑ At gear engagement
- ❑ With A/C operating
- ❑ With headlights on
- ❑ During acceleration
- ❑ Mostly driving downhill
- ❑ Mostly driving uphill
- ❑ Mostly driving level
- ❑ Mostly driving curvy roads
- ❑ Mostly driving rough roads

DRIVING HABITS

- ❑ Mostly city driving
- ❑ Highway
- ❑ Park vehicle inside
- ❑ Park vehicle outside
- ❑ Drive less than 10 miles per day
- ❑ Drive 10 to 50 miles per day
- ❑ Drive more than 50 miles per day

GASOLINE USED

- ❑ 87 Octane
- ❑ 89 Octane
- ❑ 91 Octane
- ❑ More than 91 Octane

WEATHER CONDITIONS WHEN PROBLEM OCCURS

- ❑ 32 - 55° F (0 - 13° C)
- ❑ Below freezing (32° F / 0° C)
- ❑ Above 55° F (13° C)

CHECK ENGINE LIGHT / DASH WARNING LIGHT

- ❑ Sometimes ON
- ❑ Always ON
- ❑ Never ON

PECULIAR SMELLS

- ❑ "Hot"
- ❑ Sulfur ("rotten egg")
- ❑ Burning rubber
- ❑ Gasoline
- ❑ Burning oil
- ❑ Electrical

STRANGE NOISES

- ❑ Rattle
- ❑ Knock
- ❑ Squeak
- ❑ Other

CODE RETRIEVAL PROCEDURE

Retrieving and using Diagnostic Trouble Codes (DTCs) for troubleshooting vehicle operation is only one part of an overall diagnostic strategy.

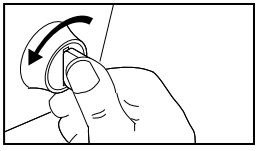
Never replace a part based only on the DTC definition. Each DTC has a set of testing procedures, instructions and flow charts that must be followed to confirm the location of the problem. This information is found in the vehicle's service manual. Always refer to the vehicle's service manual for detailed testing instructions.

Check your vehicle thoroughly before performing any test. See ***Preparation for Testing*** *on page 12 for details.*

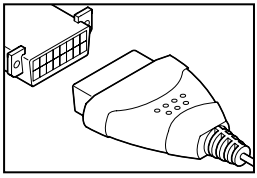
ALWAYS *observe safety precautions whenever working on a vehicle. See* ***Safety Precautions*** *on page 4 for more information.*

1. Turn the ignition off.

2. Locate the vehicle's 16-pin Data Link Connector (DLC). See page 7 for connector location.



Some DLCs have a plastic cover that must be removed before connecting the Code Reader cable connector.

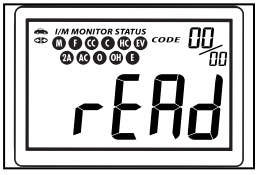


3. Turn the Code Reader off and connect the Code Reader cable connector to the vehicle's DLC. The cable connector is keyed and will only fit one way.

- If you have problems connecting the cable connector to the DLC, rotate the connector 180° and try again.

  If you still have problems, check the DLC on the vehicle and on the Code Reader. Refer to your vehicle's service manual to properly check the vehicle's DLC.

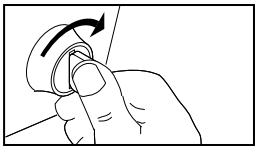
- After the Code Reader's cable is successfully connected to the vehicle's DLC, the Code Reader automatically turns "On" and establishes communication with the vehicle's computer. The word "rEAd" will show on the LCD display. Proceed to step 4.



- If the Code Reader does not turn on automatically when connected to the vehicle, it indicates that there is no power at the vehicle's DLC. Check your fuse panel and replace any burned-out fuses.

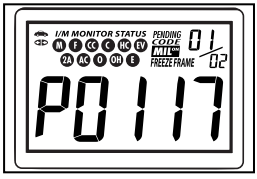
  If replacing the fuse(s) does not correct the problem, consult your vehicle's repair manual to locate the proper computer (PCM) fuse/circuit. Perform any necessary repairs before continuing.

4. Turn the ignition on. **DO NOT** start the engine.



If the ignition key is not turned "ON" within 10 seconds after the Code Reader is connected to a vehicle, an “Error” message will show on the Code Reader's LCD display. At times, an error message may display after you turn the ignition key on. If this happens, wait for the Code Reader to automatically re-link to the vehicle's computer.

- After 10-60 seconds, the Code Reader will retrieve and display any diagnostic information (trouble codes, Monitor status) stored in the vehicle's computer memory.



- If the Code Reader does not retrieve vehicle diagnostic information and keeps cycling between "rEAd" and “Error” on the LCD display, it indicates that the Code Reader is unable to communicate with vehicle's computer. Do the following:
  - Turn the ignition key off, wait 10 seconds and turn the key back on to reset the computer.
  - Make sure your vehicle is OBD 2 compliant. See VEHICLES COVERED on page 6 for vehicle compliance verification information.

If the Code Reader is interrupted or disconnected during code retrieval procedure, the screen will display "Error".

6. Read and interpret the Diagnostic Trouble Codes using the LCD display and the green, yellow and red LEDs.

The green, yellow and red LEDs are used (with the LCD display) as visual aids to make it easier for the user to determine engine system conditions.

- **Green LED** - Indicates that all engine systems are "OK" and running normally. All monitors on the vehicle are active and are performing their diagnostic testing, and no trouble codes are present. A zero will show on Code Reader's LCD display for further confirmation.
- **Yellow LED** - Indicates one of the following conditions:

  PENDING CODE PRESENT - If the yellow LED is lit, it may indicate the existence of a pending code. Check Code Reader's LCD display for confirmation. A pending code is confirmed by the presence of a numeric code and the word PENDING on Code Reader's LCD display. If no pending code is shown, the yellow LED indicates Monitor Status (see the following). See DIAGNOSTIC TROUBLE CODES (DTCs) on page 35 for more information about pending codes.

  MONITOR STATUS - If Code Reader's LCD display shows a zero (indicating there are no DTCs present in the vehicle's computer), but the yellow LED is lit, it indicates a "Monitor Has Not Run" status. This means that some of the Monitors on the vehicle have not yet finished their diagnostic self-testing. This condition is confirmed by one or more **blinking** Monitor icons on the LCD display. A **blinking** Monitor icon means the Monitor has not yet run and finished its diagnostic self-testing. All Monitor icons that are **solid** have completed their diagnostic self-testing.

  For more information on Monitors, see "OBD 2 Monitors" on page 38.

- **Red LED** - Indicates there is a problem with one or more of the vehicle's systems. The red LED is also used to show that DTC(s) are present (displayed on Code Reader's LCD display). In this case, the Multifunction Indicator (Check Engine) lamp on the vehicle's instrument panel will light steady on.

  *Code Reader will automatically re-link to the vehicle's computer every 15 seconds to refresh the data being retrieved. When data is being refreshed, a single beep will sound, and "**rEAd**" will be shown on the LCD display for 5-6 seconds. Code Reader will then beep twice and return to displaying codes. This action repeats as long as Code Reader is in communication with the vehicle's computer.*

  Code Reader will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "0" will be displayed. Code Reader is capable of retrieving and storing up to 32 codes in memory, for immediate or later viewing.

7. If more than one code is present, press and release the **SCROLL** button, as necessary, to display additional codes.

- Whenever the **SCROLL** function is used to view additional codes, Code Reader's communication link with the vehicle's computer disconnects. To re-establish communication, press the **LINK** button again.

*Freeze Frame data is always associated with the "Priority Code" (identified as Code #1 in the Code Reader's display). If the **FREEZE FRAME** icon is lit when the "Priority Code" (Code #1) is displayed on the Code Reader's screen, it indicates that there is Freeze Frame data associated with this code, and the vehicle's computer has saved it in its memory.*

8. To prolong battery life, Code Reader automatically turns "Off" approximately one minute after it is disconnected from the vehicle. Retrieved codes remain in Code Reader's memory, and may be viewed at any time by turning the unit "On." **If Code Reader's batteries are removed, or if Code Reader is re-linked to a vehicle to retrieve codes, any codes currently in its memory are automatically cleared.**

Refer to page 45 for Diagnostic Trouble Code definitions. Match the retrieved DTC(s) with those listed. Read the associated definition(s), and see the vehicle's service manual for further evaluation.

ERASING DIAGNOSTIC TROUBLE CODES (DTCs)

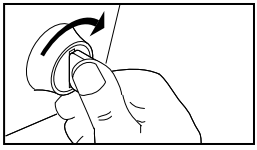
When Code Reader's ERASE function is used to erase the DTCs from the vehicle's on-board computer, "Freeze Frame" data and manufacturer-specific enhanced data are also erased.

If you plan to take the vehicle to a Service Center for repair, **DO NOT** erase the codes from the vehicle's computer. If the codes are erased, valuable information that might help the technician troubleshoot the problem will also be erased.

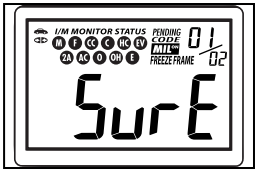
Erase DTCs from the computer's memory as follows:

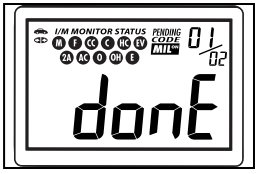
When DTCs are erased from the vehicle's computer memory, the I/M Readiness Monitor Status program resets status of all the Monitors to a not run "flashing" condition. To set all of the Monitors to a DONE status, an OBD 2 Drive Cycle must be performed. Refer to your vehicle's service manual for information on how to perform an OBD 2 Drive Cycle for the vehicle under test.

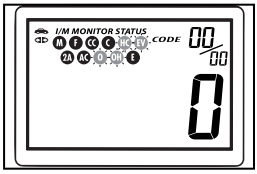
1. Perform the Code Retrieval Procedure as described on page 17.
2. Wait until the codes are displayed on the Code Reader's LCD and then proceed to step 3.



3. Press and release Code Reader 's **ERASE** ERASE button. The LCD display will indicate "**SurE**" for your confirmation.
   - If you change your mind and do not wish to erase the codes, press the **LINK** LINK button to return to the code retrieval function.
   - If you wish to continue, press and release the **ERASE** ERASE button again.
   - The LCD will display "**donE**" for a few seconds, and then will automatically enter the re-link (read) mode to confirm that all retrievable information including DTCs, have been successfully erased/cleared from the computer memory.
   - If the erase was successful, the LCD display will show zero (0) codes, and some of the Monitors icons will be flashing to indicate that the Monitors have been re-set.







Erasing DTCs does not fix the problem(s) that caused the code(s) to be set. If proper repairs to correct the problem that caused the code(s) to be set are not made, the code(s) will appear again (and the check engine light will illuminate) as soon as the vehicle is driven long enough for its Monitors to complete their testing.

I/M READINESS TESTING

I/M is an Inspection and Maintenance program legislated by the Government to meet federal clean-air standards.

The program requires that a vehicle be taken periodically to an Emissions Station for an "Emissions Test" or "Smog Check," where the emissions-related components and systems are inspected and tested for proper operation. Emissions Tests are generally performed once a year, or once every two years.

On OBD 2 systems, the I/M program is enhanced by requiring vehicles to meet stricter test standards. One of the tests instituted by the Federal Government is called I/M 240. On I/M 240, the vehicle under test is driven under different speeds and load conditions on a dynamometer for 240 seconds, while the vehicle's emissions are measured.

Emissions tests vary depending on the geographic or regional area in which the vehicle is registered. If the vehicle is registered in a highly urbanized area, the I/M 240 is probably the type of test required. If the vehicle is registered in a rural area, the stricter "dynamometer type" test may not be required.

I/M Readiness Monitors

I/M Readiness shows whether the various emissions-related systems on the vehicle are operating properly and are ready for Inspection and Maintenance testing.

State and Federal Governments enacted Regulations, Procedures and Emission Standards to ensure that all emissions-related components and systems are **continuously** or **periodically** monitored, tested and diagnosed whenever the vehicle is in operation. It also requires vehicle manufacturers to automatically detect and report any problems or faults that may increase the vehicle's emissions to an unacceptable level.

The vehicle's emissions control system consists of several components or sub-systems (Oxygen Sensor, Catalytic Converter, EGR, Fuel System, etc.) that aid in reducing vehicle emissions.

To have an efficient Vehicle Emission Control System, all the emissions-related components and systems must work correctly whenever the vehicle is in operation.

To comply with State and Federal Government regulations, vehicle manufacturers designed a series of special computer programs called "Monitors" that are programmed into the vehicle's computer. Each of these Monitors is specifically designed to run tests and diagnostics on a specific emissions-related component or system (Oxygen Sensor, Catalytic Converter, EGR Valve, Fuel System, etc.) to ensure their proper operation. Currently, there are a maximum of eleven Monitors available for use.

To learn more about Emissions Inspection and Maintenance (I/M) Readiness Monitors, see OBD 2 MONITORS on page 38.

*Each Monitor has a specific function to test and diagnose **only** its designated emissions-related component or system. The names of the Monitors (Oxygen Sensor Monitor, Catalyst Monitor, EGR Monitor, Misfire Monitor, etc.) describe which component or system each Monitor is designed to test and diagnose.*

Emissions Inspection and Maintenance (I/M) Readiness

Monitor Status Information

I/M Readiness Monitor Status shows which of the vehicle's Monitors have run and completed their diagnosis and testing, and which ones have not yet run and completed testing and diagnosis of their designated sections of the vehicle's emissions system.

- If a Monitor was able to meet all the conditions required to enable it to perform the self-diagnosis and testing of its assigned engine system, it means the monitor "HAS RUN."
- If a Monitor has not yet met all the conditions required for it to perform the self-diagnosis and testing of its assigned engine system; it means the Monitor "HAS NOT RUN."

The Monitor Run/Not Run status does not show whether or not a problem exists in a system. Monitor status only indicates whether a particular Monitor has or has not run and performed the self-diagnosis and testing of its associated system.

Performing I/M Readiness Quick Check

When a vehicle first comes from the factory, all Monitors indicate a DONE status. This indicates that all Monitors have run and completed their diagnostic testing. The DONE status remains in the computer's memory, unless the Diagnostic Trouble Codes are erased or the vehicle's computer memory is cleared.

Code Reader allows you to retrieve Monitor/System Status Information to help you determine if the vehicle is ready for an Emissions Test (Smog Check). In addition to retrieving Diagnostic Trouble Codes, Code Reader also retrieves Monitor Run/Not Run

status. This information is very important since different areas of the state/country have different emissions laws and regulations concerning Monitor Run/Not Run status.

Before an Emissions Test (Smog Check) can be performed, your vehicle must meet certain rules, requirements and procedures legislated by the Federal and state (country) governments where you live.

1. In most areas, one of the requirements that must be met before a vehicle is allowed to be Emissions Tested (Smog Checked) is that the vehicle does not have any Diagnostic Trouble Codes present (with the exception of PENDING Diagnostic Trouble Codes).
2. In addition to the requirement that no Diagnostic Trouble Codes be present, some areas also require that all the Monitors that a particular vehicle supports indicate a "Has Run" status condition before an Emissions Check may be performed.
3. Other areas may only require that some (but not all) Monitors indicate a "Has Run" status before an Emissions Test (Smog Check) may be performed.

Monitors with a "Has Run" status indicate that all the required conditions they needed to perform diagnosis and testing of their assigned engine area (system) have been met, and all diagnostic testing has completed successfully.

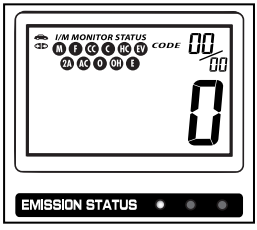
Monitors with a "Has Not Run" status have not yet met the conditions they need to perform diagnosis and testing of their assigned engine area (system), and have not been able to perform diagnostic testing on that system.

The green, yellow and red LEDs provide a quick way to help you determine if a vehicle is ready for an Emissions Test (Smog Check). Follow the instructions below to perform the Quick Check.

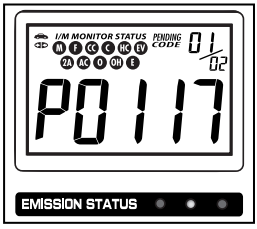
Perform the Code Retrieval Procedure as described on page 17, then interpret the LED indications as follows:

Interpreting I/M Readiness Test Results

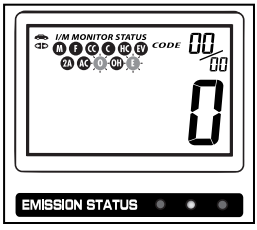
1. **GREEN LED** - Indicates that all engine systems are "OK" and operating normally (all Monitors supported by the vehicle have run and performed their self-diagnostic testing). The vehicle is ready for an Emissions Test (Smog Check), and there is a good possibility that it can be certified.



2. **YELLOW LED** - Determine from the Code Retrieval Procedure (page 17) which of the two possible conditions is causing the yellow LED to light.



   - If a "PENDING" Diagnostic Trouble Code is causing the yellow LED to light, it is possible that the vehicle will be allowed to be tested for emissions and certified. Currently, most areas (states / countries) will allow an Emissions Test (Smog Check) to be performed if the only code in the vehicle's computer is a "PENDING" Diagnostic Trouble Code.

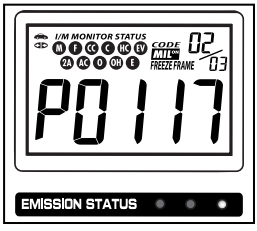


   - If no running Monitors are causing the yellow LED to light, then the issue of the vehicle being ready for an Emissions Test (Smog Check) depends on the emissions regulations and laws of your local area.

     - Some areas require that all Monitors indicate a "Has Run" status before they allow an Emissions Test (Smog Check) to be performed. Other areas only require that some, but not all, Monitors have run their self-diagnostic testing before an Emissions Test (Smog Check) may be performed.

       From the code retrieval procedure, determine the status of each Monitor (a solid Monitor icon shows Monitor "Has Run" status, a flashing Monitor icon indicates "Has Not Run" status). Take this information to an emissions professional to determine (based on your test results) if your vehicle is ready for an Emissions Test (Smog Check).

3. **RED LED** - Indicates there is a problem with one or more of the vehicle's systems. A vehicle displaying a red LED is definitely not ready for an Emissions Test (Smog Check). The red LED is also an indication that there are Diagnostic Trouble Code(s) present (displayed on the Code Reader's screen). The Multifunction Indicator (Check Engine) Lamp on the vehicle's instrument panel will light steady on. The problem that is causing the red LED to light must be repaired before an Emissions Test (Smog Check) can be performed. It is also suggested that the vehicle be inspected/repaired before driving the vehicle further.



If the Red LED was obtained, there is a definite problem present in the system(s). In these cases, you have the following options.

- Repair the vehicle yourself. If you are going to perform the repairs yourself, proceed by reading the vehicle service manual and following all its procedures and recommendations.
- Take the vehicle to a professional to have it serviced. The problem(s) causing the red LED to light must be repaired before the vehicle is ready for an Emissions Test (Smog Check).

Using the I/M Readiness Monitor Status to Confirm a Repair

The I/M Readiness Monitor Status function can be used (after repair of a fault has been performed) to confirm that the repair has been performed correctly, and/or to check for Monitor Run Status. Use the following procedure to determine I/M Readiness Monitor Status:

1. Using retrieved Diagnostic Trouble Codes (DTCs) and code definitions as a guide, and following manufacturer's repair procedures, repair the fault or faults as instructed.
2. After the fault or faults have been repaired, connect Code Reader to the vehicle's DLC and erase the code or codes from the vehicle's computer memory.
   - See page 20 for procedures to erase DTCs from the vehicle's on-board computer.
   - Write the codes down on a piece of paper for reference before erasing.
3. After the erase procedure is performed, most of the Monitor icons on the Code Reader's LCD display will be flashing. Leave Code Reader connected to the vehicle, and perform a Trip Drive Cycle for each "flashing" Monitor:

Misfire, Fuel and Comprehensive Component Monitors run continuously and their icons will always be on solid, even after the erase function is performed.

- Each DTC is associated with a specific Monitor. Consult the vehicle's service manual to identify the Monitor (or Monitors) associated with the faults that were repaired. Follow the manufacturer's procedures to perform a Trip Drive Cycle for the appropriate Monitors.
- While observing the Monitor icons on Code Reader's LCD display, perform a Trip Drive Cycle for the appropriate Monitor or Monitors.

If the vehicle needs to be driven in order to perform a Trip Drive Cycle, ALWAYS have a second person help you. One person should drive the vehicle while the other person observes the Monitor icons on Code Reader for Monitor RUN status. Trying to drive and observe Code Reader at the same time is dangerous, and could cause a serious traffic accident.

4. When a Monitor's Trip Drive Cycle is performed properly, the Monitor icon on Code Reader's LCD display changes from "flashing" to "solid," indicating that the Monitor has run and finished its diagnostic testing.
   - If, after the Monitor has run, the MIL on the vehicle's dash is not lit, and no codes associated with that particular Monitor are present in the vehicle's computer, the repair was successful.
   - If, after the Monitor has run, the MIL on the vehicle's dash lights and/or a DTC associated with that Monitor is present in the vehicle's computer, the repair was unsuccessful. Refer to the vehicle's service manual and recheck repair procedures.

WHAT'S NEXT?

Use the green, yellow and red LEDs as a "quick check" of the status of a vehicle's engine control and emissions systems.

When checking your vehicle for road trip readiness:

- A **GREEN LED** indicates that all engine systems are "OK" and operating normally. You can feel confident that the vehicle is mechanically sound and suitable for travel. Always BE SURE to check fluid levels, tire pressure, etc., before any prolonged travel.
- A **YELLOW LED** indicates a "Pending" DTC is present and/or some of the vehicle's emission monitors have not run their diagnostic testing. Further testing and evaluation may be needed to determine your vehicle's"road trip readiness.
- A **RED LED** indicates there is a problem with one or more of the vehicle's systems. The vehicle should be inspected/repaired before driving the vehicle further.

When checking to see if your vehicle is ready for an Emissions Test (Smog Check):

- A **GREEN LED** indicates that all engine systems are "OK" and operating normally. The vehicle is ready for an Emissions Test (Smog Check), and there is a good possibility that it can be certified.
- A **YELLOW LED** indicates a "Pending" DTC is present and/or some of the vehicle's emission monitors have not run their diagnostic testing. The issue of the vehicle being ready for an Emissions Test (Smog Check) depends on the emissions regulations and laws of your local area. Have an emissions professional review your test results to determine if your vehicle is ready for an Emissions Test (Smog Check).
- A **RED LED** indicates there is a problem with one or more of the vehicle's systems. The vehicle is most likely not ready for an Emissions Test (Smog Check). The problem that is causing the

red LED to light must be repaired before an Emissions Test (Smog Check) can be performed. It is also suggested that the vehicle be inspected/repaired before driving the vehicle further.

When inspecting a used vehicle before buying or selling:

- A **GREEN LED** indicates that all emissions-related systems are "OK" and operating normally. You can feel confident that these vehicle systems are mechanically sound. Always BE SURE to check other vehicle systems NOT covered by Code Reader (transmission, brakes, etc.) as well as the vehicle's service record before buying or selling a vehicle.
- A **YELLOW LED** indicates a "Pending" DTC is present and/or some of the vehicle's emission monitors have not run their diagnostic testing. Further testing and evaluation may be needed to determine the vehicle's actual condition.
- A **RED LED** indicates there is a problem with one or more of the vehicle's systems. It is recommended that you take the vehicle qualified service technician for further diagnosis.

If no codes were retrieved and/or the green lights, and all your vehicle's Monitors show a "Has Run" status, you're "good to go." You can feel confident that:

- The systems and components monitored by your vehicle's on-board computer are in good working order and running properly.
- Your vehicle should pass an Emissions Test (Smog Check) without problem.

If codes were retrieved and/or the yellow or red LEDs light, you can choose to:

- **Fix the problem yourself:** If you choose to fix the problem yourself, read and follow all of the vehicle service manual's recommendations and procedures.
- **Take your vehicle to an Automotive Service Center for repair:** Take your vehicle, a copy of the completed Preliminary Vehicle Diagnosis Worksheet (see page 14) and codes retrieved to your technician for evaluation. This will show your technician that you are an informed motorist and will also assist him in pinpointing the location of the problem as a starting point for needed repairs.

If the red LED lights after retrieving codes or performing an I/M Readiness inspection, it is suggested that the vehicle be inspected/repaired before driving the vehicle further.

COMPUTER ENGINE CONTROLS

The Introduction of Electronic Engine Controls

Electronic Computer Control Systems make it possible for vehicle manufacturers to comply with the tougher emissions and fuel efficiency standards mandated by State and Federal Governments.

As a result of increased air pollution (smog) in large cities, such as Los Angeles, the California Air Resources Board (**CARB**) and the Environmental Protection Agency (**EPA**) set new regulations and air pollution standards to deal with the problem. To further complicate matters, the energy crisis of the early 1970s caused a sharp increase in fuel prices over a short period. As a result, vehicle manufacturers were not only required to comply with the new emissions standards, they also had to make their vehicles more fuel-efficient. Most vehicles were required to meet a miles-per-gallon (MPG) standard set by the U.S. Federal Government.

Precise fuel delivery and spark timing are needed to reduce vehicle emissions. Mechanical engine controls in use at the time (such as ignition points, mechanical spark advance and the carburetor) responded too slowly to driving conditions to properly control fuel delivery and spark timing. This made it difficult for vehicle manufacturers to meet the new standards.

A new Engine Control System had to be designed and integrated with the engine controls to meet the stricter standards. The new system had to:

- Respond instantly to supply the proper mixture of air and fuel for any driving condition (idle, cruising, low-speed driving, high-speed driving, etc.).
- Calculate instantly the best time to "ignite" the air/fuel mixture for maximum engine efficiency.
- Perform both these tasks without affecting vehicle performance or fuel economy.

Vehicle Computer Control Systems can perform millions of calculations each second. This makes them an ideal substitute for the slower mechanical engine controls. By switching from mechanical to electronic engine controls, vehicle manufacturers are able to control fuel delivery and spark timing more precisely. Some newer Computer Control Systems also provide control over other vehicle functions, such as transmission, brakes, charging, body, and suspension systems.

The Basic Engine Computer Control System

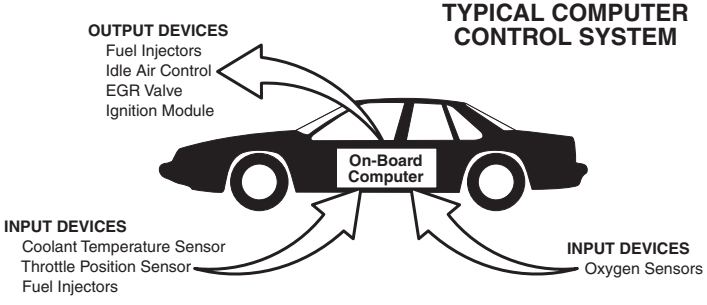
The Computer Control System consists of an on-board computer and several related control devices (sensors, switches, and actuators).

The on-board computer is the heart of the Computer Control System. The computer contains several programs with preset reference values for air/fuel ratio, spark or ignition timing, injector pulse width, engine speed, etc. Separate values are provided for various driving conditions, such as idle, low speed driving, high-speed driving, low load, or high load. The preset reference values represent the ideal air/fuel mixture, spark timing, transmission gear selection, etc., for any driving condition. These values are programmed by the vehicle manufacturer, and are specific to each vehicle model.

Most on-board computers are located inside the vehicle behind the dashboard, under the passenger's or driver's seat, or behind the right kick panel. However, some manufacturers may still position it in the engine compartment.

Vehicle sensors, switches, and actuators are located throughout the engine, and are connected by electrical wiring to the on-board computer. These devices include oxygen sensors, coolant temperature sensors, throttle position sensors, fuel injectors, etc. Sensors and switches are **input devices**. They provide signals representing current engine operating conditions to the computer. Actuators are **output devices**. They perform actions in response to commands received from the computer.

The on-board computer receives information inputs from sensors and switches located throughout the engine. These devices monitor critical engine conditions such as coolant temperature, engine speed, engine load, throttle position, air/fuel ratio etc.



The computer compares the values received from these sensors with its preset reference values, and makes corrective actions as needed so that the sensor values always match the preset reference values for the current driving condition. The computer makes adjustments by commanding other devices such as the fuel injectors, idle air control, EGR valve or Ignition Module to perform these actions.

Vehicle operating conditions are constantly changing. The computer continuously makes adjustments or corrections (especially to the air/fuel mixture and spark timing) to keep all the engine systems operating within the preset reference values.

On-Board Diagnostics - First Generation (OBD 1)

With the exception of some 1994 and 1995 vehicles, most vehicles from 1982 to 1995 are equipped with OBD 1 systems.

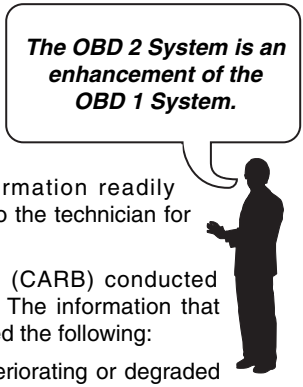
Beginning in 1988, California's Air Resources Board (CARB), and later the Environmental Protection Agency (EPA) required vehicle manufacturers to include a self-diagnostic program in their on-board computers. The program would be capable of identifying emissions-related faults in a system. The first generation of Onboard Diagnostics came to be known as **OBD 1**.

OBD 1 is a set of self-testing and diagnostic instructions programmed into the vehicle's on-board computer. The programs are specifically designed to detect failures in the sensors, actuators, switches and wiring of the various vehicle emissions-related systems. If the computer detects a failure in any of these components or systems, it lights an indicator on the dashboard to alert the driver. The indicator lights **only** when an emissions-related problem is detected.

The computer also assigns a numeric code for each specific problem that it detects, and stores these codes in its memory for later retrieval. These codes can be retrieved from the computer's memory with the use of a "Code Reader" or a "Scan Tool."

On-Board Diagnostics - Second Generation (OBD 2)

In addition to performing all the functions of the OBD 1 System, the OBD 2 System has been enhanced with new Diagnostic Programs. These programs closely monitor the functions of various emissions-related components and systems (as well as other systems) and make this information readily available (with the proper equipment) to the technician for evaluation.



The California Air Resources Board (CARB) conducted studies on OBD 1 equipped vehicles. The information that was gathered from these studies showed the following:

- A large number of vehicles had deteriorating or degraded emissions-related components. These components were causing an increase in emissions.
- Because OBD 1 systems only detect failed components, the degraded components were not setting codes.
- Some emissions problems related to degraded components only occur when the vehicle is being driven under a load. The emission checks being conducted at the time were not performed under simulated driving conditions. As a result, a significant number of vehicles with degraded components were passing Emissions Tests.
- Codes, code definitions, diagnostic connectors, communication protocols and emissions terminology were different for each manufacturer. This caused confusion for the technicians working on different make and model vehicles.

To address the problems made evident by this study, CARB and the EPA passed new laws and standardization requirements. These laws required that vehicle manufacturers to equip their new vehicles with devices capable of meeting all of the new emissions standards and regulations. It was also decided that an enhanced on-board diagnostic system, capable of addressing all of these problems, was needed. This new system is known as "**On-Board Diagnostics Generation Two (OBD 2)**." The primary objective of the OBD 2 system is to comply with the latest regulations and emissions standards established by CARB and the EPA.

The Main Objectives of the OBD 2 System are:

- To detect degraded and/or failed emissions-related components or systems that could cause tailpipe emissions to exceed by 1.5 times the Federal Test Procedure (FTP) standard.
- To expand emissions-related system monitoring. This includes a set of computer run diagnostics called Monitors. Monitors perform diagnostics and testing to verify that all emissions-related components and/or systems are operating correctly and within the manufacturer's specifications.
- To use a standardized Diagnostic Link Connector (DLC) in all vehicles. (Before OBD 2, DLCs were of different shapes and sizes.)
- To standardize the code numbers, code definitions and language used to describe faults. (Before OBD 2, each vehicle manufacturer used their own code numbers, code definitions and language to describe the same faults.)
- To expand the operation of the Malfunction Indicator Lamp (MIL).
- To standardize communication procedures and protocols between the diagnostic equipment (Scan Tools, Code Readers etc.) and the vehicle's on-board computer.

OBD 2 Terminology

The following terms and their definitions are related to OBD 2 systems. Read and reference this list as needed to aid in the understanding of OBD 2 systems.

- **Powertrain Control Module (PCM)** - The PCM is the OBD 2 accepted term for the vehicle's "on-board computer." In addition to controlling the engine management and emissions systems, the PCM also participates in controlling the powertrain (transmission) operation. Most PCMs also have the ability to communicate with other computers on the vehicle (ABS, ride control, body etc.).
- **Monitor** - Monitors are "diagnostic routines" programmed into the PCM. The PCM utilizes these programs to run diagnostic tests, and to monitor operation of the vehicle's emissions-related components or systems to ensure they are operating correctly and within the vehicle's manufacturer specifications. Currently, up to eleven Monitors are used in OBD 2 systems. Additional Monitors will be added as the OBD 2 system is further developed.

Not all vehicles support all eleven Monitors.

- **Enabling Criteria** - Each Monitor is designed to test and monitor the operation of a specific part of the vehicle's emissions system (EGR system, oxygen sensor, catalytic converter, etc.). A specific set of "conditions" or "driving procedures" must be met before the computer can command a Monitor to run tests on its related system. These "conditions" are known as "**Enabling Criteria**." The requirements and procedures vary for each Monitor. Some Monitors only require the ignition key to be turned "**On**" for them to run and complete their diagnostic testing. Others may require a set of complex procedures, such as, starting the vehicle when cold, bringing it to operating temperature, and driving the vehicle under specific conditions before the Monitor can run and complete its diagnostic testing.
- **Monitor Has/Has Not Run** - The terms "Monitor has run" or "Monitor has not run" are used throughout this manual. "**Monitor has run**," means the PCM **has** commanded a particular Monitor to perform the required diagnostic testing on a system to ensure the system is operating correctly (within factory specifications). The term "**Monitor has not run**" means the PCM **has not** yet commanded a particular Monitor to perform diagnostic testing on its associated part of the emissions system.
- **Trip** - A Trip for a particular Monitor requires that the vehicle is driven in such a way that all the "Enabling Criteria" for the Monitor to run and complete its diagnostic testing are met. The "Trip Drive Cycle" for a particular Monitor begins when the ignition key is turned "**On**." It is successfully completed when all the "Enabling Criteria" for the Monitor to run and complete its diagnostic testing are met by the time the ignition key is turned "**Off**." Since each of the eleven monitors is designed to run diagnostics and testing on a different part of the engine or emissions system, the "Trip Drive Cycle" needed for each individual Monitor to run and complete varies.
- **OBD 2 Drive Cycle** - An OBD 2 Drive Cycle is an extended set of driving procedures that takes into consideration the various types of driving conditions encountered in real life. These conditions may include starting the vehicle when it is cold, driving the vehicle at a steady speed (cruising), accelerating, etc. An OBD 2 Drive Cycle begins when the ignition key is turned "On" (when cold) and ends when the vehicle has been driven in such a way as to have all the "Enabling Criteria" met for **all** its applicable Monitors. Only those trips that provide the Enabling Criteria for **all** Monitors applicable to the vehicle to run and complete their individual diagnostic tests qualify as an OBD 2 Drive Cycle. OBD 2 Drive Cycle requirements vary from one model of vehicle to another. Vehicle manufacturers set these procedures. Consult your vehicle's service manual for OBD 2 Drive Cycle procedures.

*Do not confuse a "Trip" Drive Cycle with an OBD 2 Drive Cycle. A Trip Drive Cycle provides the "Enabling Criteria" for **one** specific Monitor to run and complete its diagnostic testing. An OBD 2 Drive Cycle must meet the "Enabling Criteria" for **all** Monitors on a particular vehicle to run and complete their diagnostic testing.*

- **Warm-up Cycle** - Vehicle operation after an engine off period where engine temperature rises at least 40°F (22°C) from its temperature before starting, **and** reaches at least 160°F (70°C). The PCM uses warm-up cycles as a counter to automatically erase a specific code and related data from its memory. When no faults related to the original problem are detected within a specified number of warm-up cycles, the code is erased automatically.

DIAGNOSTIC TROUBLE CODES (DTCs)

Diagnostic Trouble Codes (DTCs) are meant to guide you to the proper service procedure in the vehicle's service manual. **DO NOT** replace parts based only on DTCs without first consulting the vehicle's service manual for proper testing procedures for that particular system, circuit or component.

Diagnostic Trouble Codes (DTCs) are codes that identify a specific problem area.

DTCs are alphanumeric codes that are used to identify a problem that is present in any of the systems that are monitored by the on-board computer (PCM). Each trouble code has an assigned message that identifies the circuit, component or system area where the problem was found.

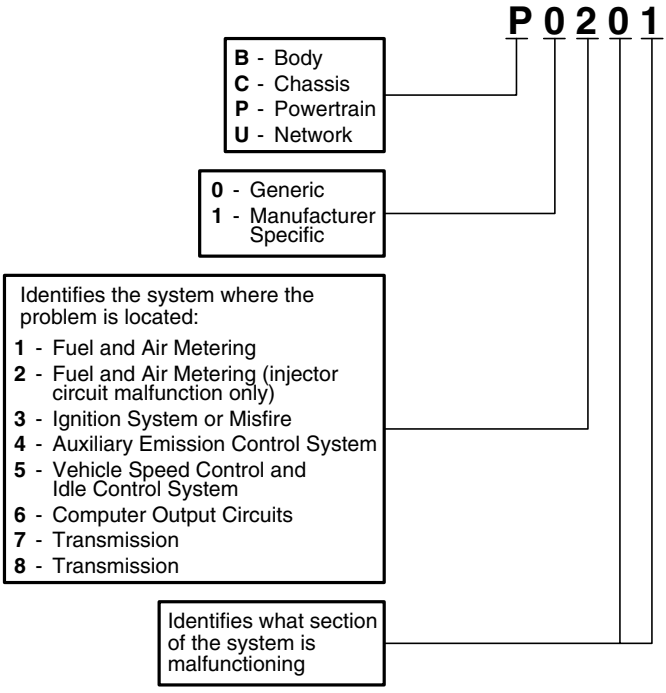
OBD 2 diagnostic trouble codes are made up of five characters:

- The 1st character is a **letter**. It identifies the "main system" where the fault occurred (Body, Chassis, Powertrain, or Network).
- The 2nd character is a **numeric digit**. It identifies the "type" of code (Generic or Manufacturer-Specific).

***Generic DTCs** are codes that are used by all vehicle manufacturers. The standards for generic DTCs, as well as their definitions, are set by the Society of Automotive Engineers (SAE).*

***Manufacturer-Specific DTCs** are codes that are controlled by the vehicle manufacturer. The Federal Government does not require manufacturer-specific codes in order to comply with the new OBD 2 emissions standards. However, manufacturers are free to expand beyond the required codes to make their systems easier to diagnose.*

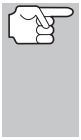
OBD 2 DTC EXAMPLE
P0201 - Injector Circuit Malfunction, Cylinder 1



- The 3rd character is a **numeric digit**. It identifies the specific system or sub-system where the problem is located.
- The 4th and 5th characters are **numeric digits**. They identify the section of the system that is malfunctioning.

DTCs and MIL Status

When the vehicle's on-board computer detects a failure in an emissions-related component or system, the computer's internal diagnostic program assigns a diagnostic trouble code (DTC) that points to the system (and subsystem) where the fault was found. The diagnostic program saves the code in the computer's memory. It records a "Freeze Frame" of conditions present when the fault was found, and lights the Malfunction Indicator Lamp (MIL). Some faults require detection for two trips in a row before the MIL is turned on.



The "Malfunction Indicator Lamp" (MIL) is the accepted term used to describe the lamp on the dashboard that lights to warn the driver that an emissions-related fault has been found. Some manufacturers may still call this lamp a "Check Engine" or "Service Engine Soon" light.

There are two types of DTCs used for emissions-related faults: Type "A" and Type "B." Type "A" codes are "One-Trip" codes; Type "B" DTCs are usually Two-Trip DTCs.

When a **Type "A"** DTC is found on the First Trip, the following events take place:

- The computer commands the MIL "On" when the failure is first found.
- If the failure causes a severe misfire that may cause damage to the catalytic converter, the MIL "flashes" **once per second**. The MIL continues to flash as long as the condition exists. If the condition that caused the MIL to flash is no longer present, the MIL will light "steady" On.
- A DTC is saved in the computer's memory for later retrieval.
- A "Freeze Frame" of the conditions present in the engine or emissions system when the MIL was ordered "On" is saved in the computer's memory for later retrieval. This information shows fuel system status (closed loop or open loop), engine load, coolant temperature, fuel trim value, MAP vacuum, engine RPM and DTC priority.

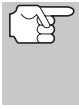
When a **Type "B"** DTC is found on the First Trip, the following events take place:

- The computer sets a Pending DTC, but the MIL is not ordered "On." "Freeze Frame" data is not recorded at this time. The Pending DTC is saved in the computer's memory for later retrieval.
- If the failure **is found** on the second consecutive trip, the MIL is ordered "On." "Freeze Frame" data is saved in the computer's memory.
- If the failure **is not found** on the second Trip, the Pending DTC is erased from the computer's memory.

The MIL will stay lit for both Type "A" and Type "B" codes until one of the following conditions occurs:

- If the conditions that caused the MIL to light are no longer present for the next three trips in a row, the computer automatically turns the MIL "Off" if no other emissions-related faults are present. However, the DTCs remain in the computer's memory for 40 warm-up cycles (80 warm-up cycles for fuel and misfire faults). The DTCs are automatically erased if the fault that caused them to be set is not detected again during that period.

- Misfire and fuel system faults require three trips with "similar conditions" before the MIL is turned "Off." These are trips where the engine load, RPM and temperature are similar to the conditions present when the fault was first found.



After the MIL has been turned off, DTCs, Freeze Frame data, and manufacturer-specific enhanced data stay in the computer's memory. This data can only be retrieved by using equipment such as a Scan Tool.

- Erasing the DTCs from the computer's memory can also turn off the MIL. See ERASING DIAGNOSTIC TROUBLE CODES (DTCs) on page 20, before erasing codes from the computer's memory. If a Code Reader or Scan Tool is used to erase the codes, Freeze Frame data as well as other manufacturer-specific enhanced data will also be erased.

OBD 2 MONITORS

To ensure the correct operation of the various emissions-related components and systems, a diagnostic program was developed and installed in the vehicle's on-board computer. The program has several procedures and diagnostic strategies. Each procedure or diagnostic strategy is made to monitor the operation of, and run diagnostic tests on, a specific emissions-related component or system. These tests ensure the system is running correctly and is within the manufacturer's specifications. On OBD 2 systems, these procedures and diagnostic strategies are called "Monitors."

Currently, a maximum of eleven Monitors are used in OBD 2 systems. Additional monitors may be added as a result of Government regulations as the OBD 2 system grows and matures. Not all vehicles use all eleven Monitors.

Monitor operation is either "**Continuous**" or "**Non-Continuous**," depending on the specific monitor.

Continuous Monitors

Three of these Monitors are designed to constantly monitor their associated components and/or systems for proper operation. Continuous Monitors run constantly when the engine is running. The Continuous Monitors are:

1. Comprehensive Component Monitor (CCM)

2. Misfire Monitor

3. Fuel System Monitor

Non-Continuous Monitors

The other eight Monitors are "non-continuous" Monitors. "Non-continuous" Monitors perform and complete their testing once per trip. The "non-continuous" Monitors are:

1. Oxygen Sensor Monitor
2. Oxygen Sensor Heater Monitor
3. Catalyst Monitor
4. Heated Catalyst Monitor
5. EGR System Monitor
6. EVAP System Monitor
7. Secondary Air System Monitor
8. Air Conditioning (A/C) Monitor

The following provides a brief explanation of the function of each Monitor:

- **Comprehensive Component Monitor (CCM)** - This Monitor continuously checks all inputs and outputs from sensors, actuators, switches and other devices that provide a signal to the computer. The Monitor checks for shorts, opens, out of range value, functionality and “rationality.”

  Rationality: Each input signal is compared against all other inputs and against information in the computer's memory to see if it makes sense under the current operating conditions. Example: The signal from the throttle position sensor indicates the vehicle is in a wide-open throttle condition, but the vehicle is really at idle, and the idle condition is confirmed by the signals from all other sensors. Based on the input data, the computer determines that the signal from the throttle position sensor is not rational (does not make sense when compared to the other inputs). In this case, the signal would fail the rationality test.

  The CCM may be either a "One-Trip" or a "Two-Trip" Monitor, depending on the component.

- **Fuel System Monitor** - This Monitor uses a Fuel System Correction program, called Fuel Trim, inside the on-board computer. Fuel Trim is a set of positive and negative values that represent adding or subtracting fuel from the engine. This program is used to correct for a lean (too much air/not enough fuel) or rich (too much fuel/not enough air) air-fuel mixture. The program is designed to add or subtract fuel, as needed, up to a certain percent. If the correction needed is too large and exceeds the time and percent allowed by the program, a fault is indicated by the computer.

  The Fuel System Monitor may be a "One-Trip" or "Two-Trip" Monitor, depending on the severity of the problem.

- **Misfire Monitor** - This Monitor continuously checks for engine misfires. A misfire occurs when the air-fuel mixture in the cylinder does not ignite. The misfire Monitor uses changes in crankshaft speed to sense an engine misfire. When a cylinder misfires, it no longer contributes to the speed of the engine, and engine speed decreases each time the affected cylinder(s) misfire. The misfire Monitor is designed to sense engine speed fluctuations and determine from which cylinder(s) the misfire is coming, as well as how bad the misfire is. There are three types of engine misfires, Types 1, 2, and 3.
  - Type 1 and Type 3 misfires are two-trip monitor faults. If a fault is sensed on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The MIL is not commanded on at this time. If the fault is found again on the second trip, under similar conditions of engine speed, load and temperature, the computer commands the MIL "On," and the code is saved in its long term memory.
  - Type 2 misfires are the most severe type of misfire. When a Type 2 misfire is sensed on the first trip, the computer commands the MIL to light when the misfire is sensed. If the computer determines that a Type 2 misfire is severe , and may cause catalytic converter damage, it commands the MIL to "flash" once per second as soon as the misfire is sensed. When the misfire is no longer present, the MIL reverts to steady "On" condition.
- **Catalyst Monitor** - The catalytic converter is a device that is installed downstream of the exhaust manifold. It helps to oxidize (burn) the unburned fuel (hydrocarbons) and partially burned fuel (carbon monoxide) left over from the combustion process. To accomplish this, heat and catalyst materials inside the converter react with the exhaust gases to burn the remaining fuel. Some materials inside the catalytic converter also have the ability to store oxygen, and release it as needed to oxidize hydrocarbons and carbon monoxide. In the process, it reduces vehicle emissions by converting the polluting gases into carbon dioxide and water.

  The computer checks the efficiency of the catalytic converter by monitoring the oxygen sensors used by the system. One sensor is located before (upstream of) the converter; the other is located after (downstream of) the converter. If the catalytic converter loses its ability to store oxygen, the downstream sensor signal voltage becomes almost the same as the upstream sensor signal. In this case, the monitor fails the test.

  The Catalyst Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On" and saves the code in its long-term memory.

- **Heated Catalyst Monitor** - Operation of the "heated" catalytic converter is similar to the catalytic converter. The main difference is that a heater is added to bring the catalytic converter to its operating temperature more quickly. This helps reduce emissions by reducing the converter's down time when the engine is cold. The Heated Catalyst Monitor performs the same diagnostic tests as the catalyst Monitor, and also tests the catalytic converter's heater for proper operation. This Monitor is also a "Two-Trip" Monitor.
- **Exhaust Gas Recirculation (EGR) Monitor** - The Exhaust Gas Recirculation (EGR) system helps reduce the formation of Oxides of Nitrogen during combustion. Temperatures above 2500°F cause nitrogen and oxygen to combine and form Oxides of Nitrogen in the combustion chamber. To reduce the formation of Oxides of Nitrogen, combustion temperatures must be kept below 2500°F. The EGR system recirculates small amounts of exhaust gas back into the intake manifold, where it is mixed with the incoming air/fuel mixture. This reduces combustion temperatures by up to 500°F. The computer determines when, for how long, and how much exhaust gas is recirculated back to the intake manifold. The EGR Monitor performs EGR system function tests at preset times during vehicle operation.

  The EGR Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.
- **Evaporative System (EVAP) Monitor** - OBD 2 vehicles are equipped with a fuel Evaporative system (EVAP) that helps prevent fuel vapors from evaporating into the air. The EVAP system carries fumes from the fuel tank to the engine where they are burned during combustion. The EVAP system may consist of a charcoal canister, fuel tank cap, purge solenoid, vent solenoid, flow monitor, leak detector and connecting tubes, lines and hoses.

  Fumes are carried from the fuel tank to the charcoal canister by hoses or tubes. The fumes are stored in the charcoal canister. The computer controls the flow of fuel vapors from the charcoal canister to the engine via a purge solenoid. The computer energizes or de-energizes the purge solenoid (depending on solenoid design). The purge solenoid opens a valve to allow engine vacuum to draw the fuel vapors from the canister into the engine where the vapors are burned. The EVAP Monitor checks for proper fuel vapor flow to the engine, and pressurizes the system to test for leaks. The computer runs this Monitor once per trip.

  The EVAP Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the PCM commands the MIL "On," and saves the code in its long-term memory.

- **Air Conditioning (A/C) Monitor** - The A/C Monitor senses leaks in air conditioning systems that utilize R-12 refrigerant. Vehicle manufacturers have been given two options:

  1. Use R-12 refrigerant in their A/C systems, and integrate an A/C Monitor in the OBD 2 systems of these vehicles to detect for refrigerant leaks; or

  2. Use R-134 refrigerant instead of R12. The A/C Monitor is not required on these vehicles.

  To date, all vehicle manufacturers have opted to use R-134 in their A/C systems. As a result, this Monitor has not yet been implemented.

- **Oxygen Sensor Heater Monitor** - The Oxygen Sensor Heater Monitor tests the operation of the oxygen sensor's heater. There are two modes of operation on a computer-controlled vehicle: "open-loop" and "closed-loop." The vehicle operates in open-loop when the engine is cold, before it reaches normal operating temperature. The vehicle also goes to open-loop mode at other times, such as heavy load and full throttle conditions. When the vehicle is running in open-loop, the oxygen sensor signal is ignored by the computer for air/fuel mixture corrections. Engine efficiency during open-loop operation is very low, and results in the production of more vehicle emissions.

  Closed-loop operation is the best condition for both vehicle emissions and vehicle operation. When the vehicle is operating in closed-loop, the computer uses the oxygen sensor signal for air/fuel mixture corrections.

  In order for the computer to enter closed-loop operation, the oxygen sensor must reach a temperature of at least 600°F. The oxygen sensor heater helps the oxygen sensor reach and maintain its minimum operating temperature (600° F) more quickly, to bring the vehicle into closed-loop operation as soon as possible.

  The Oxygen Sensor Heater Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.

- **Oxygen Sensor Monitor** - The Oxygen Sensor monitors how much oxygen is in the vehicle's exhaust. It generates a varying voltage of up to one volt, based on how much oxygen is in the exhaust gas, and sends the signal to the computer. The computer uses this signal to make corrections to the air/fuel mixture. If the exhaust gas has a large amount of oxygen (a lean air/fuel mixture), the oxygen sensor generates a "low" voltage signal. If the exhaust gas has very little oxygen (a rich mixture condition), the oxygen sensor generates a "high" voltage signal. A 450mV signal indicates the most efficient, and least polluting, air/fuel ratio of 14.7 parts of air to one part of fuel.

The oxygen sensor must reach a temperature of at least 600-650°F, and the engine must reach normal operating temperature, for the computer to enter into closed-loop operation. The oxygen sensor only functions when the computer is in closed-loop. A properly operating oxygen sensor reacts quickly to any change in oxygen content in the exhaust stream. A faulty oxygen sensor reacts slowly, or its voltage signal is weak or missing.

The oxygen sensor is a "Two-Trip" monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.

- **Secondary Air System Monitor** - When a cold engine is first started, it runs in open-loop mode. During open-loop operation, the engine usually runs rich. A vehicle running rich wastes fuel and creates increased emissions, such as carbon monoxide and some hydrocarbons. A Secondary Air System injects air into the exhaust stream to aid catalytic converter operation:

  1. It supplies the catalytic converter with the oxygen it needs to oxidize the carbon monoxide and hydrocarbons left over from the combustion process during engine warm-up.
  2. The extra oxygen injected into the exhaust stream also helps the catalytic converter reach operating temperature more quickly during warm-up periods. The catalytic converter must heat to operating temperature to work properly.

  The Secondary Air System Monitor checks for component integrity and system operation, and tests for faults in the system. The computer runs this Monitor once per trip.

  The Secondary Air System Monitor is a "Two-Trip" monitor. If a fault is found on the first trip, the computer temporarily saves this fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.

OBD 2 Reference Table

The table below lists current OBD 2 Monitors, and indicates the following for each Monitor:

A Monitor Type (how often does the Monitor run; Continuous or Once per trip)

B Number of trips needed, with a fault present, to set a pending DTC

C Number of consecutive trips needed, with a fault present, to command the MIL "On" and store a DTC

D Number of trips needed, with no faults present, to erase a Pending DTC

E Number and type of trips or drive cycles needed, with no faults present, to turn off the MIL

F Number of warm-up periods needed to erase the DTC from the computer's memory after the MIL is turned off

Name of Monitor	A	B	C	D	E	F
Comprehensive Component Monitor	Continuous	1	2	1	3	40
Misfire Monitor (Type 1 and 3)	Continuous	1	2	1	3 - similar conditions	80
Misfire Monitor (Type 2)	Continuous		1		3 - similar conditions	80
Fuel System Monitor	Continuous	1	1 or 2	1	3 - similar conditions	80
Catalytic Converter Monitor	Once per trip	1	2	1	3 trips	40
Oxygen Sensor Monitor	Once per trip	1	2	1	3 trips	40
Oxygen Sensor Heater Monitor	Once per trip	1	2	1	3 trips	40
Exhaust Gas Recirculation (EGR) Monitor	Once per trip	1	2	1	3 trips	40
Evaporative Emissions Controls Monitor	Once per trip	1	2	1	3 trips	40
Secondary Air System (AIR) Monitor	Once per trip	1	2	1	3 trips	40

DIAGNOSTIC TROUBLE CODE DEFINITIONS

This section provides the most complete lists of DTC definitions available at the time of publication. OBD 2 is an evolving system; new codes and definitions are added as the system grows. **ALWAYS** check your vehicle's service manual for code definitions that are not listed here.This section contains both "Generic" and "Manufacturer Specific" DTC definitions:

- **OBD 2 Powertrain "Generic" DTC Definitions** apply to all makes and models of import and domestic vehicles that are "OBD 2 COMPLIANT." These DTCs always start with "P0."
- **OBD 2 Powertrain "Manufacturer Specific" DTC Definitions** apply only to vehicles made by a specific manufacturer. These DTCs always start with "P1." Some codes may have more than one definition. BE SURE to use the correct definition for your vehicle make, model and year.

This manual provides "Manufacturer Specific" DTC definitions for CHRYSLER, FORD, GENERAL MOTORS, HONDA and TOYOTA ***only. For DTC definitions that are not in these lists, and/or for Body, Chassis and Network DTC definitions, reference your vehicle's service manual.***

GENERIC DTC DEFINITIONS

Code	Definition
P0010	"A" Camshaft Position - Actuator Circuit (Bank 1)
P0011	"A" Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)
P0012	"A" Camshaft Position - Timing Over-Retarded (Bank 1)
P0013	"B" Camshaft Position - Actuator Circuit (Bank 1)
P0014	"B" Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)
P0015	"B" Camshaft Position - Timing Over-Retarded (Bank 1)
P0020	"A" Camshaft Position - Actuator Circuit (Bank 2)
P0021	"A" Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)
P0022	"A" Camshaft Position - Timing Over-Retarded (Bank 2)
P0023	"B" Camshaft Position - Actuator Circuit (Bank 2)
P0024	"B" Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)
P0025	"B" Camshaft Position - Timing Over-Retarded (Bank 2)
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)
P0033	Turbo Charger Bypass Valve Control Circuit
P0034	Turbo Charger Bypass Valve Control Circuit Low
P0035	Turbo Charger Bypass Valve Control Circuit High
P0036	HO2S Heater Control Circuit (Bank 1 Sensor 2)
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)
P0042	HO2S Heater Control Circuit (Bank 1 Sensor 3)
P0043	HO2S Heater Control Circuit Low (Bank 1 Sensor 3)
P0044	HO2S Heater Control Circuit High (Bank 1 Sensor 3)
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)
P0056	HO2S Heater Control Circuit (Bank 2 Sensor 2)
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)

Code	Definition
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)
P0062	HO2S Heater Control Circuit (Bank 2 Sensor 3)
P0063	HO2S Heater Control Circuit Low (Bank 2 Sensor 3)
P0064	HO2S Heater Control Circuit High (Bank 2 Sensor 3)
P0065	Air Assisted Injector Control Range/Performance
P0066	Air Assisted Injector Control Circuit or Circuit Low
P0067	Air Assisted Injector Control Circuit High
P0070	Ambient Air Temperature Sensor Circuit
P0071	Ambient Air Temperature Sensor Range/Performance
P0072	Ambient Air Temperature Sensor Circuit Low Input
P0073	Ambient Air Temperature Sensor Circuit High Input
P0074	Ambient Air Temperature Sensor Circuit Intermittent
P0075	Intake Valve Control Solenoid Circuit (Bank 1)
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)
P0078	Exhaust Valve Control Solenoid Circuit (Bank 1)
P0079	Exhaust Valve Control Solenoid Circuit Low (Bank 1)
P0080	Exhaust Valve Control Solenoid Circuit High (Bank 1)
P0081	Intake Valve Control Solenoid Circuit (Bank 2)
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)
P0084	Exhaust Valve Control Solenoid Circuit (Bank 2)
P0085	Exhaust Valve Control Solenoid Circuit Low (Bank 2)
P0086	Exhaust Valve Control Solenoid Circuit High (Bank 2)
P0100	Mass or Volume Air Flow Circuit Malfunction
P0101	Mass or Volume Circuit Range Performance Problem
P0102	Mass or Volume Circuit Low Input
P0103	Mass or Volume Circuit High Input
P0104	Mass or Volume Circuit Intermittent
P0105	Manifold Absolute Pressure/Barometric Pressure Circuit Malfunction
P0106	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem

Code	Definition
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input
P0109	Manifold Absolute Pressure/Barometric Pressure Circuit Intermittent
P0110	Intake Air Temperature Circuit Malfunction
P0111	Intake Air Temperature Circuit Range/Performance Problem
P0112	Intake Air Temperature Circuit Low Input
P0113	Intake Air Temperature Circuit High Input
P0114	Intake Air Temperature Circuit Intermittent
P0115	Engine Coolant Temperature Circuit Malfunction
P0116	Engine Coolant Temperature Circuit Range/Performance Problem
P0117	Engine Coolant Temperature Circuit Low Input
P0118	Engine Coolant Temperature Circuit High Input
P0119	Engine Coolant Temperature Circuit Intermittent
P0120	Throttle/Pedal Position Sensor/Switch A Circuit Malfunction
P0121	Throttle/Pedal Position Sensor/Switch A Circuit Range/ Performance Problem
P0122	Throttle/Pedal Position Sensor/Switch A Circuit Low Input
P0123	Throttle/Pedal Position Sensor/Switch A Circuit High Input
P0124	Throttle/Pedal Position Sensor/Switch A Circuit Intermittent
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control
P0126	Insufficient Coolant Temperature for Stable Operation
P0127	Intake Air Temperature Too High
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)
P0130	O2 Sensor Circuit Malfunction (Bank 1 Sensor 1)
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)
P0135	O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)
P0136	O2 Sensor Circuit Malfunction (Bank 1 Sensor 2)

Code	Definition
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)
P0141	O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)
P0142	O2 Sensor Circuit Malfunction (Bank 1 Sensor 3)
P0143	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 3)
P0144	O2 Sensor Circuit High Voltage (Bank 1 Sensor 3)
P0145	O2 Sensor Circuit Slow Response (Bank 1 Sensor 3)
P0146	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 3)
P0147	O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 3)
P0148	Fuel Delivery Error
P0149	Fuel Timing Error
P0150	O2 Sensor Circuit Malfunction (Bank 2 Sensor 1)
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)
P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)
P0154	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)
P0155	O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)
P0156	O2 Sensor Circuit Malfunction (Bank 2 Sensor 2)
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)
P0159	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2)
P0160	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)
P0161	O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 2)
P0162	O2 Sensor Circuit Malfunction (Bank 2 Sensor 3)
P0163	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 3)
P0164	O2 Sensor Circuit High Voltage (Bank 2 Sensor 3)
P0165	O2 Sensor Circuit Slow Response (Bank 2 Sensor 3)
P0166	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 3)
P0167	O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 3)
P0168	Fuel Temperature Too High
P0169	Incorrect Fuel Composition
P0170	Fuel Trim Malfunction (Bank 1)

Code	Definition
P0171	System too Lean (Bank 1)
P0172	System too Rich (Bank 1)
P0173	Fuel Trim Malfunction (Bank 2)
P0174	System too Lean (Bank 2)
P0175	System too Rich (Bank 2)
P0176	Fuel Composition Sensor Circuit Malfunction
P0177	Fuel Composition Sensor Circuit Range/Performance
P0178	Fuel Composition Sensor Circuit Low Input
P0179	Fuel Composition Sensor Circuit High Input
P0180	Fuel Temperature Sensor A Circuit Malfunction
P0181	Fuel Temperature Sensor A Circuit Range/Performance
P0182	Fuel Temperature Sensor A Circuit Low Input
P0183	Fuel Temperature Sensor A Circuit High Input
P0184	Fuel Temperature Sensor A Circuit Intermittent
P0185	Fuel Temperature Sensor B Circuit Malfunction
P0186	Fuel Temperature Sensor B Circuit Range/Performance
P0187	Fuel Temperature Sensor B Circuit Low Input
P0188	Fuel Temperature Sensor B Circuit High Input
P0189	Fuel Temperature Sensor B Circuit Intermittent
P0190	Fuel Rail Pressure Sensor Circuit Malfunction
P0191	Fuel Rail Pressure Sensor Circuit Range/Performance
P0192	Fuel Rail Pressure Sensor Circuit Low Input
P0193	Fuel Rail Pressure Sensor Circuit High Input
P0194	Fuel Rail Pressure Sensor Circuit Intermittent
P0195	Engine Oil Temperature Sensor Malfunction
P0196	Engine Oil Temperature Sensor Range/Performance
P0197	Engine Oil Temperature Sensor Low
P0198	Engine Oil Temperature Sensor High
P0199	Engine Oil Temperature Sensor Intermittent
P0200	Injector Circuit Malfunction
P0201	Injector Circuit Malfunction - Cylinder 1
P0202	Injector Circuit Malfunction - Cylinder 2
P0203	Injector Circuit Malfunction - Cylinder 3
P0204	Injector Circuit Malfunction - Cylinder 4

Code	Definition
P0205	Injector Circuit Malfunction - Cylinder 5
P0206	Injector Circuit Malfunction - Cylinder 6
P0207	Injector Circuit Malfunction - Cylinder 7
P0208	Injector Circuit Malfunction - Cylinder 8
P0209	Injector Circuit Malfunction - Cylinder 9
P0210	Injector Circuit Malfunction - Cylinder 10
P0211	Injector Circuit Malfunction - Cylinder 11
P0212	Injector Circuit Malfunction - Cylinder 12
P0213	Cold Start Injector 1 Malfunction
P0214	Cold Start Injector 2 Malfunction
P0215	Engine Shutoff Solenoid Malfunction
P0216	Injection Timing Control Circuit Malfunction
P0217	Engine Overtemp Condition
P0218	Transmission Over Temperature Condition
P0219	Engine Overspeed Condition
P0220	Throttle/Pedal Position Sensor/Switch B Circuit Malfunction
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/ Performance Problem
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input
P0224	Throttle/Pedal Position Sensor/Switch B Circuit Intermittent
P0225	Throttle/Pedal Position Sensor/Switch C Circuit Malfunction
P0226	Throttle/Pedal Position Sensor/Switch C Circuit Range/ Performance Problem
P0227	Throttle/Pedal Position Sensor/Switch C Circuit Low Input
P0228	Throttle/Pedal Position Sensor/Switch C Circuit High Input
P0229	Throttle/Pedal Position Sensor/Switch C Circuit Intermittent
P0230	Fuel Pump Primary Circuit Malfunction
P0231	Fuel Pump Secondary Circuit Low
P0232	Fuel Pump Secondary Circuit High
P0233	Fuel Pump Secondary Circuit Intermittent
P0234	Engine Overboost Condition
P0235	Turbocharger Boost Sensor A Circuit Malfunction
P0236	Turbocharger Boost Sensor A Circuit Range/Performance

Code	Definition
P0237	Turbocharger Boost Sensor A Circuit Low
P0238	Turbocharger Boost Sensor A Circuit High
P0239	Turbocharger Boost Sensor B Circuit Malfunction
P0240	Turbocharger Boost Sensor B Circuit Range/Performance
P0241	Turbocharger Boost Sensor B Circuit Low
P0242	Turbocharger Boost Sensor B Circuit High
P0243	Turbocharger Wastegate Solenoid A Malfunction
P0244	Turbocharger Wastegate Solenoid A Range/Performance
P0245	Turbocharger Wastegate Solenoid A Low
P0246	Turbocharger Wastegate Solenoid A High
P0247	Turbocharger Wastegate Solenoid B Malfunction
P0248	Turbocharger Wastegate Solenoid B Range/Performance
P0249	Turbocharger Wastegate Solenoid B Low
P0250	Turbocharger Wastegate Solenoid B High
P0251	Injection Pump A Rotor/Cam Malfunction
P0252	Injection Pump A Rotor/Cam Range/Performance
P0253	Injection Pump A Rotor/Cam Low
P0254	Injection Pump A Rotor/Cam High
P0255	Injection Pump A Rotor/Cam Intermitted
P0256	Injection Pump B Rotor/Cam Malfunction
P0257	Injection Pump B Rotor/Cam Range/Performance
P0258	Injection Pump B Rotor/Cam Low
P0259	Injection Pump B Rotor/Cam High
P0260	Injection Pump B Rotor/Cam Intermitted
P0261	Cylinder 1 Injector Circuit Low
P0262	Cylinder 1 Injector Circuit High
P0263	Cylinder 1 Contribution/Balance Fault
P0264	Cylinder 2 Injector Circuit Low
P0265	Cylinder 2 Injector Circuit High
P0266	Cylinder 2 Contribution/Balance Fault
P0267	Cylinder 3 Injector Circuit Low
P0268	Cylinder 3 Injector Circuit High
P0269	Cylinder 3 Contribution/Balance Fault
P0270	Cylinder 4 Injector Circuit Low

Code	Definition
P0271	Cylinder 4 Injector Circuit High
P0272	Cylinder 4 Contribution/Balance Fault
P0273	Cylinder 5 Injector Circuit Low
P0274	Cylinder 5 Injector Circuit High
P0275	Cylinder 5 Contribution/Balance Fault
P0276	Cylinder 6 Injector Circuit Low
P0277	Cylinder 6 Injector Circuit High
P0278	Cylinder 6 Contribution/Balance Fault
P0279	Cylinder 7 Injector Circuit Low
P0280	Cylinder 7 Injector Circuit High
P0281	Cylinder 7 Contribution/Balance Fault
P0282	Cylinder 8 Injector Circuit Low
P0283	Cylinder 8 Injector Circuit High
P0284	Cylinder 8 Contribution/Balance Fault
P0285	Cylinder 9 Injector Circuit Low
P0286	Cylinder 9 Injector Circuit High
P0287	Cylinder 9 Contribution/Balance Fault
P0288	Cylinder 10 Injector Circuit Low
P0289	Cylinder 10 Injector Circuit High
P0290	Cylinder 10 Contribution/Balance Fault
P0291	Cylinder 11 Injector Circuit Low
P0292	Cylinder 11 Injector Circuit High
P0293	Cylinder 11 Contribution/Balance Fault
P0294	Cylinder 12 Injector Circuit Low
P0295	Cylinder 12 Injector Circuit High
P0296	Cylinder 12 Contribution/Balance Fault
P0298	Engine Oil Over Temperature
P0300	Random/Multiple Cylinder Misfire Detected
P0301	Cylinder 1 Misfire Detected
P0302	Cylinder 2 Misfire Detected
P0303	Cylinder 3 Misfire Detected
P0304	Cylinder 4 Misfire Detected
P0305	Cylinder 5 Misfire Detected
P0306	Cylinder 6 Misfire Detected

Code	Definition
P0307	Cylinder 7 Misfire Detected
P0308	Cylinder 8 Misfire Detected
P0309	Cylinder 9 Misfire Detected
P0310	Cylinder 10 Misfire Detected
P0311	Cylinder 11 Misfire Detected
P0312	Cylinder 12 Misfire Detected
P0313	Misfire Detected with Low Fuel
P0314	Single Cylinder Misfire (Cylinder not specified)
P0320	Ignition/Distributor Engine Speed Input Circuit Malfunction
P0321	Ignition/Distributor Engine Speed Input Circuit Range/ Performance
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal
P0323	Ignition/Distributor Engine Speed Input Circuit Intermittent
P0324	Knock Control System Error
P0325	Knock Sensor 1 Circuit Malfunction (Bank 1 or Single Sensor)
P0326	Knock Sensor 1 Circuit Range/Performance (Bank 1 or Single Sensor)
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)
P0329	Knock Sensor 1 Circuit Intermittent (Bank 1 or Single Sensor)
P0330	Knock Sensor 2 Circuit Malfunction (Bank 2)
P0331	Knock Sensor 2 Circuit Range/Performance (Bank 2)
P0332	Knock Sensor 2 Circuit Low Input (Bank 2)
P0333	Knock Sensor 2 Circuit High Input (Bank 2)
P0334	Knock Sensor 2 Circuit Intermittent (Bank 2)
P0335	Crankshaft Position Sensor A Circuit Malfunction
P0336	Crankshaft Position Sensor A Circuit Range/Performance
P0337	Crankshaft Position Sensor A Circuit Low Input
P0338	Crankshaft Position Sensor A Circuit High Input
P0339	Crankshaft Position Sensor A Circuit Intermittent
P0340	Camshaft Position Sensor Circuit Malfunction
P0341	Camshaft Position Sensor Circuit Range/Performance
P0342	Camshaft Position Sensor Circuit Low Input
P0343	Camshaft Position Sensor Circuit High Input
P0344	Camshaft Position Sensor Circuit Intermittent

Code	Definition
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)
P0346	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 2)
P0347	Camshaft Position Sensor "A" Circuit Low Input (Bank 2)
P0348	Camshaft Position Sensor "A" Circuit High Input (Bank 2)
P0349	Camshaft Position Sensor "A" Circuit Intermittent (Bank 2)
P0350	Ignition Coil Primary/Secondary Circuit Malfunction
P0351	Ignition Coil A Primary/Secondary Circuit Malfunction
P0352	Ignition Coil B Primary/Secondary Circuit Malfunction
P0353	Ignition Coil C Primary/Secondary Circuit Malfunction
P0354	Ignition Coil D Primary/Secondary Circuit Malfunction
P0355	Ignition Coil E Primary/Secondary Circuit Malfunction
P0356	Ignition Coil F Primary/Secondary Circuit Malfunction
P0357	Ignition Coil G Primary/Secondary Circuit Malfunction
P0358	Ignition Coil H Primary/Secondary Circuit Malfunction
P0359	Ignition Coil I Primary/Secondary Circuit Malfunction
P0360	Ignition Coil J Primary/Secondary Circuit Malfunction
P0361	Ignition Coil K Primary/Secondary Circuit Malfunction
P0362	Ignition Coil L Primary/Secondary Circuit Malfunction
P0365	Camshaft Position Sensor "B" Circuit (Bank 1)
P0366	Camshaft Position Sensor "B" Circuit Range/Performance (Bank 1)
P0367	Camshaft Position Sensor "B" Circuit Low Input (Bank 1)
P0368	Camshaft Position Sensor "B" Circuit High Input (Bank 1)
P0369	Camshaft Position Sensor "B" Circuit Intermittent (Bank 1)
P0370	Timing Reference High Resolution Signal A Malfunction
P0371	Timing Reference High Resolution Signal A Too Many Pulses
P0372	Timing Reference High Resolution Signal A Too Few Pulses
P0373	Timing Reference High Resolution Signal A Intermittent/ Erratic Pulses
P0374	Timing Reference High Resolution Signal A No Pulses
P0375	Timing Reference High Resolution Signal B Malfunction
P0376	Timing Reference High Resolution Signal B Too Many Pulses
P0377	Timing Reference High Resolution Signal B Too Few Pulses

Code	Definition
P0378	Timing Reference High Resolution Signal B Intermittent/Erratic Pulses
P0379	Timing Reference High Resolution Signal B No Pulses
P0380	Glow Plug/Heater Circuit Malfunction
P0381	Glow Plug/Heater Indicator Circuit Malfunction
P0382	Glow Plug/Heater Circuit "B" Malfunction
P0385	Crankshaft Position Sensor B Circuit Malfunction
P0386	Crankshaft Position Sensor B Circuit Range/Performance
P0387	Crankshaft Position Sensor B Circuit Low Input
P0388	Crankshaft Position Sensor B Circuit High Input
P0389	Crankshaft Position Sensor B Circuit Intermittent
P0390	Camshaft Position Sensor "B" Circuit (Bank 2)
P0391	Camshaft Position Sensor "B" Circuit Range/Performance (Bank 2)
P0392	Camshaft Position Sensor "B" Circuit Low Input (Bank 2)
P0393	Camshaft Position Sensor "B" Circuit High Input (Bank 2)
P0394	Camshaft Position Sensor "B" Circuit Intermittent (Bank 2)
P0400	Exhaust Gas Recirculation Flow Malfunction
P0401	Exhaust Gas Recirculation Flow Insufficient Detected
P0402	Exhaust Gas Recirculation Flow Excessive Detected
P0403	Exhaust Gas Recirculation Circuit Malfunction
P0404	Exhaust Gas Recirculation Circuit Range/Performance
P0405	Exhaust Gas Recirculation Sensor A Circuit Low
P0406	Exhaust Gas Recirculation Sensor A Circuit High
P0407	Exhaust Gas Recirculation Sensor B Circuit Low
P0408	Exhaust Gas Recirculation Sensor B Circuit High
P0409	Exhaust Gas Recirculation Sensor "A" Circuit
P0410	Secondary Air Injection System Malfunction
P0411	Secondary Air Injection System Incorrect Flow Detected
P0412	Secondary Air Injection System Switching Valve A Circuit Malfunction
P0413	Secondary Air Injection System Switching Valve A Circuit Open
P0414	Secondary Air Injection System Switching Valve A Circuit Shorted
P0415	Secondary Air Injection System Switching Valve B Circuit Malfunction

Code	Definition
P0416	Secondary Air Injection System Switching Valve B Circuit Open
P0417	Secondary Air Injection System Switching Valve B Circuit Shorted
P0418	Secondary Air Injection System Relay "A" Circuit Malfunction
P0419	Secondary Air Injection System Relay "B" Circuit Malfunction
P0420	Catalyst System Efficiency Below Threshold (Bank 1)
P0421	Warm Up Catalyst Efficiency Below Threshold (Bank 1)
P0422	Main Catalyst Efficiency Below Threshold (Bank 1)
P0423	Heated Catalyst Efficiency Below Threshold (Bank 1)
P0424	Heated Catalyst Temperature Below Threshold (Bank 1)
P0425	Catalyst Temperature Sensor (Bank 1)
P0426	Catalyst Temperature Sensor Range/Performance (Bank 1)
P0427	Catalyst Temperature Sensor Low Input (Bank 1)
P0428	Catalyst Temperature Sensor High Input (Bank 1)
P0429	Catalyst Heater Control Circuit (Bank 1)
P0430	Catalyst System Efficiency Below Threshold (Bank 2)
P0431	Warm Up Catalyst Efficiency Below Threshold (Bank 2)
P0432	Main Catalyst Efficiency Below Threshold (Bank 2)
P0433	Heated Catalyst Efficiency Below Threshold (Bank 2)
P0434	Heated Catalyst Temperature Below Threshold (Bank 2)
P0435	Catalyst Temperature Sensor (Bank 2)
P0436	Catalyst Temperature Sensor Range/Performance (Bank 2)
P0437	Catalyst Temperature Sensor Low Input (Bank 2)
P0438	Catalyst Temperature Sensor High Input (Bank 2)
P0439	Catalyst Heater Control Circuit (Bank 2)
P0440	Evaporative Emission Control System Malfunction
P0441	Evaporative Emission Control System Incorrect Purge Flow
P0442	Evaporative Emission Control System Leak Detected (small leak)
P0443	Evaporative Emission Control System Purge Control Valve Circuit Malfunction
P0444	Evaporative Emission Control System Purge Control Valve Circuit Open
P0445	Evaporative Emission Control System Purge Control Valve Circuit Shorted

Code	Definition
P0446	Evaporative Emission Control System Vent Control Circuit Malfunction
P0447	Evaporative Emission Control System Vent Control Open
P0448	Evaporative Emission Control System Vent Control Circuit Shorted
P0449	Evaporative Emission Control System Vent Valve/Solenoid Circuit Malfunction
P0450	Evaporative Emission Control System Pressure Sensor Malfunction
P0451	Evaporative Emission Control System Pressure Sensor Range/ Performance
P0452	Evaporative Emission Control System Pressure Sensor Low Input
P0453	Evaporative Emission Control System Pressure Sensor High Input
P0454	Evaporative Emission Control System Pressure Sensor Intermittent
P0455	Evaporative Emission Control System Leak Detected (gross leak)
P0456	Evaporative Emission Control System Leak Detected (very small leak)
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)
P0460	Fuel Level Sensor Circuit Malfunction
P0461	Fuel Level Sensor Circuit Range/Performance
P0462	Fuel Level Sensor Circuit Low Input
P0463	Fuel Level Sensor Circuit High Input
P0464	Fuel Level Sensor Circuit Intermittent
P0465	Purge Flow Sensor Circuit Malfunction
P0466	Purge Flow Sensor Circuit Range/Performance
P0467	Purge Flow Sensor Circuit Low Input
P0468	Purge Flow Sensor Circuit High Input
P0469	Purge Flow Sensor Circuit Intermittent
P0470	Exhaust Pressure Sensor Malfunction
P0471	Exhaust Pressure Sensor Range/Performance
P0472	Exhaust Pressure Sensor Low
P0473	Exhaust Pressure Sensor High

Code	Definition
P0474	Exhaust Pressure Sensor Intermittent
P0475	Exhaust Pressure Control Valve Malfunction
P0476	Exhaust Pressure Control Valve Range/Performance
P0477	Exhaust Pressure Control Valve Low
P0478	Exhaust Pressure Control Valve High
P0479	Exhaust Pressure Control Valve Intermittent
P0480	Cooling Fan 1 Control Circuit Malfunction
P0481	Cooling Fan 2 Control Circuit Malfunction
P0482	Cooling Fan 3 Control Circuit Malfunction
P0483	Cooling Fan Rationality Check Malfunction
P0484	Cooling Fan Circuit Over Current
P0485	Cooling Fan Power/Ground Circuit Malfunction
P0486	Exhaust Gas Recirculation Sensor "B" Circuit
P0487	Exhaust Gas Recirculation Throttle Position Control Circuit
P0488	Exhaust Gas Recirculation Throttle Position Control Range/ Performance
P0491	Secondary Air Injection System (Bank 1)
P0492	Secondary Air Injection System (Bank 2)
P0500	Vehicle Speed Sensor Malfunction
P0501	Vehicle Speed Sensor Range/Performance
P0502	Vehicle Speed Sensor Circuit Low Input
P0503	Vehicle Speed Sensor Intermittent/Erratic/High
P0505	Idle Control System Malfunction
P0506	Idle Control System RPM Lower Than Expected
P0507	Idle Control System RPM Higher Than Expected
P0508	Idle Control System Circuit Low
P0509	Idle Control System Circuit High
P0510	Closed Throttle Position Switch Malfunction
P0512	Starter Request Circuit
P0513	Incorrect Immobilizer Key ("Immobilizer" pending SAE J1930 approval)
P0515	Battery Temperature Sensor Circuit
P0516	Battery Temperature Sensor Circuit Low
P0517	Battery Temperature Sensor Circuit High

Code	Definition
P0520	Engine Oil Pressure/Switch Circuit Malfunction
P0521	Engine Oil Pressure/Switch Range/Performance
P0522	Engine Oil Pressure/Switch Low Voltage
P0523	Engine Oil Pressure/Switch High Voltage
P0524	Engine Oil Pressure Too Low
P0530	A/C Refrigerant Pressure Sensor Circuit Malfunction
P0531	A/C Refrigerant Pressure Sensor Circuit Range/Performance
P0532	A/C Refrigerant Pressure Sensor Circuit Low Input
P0533	A/C Refrigerant Pressure Sensor Circuit High Input
P0534	Air Conditioner Refrigerant Charge Loss
P0540	Intake Air Heater Circuit
P0541	Intake Air Heater Circuit Low
P0542	Intake Air Heater Circuit High
P0544	Exhaust Gas Temperature Sensor Circuit (Bank 1)
P0545	Exhaust Gas Temperature Sensor Circuit Low (Bank 1)
P0546	Exhaust Gas Temperature Sensor Circuit High (Bank 1)
P0547	Exhaust Gas Temperature Sensor Circuit (Bank 2)
P0548	Exhaust Gas Temperature Sensor Circuit Low (Bank 2)
P0549	Exhaust Gas Temperature Sensor Circuit High (Bank 2)
P0550	Power Steering Pressure Sensor Circuit Malfunction
P0551	Power Steering Pressure Sensor Circuit Range/Performance
P0552	Power Steering Pressure Sensor Circuit Low Input
P0553	Power Steering Pressure Sensor Circuit High Input
P0554	Power Steering Pressure Sensor Circuit Intermittent
P0560	System Voltage Malfunction
P0561	System Voltage Unstable
P0562	System Voltage Low
P0563	System Voltage High
P0564	Cruise Control Multi-Function Input Signal
P0565	Cruise Control On Signal Malfunction
P0566	Cruise Control Off Signal Malfunction
P0567	Cruise Control Resume Signal Malfunction
P0568	Cruise Control Set Signal Malfunction
P0569	Cruise Control Coast Signal Malfunction

Code	Definition
P0570	Cruise Control Accel Signal Malfunction
P0571	Cruise Control/Brake Switch A Circuit Malfunction
P0572	Cruise Control/Brake Switch A Circuit Low
P0573	Cruise Control/Brake Switch A Circuit High
P0574	Cruise Control System - Vehicle Speed Too High
P0575	Cruise Control Input Circuit
P0576	Cruise Control Input Circuit Low
P0577	Cruise Control Input Circuit High
P0578-P0580	Reserved for Cruise Control Codes
P0600	Serial Communication Link Malfunction
P0601	Internal Control Module Memory Check Sum Error
P0602	Control Module Programming Error
P0603	Internal Control Module Keep Alive Memory (KAM) Error
P0604	Internal Control Module Random Access Memory (RAM) Error
P0605	Internal Control Module Read Only Memory (ROM) Error
P0606	PCM Processor Fault
P0607	Control Module Performance
P0608	Control Module VSS Output "A" Malfunction
P0609	Control Module VSS Output "B" Malfunction
P0610	Control Module Vehicle Options Error
P0615	Starter Relay Circuit
P0616	Starter Relay Circuit Low
P0617	Starter Relay Circuit High
P0618	Alternative Fuel Control Module KAM Error
P0619	Alternative Fuel Control Module RAM/ROM Error
P0620	Generator Control Circuit Malfunction
P0621	Generator Lamp "L" Control Circuit Malfunction
P0622	Generator Field "F" Control Circuit Malfunction
P0623	Generator Lamp Control Circuit
P0624	Fuel Cap Lamp Control Circuit
P0630	VIN Not Programmed or Mismatch - ECM/PCM
P0631	VIN Not Programmed or Mismatch - TCM
P0635	Power Steering Control Circuit

Code	Definition
P0636	Power Steering Control Circuit Low
P0637	Power Steering Control Circuit High
P0638	Throttle Actuator Control Range/Performance (Bank 1)
P0639	Throttle Actuator Control Range/Performance (Bank 2)
P0640	Intake Air Heater Control Circuit
P0645	A/C Clutch Relay Control Circuit
P0646	A/C Clutch Relay Control Circuit Low
P0647	A/C Clutch Relay Control Circuit High
P0648	Immobilizer Lamp Control Circuit ("Immobilizer" pending SAE J1930 approval)
P0649	Speed Control Lamp Control Circuit
P0650	Malfunction Indicator Lamp (MIL) Control Circuit Malfunction
P0654	Engine RPM Output Circuit Malfunction
P0655	Engine Hot Lamp Output Control Circuit Malfunction
P0656	Fuel Level Output Circuit Malfunction
P0660	Intake Manifold Tuning Valve Control Circuit (Bank 1)
P0661	Intake Manifold Tuning Valve Control Circuit Low (Bank 1)
P0662	Intake Manifold Tuning Valve Control Circuit High (Bank 1)
P0663	Intake Manifold Tuning Valve Control Circuit (Bank 2)
P0664	Intake Manifold Tuning Valve Control Circuit Low (Bank 2)
P0665	Intake Manifold Tuning Valve Control Circuit High (Bank 2)
P0700	Transmission Control System Malfunction
P0701	Transmission Control System Range/Performance
P0702	Transmission Control System Electrical
P0703	Torque Converter/Brake Switch B Circuit Malfunction
P0704	Clutch Switch Input Circuit Malfunction
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)
P0706	Transmission Range Sensor Circuit Range/Performance
P0707	Transmission Range Sensor Circuit Low Input
P0708	Transmission Range Sensor Circuit High Input
P0709	Transmission Range Sensor Circuit Intermittent
P0710	Transmission Fluid Temperature Sensor Circuit Malfunction
P0711	Transmission Fluid Temperature Sensor Circuit Range/ Performance

Code	Definition
P0712	Transmission Fluid Temperature Sensor Circuit Low Input
P0713	Transmission Fluid Temperature Sensor Circuit High Input
P0714	Transmission Fluid Temperature Sensor Circuit Intermittent
P0715	Input/Turbine Speed Sensor Circuit Malfunction
P0716	Input/Turbine Speed Sensor Circuit Range/Performance
P0717	Input/Turbine Speed Sensor Circuit No Signal
P0718	Input/Turbine Speed Sensor Circuit Intermittent
P0719	Torque Converter/Brake Switch B Circuit Low
P0720	Output Speed Sensor Circuit Malfunction
P0721	Output Speed Sensor Circuit Range/Performance
P0722	Output Speed Sensor Circuit No Signal
P0723	Output Speed Sensor Circuit Intermittent
P0724	Torque Converter/Brake Switch B Circuit High
P0725	Engine Speed Input Circuit Malfunction
P0726	Engine Speed Input Circuit Range/Performance
P0727	Engine Speed Input Circuit No Signal
P0728	Engine Speed Input Circuit Intermittent
P0730	Incorrect Gear Ratio
P0731	Gear 1 Incorrect Ratio
P0732	Gear 2 Incorrect Ratio
P0733	Gear 3 Incorrect Ratio
P0734	Gear 4 Incorrect Ratio
P0735	Gear 5 Incorrect Ratio
P0736	Reverse Incorrect Ratio
P0737	TCM Engine Speed Output Circuit
P0738	TCM Engine Speed Output Circuit Low
P0739	TCM Engine Speed Output Circuit High
P0740	Torque Converter Clutch Circuit Malfunction
P0741	Torque Converter Clutch Circuit Performance or Stuck Off
P0742	Torque Converter Clutch Circuit Stuck On
P0743	Torque Converter Clutch Circuit Electrical
P0744	Torque Converter Clutch Circuit Intermittent
P0745	Pressure Control Solenoid Malfunction
P0746	Pressure Control Solenoid Performance or Stuck Off

Code	Definition
P0747	Pressure Control Solenoid Stuck On
P0748	Pressure Control Solenoid Electrical
P0749	Pressure Control Solenoid Intermittent
P0750	Shift Solenoid A Malfunction
P0751	Shift Solenoid A Performance or Stuck Off
P0752	Shift Solenoid A Stuck On
P0753	Shift Solenoid A Electrical
P0754	Shift Solenoid A Intermittent
P0755	Shift Solenoid B Malfunction
P0756	Shift Solenoid B Performance or Stuck Off
P0757	Shift Solenoid B Stuck On
P0758	Shift Solenoid B Electrical
P0759	Shift Solenoid B Intermittent
P0760	Shift Solenoid C Malfunction
P0761	Shift Solenoid C Performance or Stuck Off
P0762	Shift Solenoid C Stuck On
P0763	Shift Solenoid C Electrical
P0764	Shift Solenoid C Intermittent
P0765	Shift Solenoid D Malfunction
P0766	Shift Solenoid D Performance or Stuck Off
P0767	Shift Solenoid D Stuck On
P0768	Shift Solenoid D Electrical
P0769	Shift Solenoid D Intermittent
P0770	Shift Solenoid E Malfunction
P0771	Shift Solenoid E Performance or Stuck Off
P0772	Shift Solenoid E Stuck On
P0773	Shift Solenoid E Electrical
P0774	Shift Solenoid E Intermittent
P0775	Pressure Control Solenoid "B"
P0776	Pressure Control Solenoid "B" Performance or Stuck Off
P0777	Pressure Control Solenoid "B" Stuck On
P0778	Pressure Control Solenoid "B" Electrical
P0779	Pressure Control Solenoid "B" Intermittent
P0780	Shift Malfunction

Code	Definition
P0781	1-2 Shift Malfunction
P0782	2-3 Shift Malfunction
P0783	3-4 Shift Malfunction
P0784	4-5 Shift Malfunction
P0785	Shift/Timing Solenoid Malfunction
P0786	Shift/Timing Solenoid Range/Performance
P0787	Shift/Timing Solenoid Low
P0788	Shift/Timing Solenoid High
P0789	Shift/Timing Solenoid Intermittent
P0790	Normal/Performance Switch Circuit Malfunction
P0791	Intermediate Shaft Speed Sensor Circuit
P0792	Intermediate Shaft Speed Sensor Circuit Range/Performance
P0793	Intermediate Shaft Speed Sensor Circuit No Signal
P0794	Intermediate Shaft Speed Sensor Circuit Intermittent
P0795	Pressure Control Solenoid "C"
P0796	Pressure Control Solenoid "C" Performance or Stuck Off
P0797	Pressure Control Solenoid "C" Stuck On
P0798	Pressure Control Solenoid "C" Electrical
P0799	Pressure Control Solenoid "C" Intermittent
P0801	Reverse Inhibit Control Circuit Malfunction
P0803	1-4 Upshift (Skip Shift) Solenoid Control Circuit Malfunction
P0804	1-4 Upshift (Skip Shift) Lamp Control Circuit Malfunction
P0805	Clutch Position Sensor Circuit
P0806	Clutch Position Sensor Circuit Range/Performance
P0807	Clutch Position Sensor Circuit Low
P0808	Clutch Position Sensor Circuit High
P0809	Clutch Position Sensor Circuit Intermittent
P0810	Clutch Position Control Error
P0811	Excessive Clutch Slippage
P0812	Reverse Input Circuit
P0813	Reverse Output Circuit
P0814	Transmission Range Display Circuit
P0815	Upshift Switch Circuit
P0816	Downshift Switch Circuit

Code	Definition
P0817	Starter Disable Circuit
P0818	Driveline Disconnect Switch Input Circuit
P0820	Gear Lever X-Y Position Sensor Circuit
P0821	Gear Lever X Position Circuit
P0822	Gear Lever Y Position Circuit
P0823	Gear Lever X Position Circuit Intermittent
P0824	Gear Lever Y Position Circuit Intermittent
P0825	Gear Lever Push-Pull Switch (Shift Anticipate)
P0830	Clutch Pedal Switch "A" Circuit
P0831	Clutch Pedal Switch "A" Circuit Low
P0832	Clutch Pedal Switch "A" Circuit High
P0833	Clutch Pedal Switch "B" Circuit
P0834	Clutch Pedal Switch "B" Circuit Low
P0835	Clutch Pedal Switch "B" Circuit High
P0836	Four Wheel Drive (4WD) Switch Circuit
P0837	Four Wheel Drive (4WD) Switch Circuit Range/Performance
P0838	Four Wheel Drive (4WD) Switch Circuit Low
P0839	Four Wheel Drive (4WD) Switch Circuit High
P0840	Transmission Fluid Pressure Sensor/Switch "A" Circuit
P0841	Transmission Fluid Pressure Sensor/Switch "A" Circuit Range/ Performance
P0842	Transmission Fluid Pressure Sensor/Switch "A" Circuit Low
P0843	Transmission Fluid Pressure Sensor/Switch "A" Circuit High
P0844	Transmission Fluid Pressure Sensor/Switch "A" Circuit Intermittent
P0845	Transmission Fluid Pressure Sensor/Switch "B" Circuit
P0846	Transmission Fluid Pressure Sensor/Switch "B" Circuit Range/ Performance
P0847	Transmission Fluid Pressure Sensor/Switch "B" Circuit Low
P0848	Transmission Fluid Pressure Sensor/Switch "B" Circuit High
P0849	Transmission Fluid Pressure Sensor/Switch "B" Circuit Intermittent

MANUFACTURER SPECIFIC CODES - CHRYSLER

Code	Definition
P1103	Turbocharger Waste Gate Actuator Malfunction
P1104	Turbocharger Waste Gate Solenoid Malfunction
P1105	Fuel Pressure Solenoid Malfunction
P1195	Slow Switching O2 Sensor Bank One Sensor One During catalyst monitoring
P1196	Slow Switching O2 Sensor Bank two Sensor one During catalyst monitoring
P1197	Slow Switching O2 Sensor Bank One Sensor two During catalyst monitoring
P1198	Radiator Temperature Sensor Input voltage too high
P1199	Radiator Temperature Sensor Input voltage too low
P1281	Engine is cold too long
P1282	Fuel Pump Relay control circuit
P1283	Idle select signal invalid
P1284	Fuel Injection pump battery voltage sensor out of range
P1285	Fuel Injection pump controller always on
P1286	Accelerator Position Sensor (APPS) supply voltage too high
P1287	Fuel Injection pump Controller Supply voltage low
P1288	Intake manifold short runner tuning valve solenoid circuit
P1289	Manifold tune valve solenoid circuit
P1290	CNG Fuel system pressure too high
P1291	No Temp rise seen from intake heaters
P1292	CNG Pressure sensor voltage too high
P1293	CNG Pressure sensor voltage too low
P1294	Target idle not reached
P1295	No 5 volts to TP sensor
P1296	No 5 volts to MAP sensor
P1297	No change in MAP sensor from start to run
P1298	lean operation at wide open throttle
P1299	Vacuum Leak detected (IAC fully seated)
P1300	Ignition timing adjustment circuit failure
P1388	Auto shutdown relay control circuit
P1389	No ASD relay output voltage at PCM

Code	Definition
P1390	Timing belt skipped one tooth or more
P1391	Intermittent loss of CMP or CKP
P1398	Mis-Fire Adaptive Numerator at Limit (PCM is unable to learn the crank sensors signal for use in preparation for misfire diagnostics
P1399	Wait to start lamp circuit
P1403	No 5 volt feed to EGR
P1475	Auxiliary 5 volt supply is too high
P1476	Too little secondary air
P1477	Too much secondary air
P1478	Battery Temp Sensor Volts out of limit
P1479	Transmission Fan Relay Circuit
P1480	PCV Solenoid Circuit
P1481	EATX (Electronic Automatic Transaxle) RPM pulse generator performance
P1482	Catalyst Temperature Sensor Circuit shorted low
P1483	Catalyst Temperature Sensor Circuit shorted high
P1484	Catalytic Converter overheat detected
P1485	Air injection solenoid circuit
P1486	EVAP Leak Monitor found a pinched hose
P1487	Hi Speed Fan #2 Circuit
P1488	Auxiliary 5 volt supply output is too low
P1489	High speed fan control relay circuit
P1490	Low speed fan control relay circuit
P1491	Radiator fan relay control circuit
P1492	Ambient/ Battery Temp sensor input voltage too high
P1493	Ambient/ Battery Temp sensor input voltage too low
P1494	Leak detection pump pressure switch or mechanical fault
P1495	Leak detection pump solenoid circuit
P1496	5 volt supply, output too low
P1498	High speed radiator fan ground control relay circuit
P1500	General alternator 'FR' Terminal circuit fault
P1594	Charging system voltage too high
P1595	Speed control solenoid circuits
P1596	Speed control switch always high

Code	Definition
P1597	Speed control switch always low
P1598	A/C pressure sensor input voltage too high
P1599	A/C pressure sensor input voltage too low
P1680	Clutch released switch circuit
P1681	No I/P Cluster CCD/ J1850 messages received
P1682	Charging system voltage too low
P1683	Speed control servo power control circuit
P1684	The battery has been disconnected within the last 50 starts
P1685	The SKIM (Smart Key Immobilizer Module) has received an invalid key
P1686	No SKIM (Smart Key Immobilizer Module) bus message received
P1687	No Mechanical Instrument cluster bus message
P1688	Internal Fuel injection pump controller failure
P1689	No communication between the ECM and injection pump module
P1690	Fuel injection pump CKP sensor does not agree with the ECM CKP sensor
P1691	Fuel injection pump controller calibration error
P1692	Fault in companion Engine control module
P1693	A companion DTC was set in both the ECM and PCM
P1694	No CCD message from PCM- Aisin transmission
P1695	No CCD message from body control module
P1696	PCM failure EEPROM write denied
P1697	PCM Failure SRI (Service Reminder Indicator) mileage not stored
P1698	No CCD message from TCM
P1719	Skip shift solenoid circuit
P1740	TCC solenoid or overdrive solenoid performance
P1756	Governor pressure not equal to target at 15-20 psi
P1757	Governor pressure is above 3 PSI when 0 PSI is requested
P1762	Governor pressure sensor offset improper voltage
P1763	Governor pressure sensor voltage to high
P1764	Governor pressure sensor voltage to low
P1765	Transmission 12 volt supply relay control circuit
P1899	Park/ Neutral switch stuck in park or gear

MANUFACTURER SPECIFIC CODES - FORD

Code	Definition
P1000	OBD Systems Readiness Test Not Complete
P1001	KOER Not Able to Complete, KOER Aborted
P1100	Mass Air Flow Sensor Circuit Intermittent
P1101	Mass Air Flow Sensor Out Of Self Test Range
P1105	Dual Alternator Upper Fault
P1106	Dual Alternator Lower Fault
P1107	Dual Alternator Lower Circuit
P1108	Dual Alternator Lower Circuit
P1109	Intake Air Temperature B Circuit Intermittent
P1111	System Pass
P1112	Intake Air Temperature Circuit Intermittent
P1114	Intake Air Temperature B Circuit Low Input (Super/Turbo Charged engines)
P1115	Intake Air Temperature B Circuit High Input (Super/Turbo Charged engines)
P1116	Engine Coolant Temperature Sensor Out Of Self Test Range
P1117	Engine Coolant Temperature Sensor Circuit Intermittent
P1118	Manifold Air Temperature Circuit Low Input
P1119	Manifold Air Temperature Circuit High Input
P1120	Throttle Position Sensor A Out Of Range Low (Ratch too low)
P1121	Throttle Position Sensor A Inconsistent With Mass Air Flow Sensor
P1122	Pedal Position Sensor A Circuit Low Input
P1123	Pedal Position Sensor A Circuit High Input
P1124	Throttle Position Sensor A Out Of Self Test Range
P1125	Throttle Position Sensor A Intermittent
P1127	Exhaust Not Warm, Downstream O2 Sensor Not Tested
P1128	Upstream HO2S Sensors Swapped
P1129	Downstream HO2S Sensors Swapped
P1130	Lack Of HO2S11 Switches - Fuel Trim At Limit
P1131	Lack Of HO2S11 Switches - Sensor Indicates Lean
P1132	Lack Of HO2S11 Switches - Sensor Indicates Rich
P1133	Bank 1 Fuel Control Shifted Lean (FAOSC)

Code	Definition
P1134	Bank 1 Fuel Control Shifted Rich (FAOSC)
P1135	Pedal Position Sensor A Circuit Intermittent
P1137	Lack of HO2S12 Switches - Sensor Indicates Lean
P1138	Lack of HO2S12 Switches - Sensor Indicates Rich
P1139	Water in Fuel Indicator Circuit
P1140	Water in Fuel Condition
P1141	Fuel Restriction Indicator Circuit
P1142	Fuel Restriction Condition
P1150	Lack of HO2S21 Switches - Fuel Trim At Limit
P1151	Lack of HO2S21 Switches - Sensor Indicates Lean
P1152	Lack of HO2S21 Switches - Sensor Indicates Rich
P1153	Bank 2 Fuel Control Shifted Lean (FAOSC)
P1154	Bank 2 Fuel Control Shifted Rich (FAOSC)
P1155	Alternative Fuel Control Module Has Activated the MIL
P1157	Lack of HO2S22 Switches - Sensor Indicates Lean
P1158	Lack of HO2S22 Switches - Sensor Indicates Rich
P1168	Fuel Rail Pressure Sensor In Range But Low
P1169	Fuel Rail Pressure Sensor In Range But High
P1170	Engine Shut Off Solenoid
P1171	Rotor Sensor
P1172	Rotor Control
P1173	Rotor Calibration
P1174	Cam Sensor
P1175	Cam Control
P1176	Cam Calibration
P1177	Synchronization
P1178	Boltup Limits
P1180	Fuel Delivery System - Low
P1181	Fuel Delivery System - High
P1183	Engine Oil Temperature Sensor Circuit
P1184	Engine Oil Temperature Sensor Out Of Self Test Range
P1185	Fuel Pump Temperature Sensor High
P1186	Fuel Pump Temperature Sensor Low
P1187	Variant Selection

Code	Definition
P1188	Calibration Memory
P1189	Pump Speed Signal
P1190	Calibration Resistor Out Of Range
P1191	Key Line Voltage
P1192	V External
P1193	EGR Driver Over Current
P1194	ECM/PCM A/D Converter
P1195	SCP HBCC Chip Failed to Initialize
P1196	Key Off Voltage High
P1197	Key Off Voltage Low
P1198	Pump Rotor Control Underfueling
P1209	Injector Control Pressure Peak Delta Test Fault
P1210	Injector Control Pressure Above Expected Level
P1211	Injector Control Pressure Above/Below Desired
P1212	Injector Control Pressure Not At Expected Level
P1214	Pedal Position Sensor B Circuit Intermittent
P1215	Pedal Position Sensor C Circuit Low Input
P1216	Pedal Position Sensor C Circuit High Input
P1217	Pedal Position Sensor C Circuit Intermittent
P1218	CID High
P1219	CID Low
P1220	Series Throttle Control System
P1221	Traction Control System
P1222	Pedal Position Sensor B Circuit Low Input
P1222	Traction Control Output Circuit
P1223	Pedal Position Sensor B Circuit High Input
P1224	Throttle Position Sensor B Out Of Self Test Range
P1227	Wastegate Failed Closed (Over pressure)
P1228	Wastegate Failed Open (Under pressure)
P1229	Charge Air Cooler Pump Driver
P1230	Fuel Pump Low Speed Malfunction (VLCM)
P1231	Fuel Pump Secondary Circuit Low, High Speed (VLCM)
P1232	Fuel Pump Speed Primary Circuit (Two speed fuel pump)

Code	Definition
P1233	Fuel Pump Driver Module Disabled or Off Line (Fuel Pump Driver Module)
P1234	Fuel Pump Driver Module Disabled or Off Line (Fuel Pump Driver Module)
P1235	Fuel Pump Control Out Of Range (Fuel Pump Driver Module/ VLCM)
P1236	Fuel Pump Control Out Of Range (Fuel Pump Driver Module)
P1237	Fuel Pump Secondary Circuit (Fuel Pump Driver Module)
P1238	Fuel Pump Secondary Circuit (Fuel Pump Driver Module)
P1239	Speed Fuel Pump Positive Feed
P1243	Second Fuel Pump Fault or Ground Fault
P1244	Alternator Load High Input
P1245	Alternator Load Low Input
P1246	Alternator Load Input
P1247	Turbo Boost Pressure Low
P1248	Turbo Boost Pressure Not Detected
P1249	Wastegate Control Valve Performance
P1252	Pedal Correlation PDS1 and LPDS High
P1253	Pedal Correlation PDS1 and LPDS Low
P1254	Pedal Correlation PDS2 and LPDS High
P1255	Pedal Correlation PDS2 and LPDS Low
P1256	Pedal Correlation PDS1 and HPDS
P1257	Pedal Correlation PDS2 and HPDS
P1258	Pedal Correlation PDS1 and PDS2
P1260	Theft Detected, Vehicle Immobilized
P1261	Cylinder #1 High To Low Side Short
P1262	Cylinder #2 High To Low Side Short
P1263	Cylinder #3 High To Low Side Short
P1264	Cylinder #4 High To Low Side Short
P1265	Cylinder #5 High To Low Side Short
P1266	Cylinder #6 High To Low Side Short
P1267	Cylinder #7 High To Low Side Short
P1268	Cylinder #8 High To Low Side Short
P1270	Engine RPM or Vehicle Speed Limiter Reached
P1271	Cylinder #1 High To Low Side Open

Code	Definition
P1272	Cylinder #2 High To Low Side Open
P1273	Cylinder #3 High To Low Side Open
P1274	Cylinder #4 High To Low Side Open
P1275	Cylinder #5 High To Low Side Open
P1276	Cylinder #6 High To Low Side Open
P1277	Cylinder #7 High To Low Side Open
P1278	Cylinder #8 High To Low Side Open
P1280	Injector Control Pressure Out Of Range Low
P1281	Injector Control Pressure Out Of Range High
P1282	Excessive Injector Control Pressure
P1283	Injector Pressure Regulator Circuit
P1284	Aborted KOER - Injector Control Pressure Failure
P1285	Cylinder Head Overtemperature Condition
P1286	Fuel Pulsewidth In Range But Lower Than Expected
P1287	Fuel Pulsewidth In Range But Higher Than Expected
P1288	Cylinder Head Temperature Sensor Out Of Self Test Range
P1289	Cylinder Head Temperature Sensor Circuit High Input
P1290	Cylinder Head Temperature Sensor Circuit Low Input
P1291	Injector High Side Short To GND Or VBATT - Bank 1
P1292	Injector High Side Short To GND Or VBATT - Bank 2
P1293	Injector High Side Open - Bank 1
P1294	Injector High Side Open - Bank 2
P1295	Injector Multiple Faults - Bank 1
P1296	Injector Multiple Faults - Bank 2
P1297	Injector High Side Switches Shorted Together
P1298	Injector Driver Module Failure
P1299	Cylinder Head Overtemperature Protection Active
P1300	Boost Calibration Fault
P1301	Boost Calibration High
P1302	Boost Calibration Low
P1303	Exhaust Gas Recirculation Calibration Fault
P1304	Exhaust Gas Recirculation Calibration High
P1305	Exhaust Gas Recirculation Calibration Low
P1306	Kickdown Relay Pull-in Circuit

Code	Definition
P1307	Kickdown Relay Hold Circuit
P1309	Misfire Monitor AICE Chip Fault, Misfire Monitor Disabled
P1310	Ionization Misfire Detection Module Fault
P1311	Ionization Misfire Detection Module Communication Fault
P1316	IDM Codes Detected
P1340	Camshaft Position Sensor B Circuit
P1351	Ignition Diagnostic Monitor Input Circuit
P1352	Ignition Coil A Primary Circuit
P1353	Ignition Coil B Primary Circuit
P1354	Ignition Coil C Primary Circuit
P1355	Ignition Coil D Primary Circuit
P1356	Ignition Diagnostic Monitor Indicates Engine Not Turning
P1357	Ignition Diagnostic Monitor Pulsewidth Not Defined
P1358	Ignition Diagnostic Monitor Signal Out Of Self Test Range (no CPU OK)
P1359	Spark Output Circuit
P1360	Ignition Coil A Secondary Circuit
P1361	Ignition Coil B Secondary Circuit
P1362	Ignition Coil C Secondary Circuit
P1363	Ignition Coil D Secondary Circuit
P1364	Ignition Coil Primary Circuit
P1365	Ignition Coil Secondary Circuit
P1366	Ignition Spare
P1367	Ignition Spare
P1368	Ignition Spare
P1369	Engine Temperature Light Circuit
P1380	Camshaft Position Actuator Circuit (Bank 1)
P1381	Camshaft Position Timing Over Advanced (Bank 1)
P1383	Camshaft Position Timing Over Retarded (Bank 1)
P1385	Camshaft Position Actuator Circuit (Bank 2)
P1386	Camshaft Position Timing Over Advanced (Bank 2)
P1388	Camshaft Position Timing Over Retarded (Bank 2)
P1390	Octane Adjust Service Pin In Use/Circuit Open
P1400	Differential Pressure Feedback EGR Circuit Low Input

Code	Definition
P1401	Differential Pressure Feedback EGR Circuit High Input
P1402	Exhaust Gas Recirculation Metering Orifice Restricted
P1403	Differential Pressure Feedback Sensor Hoses Reversed
P1404	EGR Temperature Sensor Circuit
P1405	Differential Pressure Feedback Sensor Upstream Hose Off Or Plugged
P1406	Differential Pressure Feedback Sensor Downstream Hose Off Or Plugged
P1407	Exhaust Gas Recirculation No Flow Detected
P1408	Exhaust Gas Recirculation Flow Out Of Self Test Range
P1409	EGR Vacuum Regulator Solenoid Circuit
P1410	Auxiliary Air Cleaner Inlet Control Circuit
P1411	Secondary Air Injection Incorrect Downstream Flow Detected
P1413	Secondary Air Injection Monitor Circuit Low Input
P1414	Secondary Air Injection Monitor Circuit High Input
P1431	Misfire Monitor Disabled, Unable to Learn Trigger Wheel Profile
P1442	Evaporative Emission Control System Control Leak Detected
P1443	Evaporative Emission Control System Control Valve
P1444	Purge Flow Sensor Circuit Low Input
P1445	Purge Flow Sensor Circuit High Input
P1450	Unable to Bleed Up Fuel Tank Vacuum
P1451	Evaporative Emission Control System Vent Control Circuit
P1452	Unable to Bleed Up Fuel Tank Vacuum
P1455	Evaporative Emission Control System Control Leak Detected (gross leak/no flow)
P1457	Unable to Pull Fuel Tank Vacuum
P1460	Wide Open Throttle A/C Cutout Circuit
P1461	A/C Pressure Sensor Circuit High Input
P1462	A/C Pressure Sensor Circuit Low Input
P1463	A/C Pressure Sensor Insufficient Pressure Change
P1464	A/C Demand Out Of Self Test Range
P1465	A/C Relay Circuit
P1466	A/C Refrigerant Temperature Sensor Circuit
P1469	Rapid A/C Cycling

Code	Definition
P1473	Fan Circuit Open (VLCM)
P1474	Fan Control Primary Circuit
P1479	High Fan Control Primary Circuit
P1480	Fan Secondary Low With Low Fan On
P1481	Fan Secondary Low With High Fan On
P1482	SCP
P1483	Brake Pedal Input Short To Battery
P1484	Fan Driver Circuit Open To Power Ground (VLCM)
P1485	Brake Pedal Input Short To Battery
P1500	Vehicle Speed Sensor
P1501	Vehicle Speed Sensor Out Of Self Test Range
P1502	Vehicle Speed Sensor Intermittent
P1504	Idle Air Control Circuit
P1505	Idle Air Control System At Adaptive Clip
P1506	Idle Air Control Overspeed Error
P1507	Idle Air Control Underspeed Error
P1512	Intake Manifold Runner Control Stuck Closed (Bank 1)
P1513	Intake Manifold Runner Control Stuck Closed (Bank 2)
P1516	Intake Manifold Runner Control Input Error (Bank 1)
P1517	Intake Manifold Runner Control Input Error (Bank 2)
P1518	Intake Manifold Runner Control Stuck Open (Bank 1)
P1519	Intake Manifold Runner Control Stuck Closed (Bank 2)
P1520	Intake Manifold Runner Control Circuit
P1530	A/C Clutch Circuit Open (VLCM)
P1532	Intake Manifold Communication Control Circuit (Bank 2)
P1533	Air Assisted Injector Circuit
P1534	Restraint Deployment Indicator Circuit
P1537	Intake Manifold Runner Control Stuck Open (Bank 1)
P1538	Intake Manifold Runner Control Stuck Open (Bank 2)
P1539	A/C Clutch Circuit Overcurrent/Short (VLCM)
P1549	Intake Manifold Communication Control Circuit (Bank 1)
P1550	Power Steering Pressure Sensor Out Of Self Test Range
P1565	Speed Control Command Switch Out Of Range High
P1566	Speed Control Command Switch Out Of Range Low

Code	Definition
P1567	Speed Control Output Circuit
P1568	Speed Control Unable To Hold Speed
P1572	Brake Pedal Switch Circuit
P1573	Throttle Position Not Available
P1574	Throttle Position Sensor Outputs Disagree
P1575	Pedal Position Out Of Self Test Range
P1576	Pedal Position Not Available
P1577	Pedal Position Sensor Outputs Disagree
P1578	ETC Power Less Than Demand
P1579	ETC In Power Limiting Mode
P1580	Electronic Throttle Monitor PCM Override
P1581	Electronic Throttle Monitor Malfunction
P1582	Electronic Throttle Monitor Data Available
P1583	Electronic Throttle Monitor Cruise Disablement
P1584	Throttle Control Detected ETB Malfunction
P1585	Throttle Control Malfunction
P1586	Electronic Throttle To PCM Communication Error
P1587	Throttle Control Modulated Command Malfunction
P1588	Throttle Control Detected Loss Of Return Spring
P1589	Throttle Control Unable To Control To Desired Throttle Angle
P1605	Keep Alive Memory Test Failure
P1610	SBDS Interactive Codes
P1611	SBDS Interactive Codes
P1612	SBDS Interactive Codes
P1613	SBDS Interactive Codes
P1614	SBDS Interactive Codes
P1615	SBDS Interactive Codes
P1616	SBDS Interactive Codes
P1617	SBDS Interactive Codes
P1618	SBDS Interactive Codes
P1618	SBDS Interactive Codes
P1619	SBDS Interactive Codes
P1620	SBDS Interactive Codes
P1625	Fan Driver Circuit Open to Power B+ (VLCM)

Code	Definition
P1626	A/C Circuit Open to Power B+ (VLCM)
P1633	Keep Alive Power Voltage Too Low
P1635	Tire/Axle Out of Acceptable Range
P1636	Inductive Signature Chip Communication Error
P1639	Vehicle ID Block Corrupted, Not Programmed
P1640	Powertrain DTCs Available In Another Control Module (Ref. PID 0946)
P1641	Fuel Pump Primary Circuit
P1642	CAN Link Circuit
P1642	Fuel Pump Monitor Circuit Low Input [DTC will be deleted on next version]
P1643	CAN Link ECM/TCM Circuit/Network
P1643	Fuel Pump Monitor Circuit Low Input[DTC will be deleted on next version]
P1644	Fuel Pump Speed Control Circuit
P1650	Power Steering Pressure Switch Out Of Self Test Range
P1651	Power Steering Pressure Switch Input
P1656	CAN Link PCM/PCM Circuit Network
P1657	CAN Link Chip Malfunction
P1700	Transmission Indeterminate Failure (Failed to Neutral)
P1701	Reverse Engagement Error
P1702	Transmission Range Sensor Circuit Intermittent
P1703	Brake Switch Out Of Self Test Range
P1704	Transmission Range Circuit Not Indicating Park/Neutral During Self Test
P1705	Transmission Range Circuit Not Indicating Park/Neutral During Self Test
P1709	Park Neutral Position Switch Out Of Self Test Range
P1711	Transmission Fluid Temperature Sensor Out Of Self Test Range
P1712	Transmission Torque Reduction Request Signal
P1713	Transmission Fluid Temperature Sensor In Range Failure (<50 deg F)
P1714	Shift Solenoid A Inductive Signature
P1715	Shift Solenoid B Inductive Signature
P1716	Shift Solenoid C Inductive Signature

Code	Definition
P1717	Shift Solenoid D Inductive Signature
P1718	Transmission Fluid Temperature Sensor In Range Failure (>250 deg F)
P1727	Coast Clutch Solenoid Inductive Signature
P1728	Transmission Slip
P1729	4x4L Switch
P1731	1-2 Shift Malfunction
P1732	2-3 Shift Malfunction
P1733	3-4 Shift Malfunction
P1740	Torque Converter Clutch Solenoid Inductive Signature
P1741	Torque Converter Clutch Solenoid Control Error
P1742	Torque Converter Clutch Solenoid Circuit Failed On
P1743	Torque Converter Clutch Solenoid Circuit Failed On
P1744	Torque Converter Clutch Solenoid Circuit Performance
P1746	Pressure Control Solenoid A Open Circuit
P1747	Pressure Control Solenoid A Short Circuit
P1749	Pressure Control Solenoid A Failed Low
P1751	Shift Solenoid A Performance
P1754	Coast Clutch Solenoid Circuit
P1756	Shift Solenoid B Performance
P1760	Pressure Control Solenoid A Short Circuit Intermittent
P1761	Shift Solenoid C Performance
P1762	Overdrive Band Failed Off
P1766	Shift Solenoid D Performance
P1767	Torque Converter Clutch Circuit
P1768	Performance/Normal/Winter Mode Input
P1770	Clutch Solenoid Circuit
P1780	Transmission Control Switch (O/D Cancel) Circuit Out Of Self Test Range
P1781	4X4L Circuit Out Of Self Test Range
P1782	Performance/Economy Switch Circuit Out Of Self Test Range
P1783	Transmission Overtemperature Condition
P1784	Transmission Mechanical Failure - First and Reverse
P1785	Transmission Mechanical Failure - First and Second

Code	Definition
P1786	3-2 Downshift Error
P1787	2-1 Downshift Error
P1788	Pressure Control Solenoid B Open Circuit
P1789	Pressure Control Solenoid B Short Circuit
P1795	Inconsistent CAN Level
P1804	4-Wheel Drive High Indicator Circuit Open or Shorted To Ground
P1806	4-Wheel Drive High Indicator Short To Battery
P1808	4-Wheel Drive Low Indicator Circuit Open or Short To Ground
P1810	4-Wheel Drive Low Indicator Short To Battery
P1812	4-Wheel Drive Mode Select Switch Circuit Open
P1815	4-Wheel Drive Mode Select Switch Circuit Short To Ground
P1819	Neutral Safety Switch Input Short To Ground
P1820	Transfer Case LO To HI Shift Relay Circuit Open Or Short To Ground
P1822	Transfer Case LO To HI Shift Relay Coil Short To Battery
P1824	4-Wheel Drive Electric Clutch Relay Open Or Short To Ground
P1826	4-Wheel Drive Electric Clutch Relay Short To Battery
P1828	Transfer Case HI To LO Shift Relay Coil Circuit Open Or Short To Ground
P1830	Transfer Case HI To LO Shift Relay Coil Circuit Short To Battery
P1832	Transfer Case 4-Wheel Drive Solenoid Circuit Open or Short To Ground
P1834	Transfer Case 4-Wheel Drive Solenoid Circuit Short To Battery
P1838	No Shift Motor Movement Detected
P1846	Transfer Case Contact Plate ‘A’ Circuit Open
P1850	Transfer Case Contact Plate ‘B’ Circuit Open
P1854	Transfer Case Contact Plate ‘C’ Circuit Open
P1858	Transfer Case Contact Plate ‘D’ Circuit Open
P1866	Transfer Case Cannot Be Shifted
P1867	Transfer Case Contact Plate General Circuit Failure
P1876	Transfer Case 2-Wheel Drive Solenoid Circuit Open Or Short To Ground
P1877	Transfer Case 2-Wheel Drive Solenoid Circuit Short To Battery
P1881	Engine Coolant Level Switch Circuit
P1882	Engine Coolant Level Switch Circuit Short To Ground

Code	Definition
P1883	Engine Coolant Level Switch Circuit
P1884	Engine Coolant Level Lamp Circuit Short To Ground
P1891	Transfer Case Contact Plate Ground Return Open Circuit
P1900	Output Shaft Speed Sensor Circuit Intermittent
P1901	Turbine Shaft Speed Sensor Circuit Intermittent

MANUFACTURER SPECIFIC CODES - GENERAL MOTORS

Code	Definition
P1031	H02 Sensor Heater Control Circuit Problem
P1106	MAP Sensor Circuit Intermittent High or Low Voltage
P1107	MAP Sensor Circuit Intermittent Voltage Low
P1108	BARO to MAP Signal Circuit Comparison Too High
P1111	IAT Sensor Circuit Intermittent Voltage High
P1112	IAT Sensor Circuit Intermittent Voltage Low (except Catera)
P1112	Intake Plenum Switchover Valve Control (Catera)
P1113	Intake Resonance Switchover Valve Control
P1114	ECT Sensor Circuit Intermittent Voltage Low
P1115	ECT Sensor Circuit Intermittent Voltage High
P1120	Throttle Positioning Sensor 1 Circuit
P1121	Throttle Positioning Sensor 1,2 Circuit Performance/ Fuel Injector Secondary System Circuit Low
P1122	TPS Circuit Intermittent Voltage Low
P1125	APP System
P1133	HO2S/O2S Insufficient Switching Sensor 1 Or Bank 1 Sensor 1
P1134	HO2S Transition Time Ratio Bank 1 Sensor 1
P1137	HO2 Sensor Low Voltage During Power Enrichment
P1138	HO2 Sensor High Voltage During Decel Fuel Cutoff
P1139	HO2S Insufficient Switching Bank 1 Sensor 2
P1140	HO2S Transition Time Ratio Bank 1 Sensor 2
P1141	HO2 Sensor Heater Control Circuit (Bank 1 Sensor 2)
P1153	HO2S Insufficient Switching Bank 2 Sensor 1
P1154	HO2S Transition Time Ratio Bank 2 Sensor 1
P1158	HO2 Sensor Shift Rich (Bank 2 Sensor 2)/ Engine Metal Over-Temperature Protection
P1161	HO2 Sensor Heater Control Circuit (Bank 2 Sensor 2)
P1171	Fuel System Lean During Acceleration
P1187	Engine Oil Temperature Sensor Circuit Voltage Low (except 1997 Corvette)
P1187	Engine Oil Pressure Sensor Circuit Voltage Low (1997 Corvette)
P1188	Engine Oil Temperature Sensor Circuit Voltage High (except 1997 Corvette)

Code	Definition
P1188	Engine Oil Pressure Sensor Circuit Voltage High (1997 Corvette)
P1189	Engine Oil Pressure Switch Circuit
P1200	Injector Control Circuit
P1214	Injection Pump Timing Offset
P1215	Generator Driver Circuit
P1216	Fuel Solenoid Response Time Too Short
P1217	Fuel Solenoid Response Time Too Long
P1218	Injection Pump Calibration Circuit
P1220	Throttle Position (TP) Sensor 2 Circuit Fault
P1221	TP Sensor 1, 2 Performance
P1222	Injector Control Circuit Intermittent
P1250	Early Fuel Evaporative (EFE) Heater Circuit
P1257	Boost Control Condition/Supercharge System Overboost
P1260	Fuel Pump Speed Relay Control Circuit
P1271	Accelerator Pedal Position Sensor 1-2 Correlation
P1272	Accelerator Pedal Position Sensor 2-3 Correlation
P1273	Accelerator Pedal Position Sensor 1-3 Correlation
P1275	Boost Control Condition (except 1997-98 Corvette)
P1275	Accelerator Pedal Positioning (APP) Sensor 1 Circuit (1997-98 Corvette)
P1276	Accelerator Pedal Positioning (APP) Sensor 1 Circuit Performance
P1280	Accelerator Pedal Positioning (APP) Sensor 2 Circuit
P1281	Accelerator Pedal Positioning (APP) Sensor 2 Circuit Performance
P1285	Accelerator Pedal Positioning (APP) Sensor 2 Circuit
P1286	Accelerator Pedal Positioning (APP) Sensor 2 Circuit Performance
P1300	Ignition Coil 1 Primary Feedback Circuit
P1305	Ignition Coil 2 Primary Feedback Circuit
P1310	Ignition Coil 3 Primary Feedback Circuit
P1315	Ignition Coil 4 Primary Feedback Circuit
P1320	ICM 4X Reference Circuit Too Many Pulses (except 1996-98 4.0L)
P1320	ICM 4X Reference Circuit Intermittent No Pulses (1996-98 4.0L)

Code	Definition
P1323	ICM 24X Reference Circuit Low Frequency
P1335	Crankshaft Positioning Sensing Circuit
P1336	CKP System Variation Not Learned
P1345	Camshaft To Crankshaft Position Correlation Fault
P1346	CKP Sensor System Variation Not Learned/ Intake Camshaft Position Performance
P1349	Intake Camshaft Position System
P1350	Ignition Control System
P1351	Ignition Control Circuit Voltage High (except 1998 3.1L)
P1351	Ignition Control Circuit Open (1998 3.1L)
P1352	Bypass Circuit Open Or Voltage High
P1359	Ignition Coil Group 1 Control Circuit
P1360	Ignition Coil group 2 Control Circuit
P1361	IC Circuit Not Toggling
P1361	Ignition Control Circuit Voltage Low (Distributor Ignition)
P1362	Bypass Circuit Shorted Or Voltage Low
P1370	ICM 4X Reference Too Many Pulses
P1371	ICM 4X Reference Too Few Pulses (except Caprice, Fleetwood, Impala SS & Roadmaster)
P1371	Distributor Ignition Low Resolution Circuit (Caprice, Fleetwood, Impala SS & Roadmaster)
P1372	CKP Sensor A-B Correlation
P1374	3X Reference Circuit
P1375	ICM 24X Reference Voltage Too High
P1376	Ignition Ground Circuit
P1377	ICM Cam Pulse To 4X Reference Pulse Comparison
P1380	ABS/EBCM/EB(T)CM DTC Detected/Rough Road Data Unusable
P1381	Misfire Detected No EBCM/EB(T)CM/PCM Serial Data
P1401	Exhaust Gas Recirculation (EGR) flow test fault
P1403	EGR Error
P1404	EGR Valve Closed Pintle Position
P1404	EGR Valve Stuck Open Or Circuit Performance
P1405	EGR Error
P1406	EGR Valve Pintle Position Circuit

Code	Definition
P1408	MAP Sensor Circuit
P1410	Fuel Tank Pressure System
P1415	AIR System Bank 1
P1416	AIR System Bank 2
P1431	Fuel Level Sensor 2 Circuit Performance
P1432	Fuel Level Sensor 2 Circuit Voltage Low
P1433	Fuel Level Sensor 2 Circuit Voltage High
P1441	EVAP System Flow During Non-Purge
P1442	EVAP Vacuum Switch Circuit
P1450	BARO Sensor Circuit
P1451	BARO Sensor Circuit
P1460	Cooling Fan Circuit (except Catera)
P1460	Misfire Detected With Low Fuel (Catera)
P1483	Engine Cooling System Performance
P1500	Starter Signal Circuit
P1501	Theft Deterrent System
P1502	Theft Deterrent System No Password Received
P1503	Theft Deterrent System Password Improper
P1508	Idle Air Control (IAC) System Low RPM
P1509	IAC System High RPM
P1510	Back-Up Power Supply
P1511	Throttle Control System- Backup System Performance
P1514	TAC System MAF Performance
P1515	Command vs Actual Throttle Position Performance (PCM)
P1516	Command vs Actual Throttle Position Performance (TAC Module)
P1517	TAC Module Processor
P1518	PCM To TAC Module Serial Data Circuit
P1519	Throttle Actuator Control Module
P1520	Park/Neutral Position Switch Circuit, Gear Indicator System
P1523	Throttle Closed Position Performance
P1524	TPS Learned Closed Throttle Angle Degrees Out Of Range
P1526	TPS Learn Not Completed
P1527	Trans Range/Pressure Switch Comparison

Code	Definition
P1530	Ignition Timing Adjustment Switch Circuit
P1530	A/C Refrigerant Pressure Sensor Error
P1531	Low Air Conditioning Refrigerant Charge
P1532	A/C Evaporator Temperature Circuit Voltage Low
P1533	A/C Low Side Temperature Sensor Circuit
P1535	A/C/ High Side Temperature Sensor Circuit
P1536	A/C System ECT Overtemperature
P1537	A/C Request Circuit Voltage Low
P1538	A/C Request Circuit Voltage High
P1539	A/C High Pressure Switch Circuit Voltage High
P1540	A/C System High Pressure
P1542	A/C System High Pressure/High Temperature
P1543	A/C System Performance
P1545	A/C Clutch Relay Control Circuit
P1546	A/C Clutch Relay Control Circuit Voltage Low (except 1996-98 Camaro/Firebird & 1997-98 Corvette)
P1546	A/C Clutch Status Circuit Voltage Low (1996-98 Camaro/ Firebird & 1997-98 Corvette)
P1550	Stepper Motor Speed Control
P1554	Speed Control Status Circuit
P1555	Electronic Variable Orifice Fault (Saturn)
P1558	Speed Control (SPS Low)
P1560	Speed Control System/Transaxle Not In Drive
P1561	Speed Control Vent Solenoid
P1562	Speed Control Vacuum Solenoid
P1564	Speed Control System/Vehicle Acceleration Too High (except Catera)
P1564	ECM Battery Voltage Loss (Catera)
P1565	Speed Control Servo Position Sensor
P1566	Speed Control System/Engine RPM Too High
P1567	Speed Control Switches/ABCS Active
P1568	Speed Control (SPS High)
P1570	Speed Control System/Traction Control Active
P1571	TCS Desired Torque Circuit (except 4.0L, 4.6L & 1997-98 5.7L Corvette)

Code	Definition
P1571	Traction Control System PWM Circuit No Frequency (4.0L & 4.6L)
P1571	ASR Desired Torque (1997-98 5.7L Corvette)
P1572	Traction Control System Active Circuit Voltage Low Too Long
P1573	PCM/EBTCM Serial Data Circuit
P1573	Engine Hot Lamp Control Circuit
P1574	EBTCM System/Stop Lamp Circuit Voltage High (except 1997-98 Corvette)
P1574	Stop Lamp Control Circuit (1997-98 Corvette)
P1575	Extended Travel Brake Switch Circuit Voltage High
P1576	Brake Booster Vacuum Sensor Circuit Voltage High
P1577	Brake Booster Vacuum Sensor Circuit Voltage Low
P1578	Brake Booster Vacuum Sensor Circuit Low Vacuum
P1579	Park/Neutral To Drive/Reverse At High Throttle Angle
P1580	Cruise Control Module Move Circuit, Low Voltage
P1581	Cruise Control Module Move Circuit, High Voltage
P1582	Cruise Control Module Direction Circuit, Low Voltage
P1583	Cruise Control Module Direction Circuit, High Voltage
P1584	Cruise Control Disabled
P1585	Cruise Control Inhibit Output Circuit
P1586	Cruise Control Brake Switch 2 Circuit
P1599	Engine Stall Or Near Stall Detected
P1600	PCM Battery
P1600	Serial Communication Between PCM & TCM
P1601	Loss of Serial Communication (Except Catera)
P1601	ECM Overtemperature
P1602	Loss Of EBC/EBTCM Serial Data (Except Catera)
P1602	KS Module Circuit (Catera)
P1603	Loss Of SDM Serial Data
P1604	Loss of IPC Serial Data
P1605	Loss of HVAC Serial Data
P1607	Engine Oil Level Switch Circuit
P1610	Loss Of PZM Serial Data (1996-97 Except 1997 Cutlass & Malibu)
P1610	Failure With Body Function Controller (1997 Cutlass & Malibu)

Code	Definition
P1610	Standard Body Module Series Data CKT (1998)
P1611	Loss Of CVRTD Serial Data
P1617	Engine Oil Level Switch Circuit
P1619	Engine Oil Lite Monitor Reset Circuit
P1620	Low Engine Coolant Level (Saturn)
P1621	PCM Memory Performance (Except 1998 5.7L)
P1621	VCM EEPROM Performance (1998 5.7L)
P1623	PCM Prom Error/ Transaxle Temperature Pull-Up Resistor Fault (Saturn Z body)
P1624	Customer Snapshot Data Available (Saturn)
P1625	TCM Flash Checksum Fault (Saturn)
P1626	Theft Deterrent System Fuel Enable Circuit
P1627	A/D Performance
P1628	PCM Engine Control Temp Pull-Up Resistor
P1629	Theft Deterrent System Fuel Enable Circuit Improper Signal Detected During Engine Cranking (Except 1997-98 2.2L, 2.4L, 3.1L & 3.8L)
P1629	Theft Deterrent Crank Signal Malfunction (1997-98 2.2L, 2.4L, 3.1L & 3.8L)
P1630	Theft Deterrent System/PCM/VCM in Learn Mode
P1631	Theft Deterrent System Password Improper
P1632	Theft Deterrent System Fuel Disabled
P1633	Ignition Supplemental Power Circuit Voltage Low
P1634	Ignition 1 Power Circuit Voltage Low
P1635	5 Volt Reference (A Or 1) Circuit
P1637	Alternator L Terminal Circuit
P1638	Alternator F Terminal Circuit
P1639	5 Volt Reference (B Or 2) Circuit
P1640	Driver 1 Input Voltage High
P1641	MIL Control Circuit (Except 5.7L VINs P & 5 & 1998 3.1L & 3.8L)
P1641	Fan Control Relay 1 Control Circuit (5.7L VINs P & 5)
P1641	A/C Relay Control Circuit (1998 3.1L & 3.8L)
P1642	Vehicle Speed Output Circuit (Except 3.4L, 5.7L VINs P & 5 & 1998 3.8L)
P1642	Fan Control Relay 2 & 3 Control Circuit (5.7L VINs P & 5)

Code	Definition
P1642	AIR Control Circuit (3.4L)
P1642	Change Oil Lamp Control Circuit (1998 3.1L Lumina & Monte Carlo)
P1643	Fuel Pump PWM Control Circuit (Except 5.7L VINs P & 5)
P1643	Engine RPM Output Circuit (5.7L VINs P & 5)
P1644	Delivered Torque Output Circuit
P1645	Boost Control Solenoid Circuit (Except 4.0L & 4.6L)
P1645	EVAP Solenoid Output Circuit (4.0L & 4.6L)
P1646	Boost Control Solenoid Control Circuit (Except 4.0L & 4.6L)
P1646	EVAP Vent Valve Output Circuit (4.0L & 4.6L)
P1650	Driver 2 Input Voltage High
P1651	Fan On Relay Control Circuit/Output Driver Module (Quad Driver) 'B' Quickset Fault (Saturn)
P1651	Fan 1 Relay Control Circuit
P1652	Fan 2 Relay Control Circuit (Except Cadillac & Corvette)
P1652	VSS Output Circuit (1996 Corvette)
P1652	Powertrain Induced Chassis Pitch Output Circuit (1997- 98 Corvette)
P1652	Lift/Drive Output Circuit (Cadillac)
P1653	TCS Delivered Torque Control Circuit (Except Caprice, Roadmaster & 1998 3.8L)
P1653	Oil Level Lamp Control Circuit (Caprice, Fleetwood & Roadmaster)
P1653	Fuel Level Output Control Circuit (1998 3.8L)
P1654	A/C Relay Control Circuit (Except 4.0L & 4.6L)
P1654	Cruise Disable Output Circuit (4.0L & 4.6L)
P1655	EVAP Purge Solenoid Control Circuit
P1656	Wastegate Solenoid Control Circuit
P1657	Skip Shift 1-4 Upshift
P1660	Cooling Fan Control Circuits
P1661	MIL Control Circuit
P1662	Speed Control Inhibit Control Circuit
P1663	Alternator Lamp Control Circuit (Except Caprice, Fleetwood & Roadmaster)
P1663	Change Oil Lamp Control Circuit (Caprice, Fleetwood & Roadmaster)

Code	Definition
P1664	Skip Shift 1-4 Upshift Lamp Control Circuit
P1665	DBCM/DBTCM Serial Data Circuit (1996-97)
P1665	EVAP Vent Valve Solenoid Control Circuit (1998)
P1667	Reverse Inhibitor Solenoid Control Circuit (1996-97)
P1667	Fuel Pump Speed Control Circuit (1998)
P1670	QDM 4 Circuit
P1671	MIL Control Circuit
P1671	Oil Change Lamp Control Circuit
P1672	Low Engine Oil Level Lamp Circuit
P1673	Engine Hot Lamp Control Circuit
P1674	Tachometer Control Circuit
P1675	EVAP Vent Solenoid Control Circuit
P1676	EVAP Canister Purge Solenoid Control CKT
P1689	TCS Delivered Torque Control Circuit
P1700	MIL Requested By TCM
P1701	MIL Request Circuit
P1740	Torque Management Request Circuits, Transmission & Traction Control (Except Catera)
P1740	Torque Control/Management Request Circuits (Catera)
P1760	Transmission Control Module Supply Voltage Interrupted
P1780	Park Neutral Position Switch Circuit
P1781	Engine Torque Signal Circuit
P1792	ECM To Transmission Control Module Engine Coolant Signal
P1800	ECM To Transmission Control Module Engine Coolant Signal
P1810	ATF Pressure Manual Valve Position Switch Malfunction
P1811	Long Shift & Max Adapt
P1812	TOT Condition
P1814	Torque Converter Overstress
P1819	Internal Mode Switch - No Start
P1820	Internal Mode Switch Circuit 'A' Low
P1822	Internal Mode Switch Circuit 'B' Low
P1823	Internal Mode Switch Circuit 'P' Low
P1825	Internal Mode Switch - Invalid Range

Code	Definition
P1826	Internal Mode Switch - Invalid Range
P1835	Kickdown Switch Circuit
P1842	1-2 Shift Solenoid Circuit Low Input
P1843	1-2 Shift Solenoid Circuit High Input
P1845	2-3 Shift Solenoid Circuit Low Input
P1847	2-3 Shift Solenoid Circuit High Input
P1850	Brake Band Apply Solenoid
P1860	TCC PWM Solenoid Circuit
P1864	TCC Enable Solenoid Circuit
P1868	Transmission Fluid Life
P1870	Trans Component Slipping
P1875	4WD Low Switch Circuit Electrical
P1886	Transaxle Shift, Timing Solenoid Performance
P1887	TCC Release Switch Malfunction
P1890	Throttle Position Signal Input
P1895	Engine Torque Delivered Circuit

MANUFACTURER SPECIFIC CODES - HONDA

Code	Definition
P1106	BARO Circuit Range/Performance
P1107	BARO Circuit Low Input
P1108	BARO Circuit High Input
P1121	Throttle Position Lower Than Expected
P1122	Throttle Position Higher Than Expected
P1128	MAP Lower Than Expected
P1129	MAP Higher Than Expected
P1149	Primary HO2S (Sensor 1) Circuit Range/Performance Problem
P1162	Primary HO2S (No. 1) Circuit Malfunction
P1163	Primary HO2S (No. 1) Circuit Slow Response
P1164	Primary HO2S (No. 1) Circuit Range/Performance
P1165	Primary HO2S (No. 1) Circuit Range/Performance
P1166	Primary HO2S (No. 1) Heater System Electrical
P1167	Primary HO2S (No. 1) Heater System
P1168	Primary HO2S (No. 1) LABEL Low Input
P1169	Primary HO2S (No. 1) LABEL High Input
P1253	VTEC System Malfunction
P1257	VTEC System Malfunction
P1258	VTEC System Malfunction
P1259	VTEC System Malfunction
P1297	Electrical Load Detector Circuit Low Input
P1298	Electrical Load Detector Circuit High Input
P1300	Multiple Cylinder Misfire Detected
P1336	CSF Sensor Intermittent Interruption
P1337	CSF Sensor No Signal
P1359	CKP/TDC Sensor Connector Disconnection
P1361	TDC Sensor Intermittent Interruption
P1362	TDC Sensor No Signal
P1366	TDC Sensor No. 2 Intermittent Interruption
P1367	TDC Sensor No. 2 Signal
P1381	Cylinder Position Sensor Intermittent Interruption
P1382	Cylinder Position Sensor No Signal

Code	Definition
P1456	EVAP Emission Control System Leak Detected (Fuel Tank System)
P1457	EVAP Emission Control System Leak Detected (Control Canister System)
P1459	EVAP Emission Purge Flow Switch Malfunction
P1491	EGR valve Lift Insufficient Detected
P1498	EGR Valve Lift Sensor High Voltage
P1508	IAC Valve Circuit Failure
P1509	IAC Valve Circuit Failure
P1519	Idle Air Control Valve Circuit Failure
P1607	EGM/PGM Internal Circuit Failure A
P1655	SEA/SEFA/TMA/TMB Signal Line Failure
P1660	A/T FI Signal A Circuit Failure
P1681	A/T FI Signal A Low Input
P1682	A/T FI Signal A High Input
P1686	A/T FI Signal B Low Input
P1687	A/T FI Signal B Low Input

MANUFACTURER SPECIFIC CODES - TOYOTA

Code	Definition
P1100	BARO Sensor Circuit malfunction
P1120	Accelerator Pedal Position Sensor Circuit Malfunction
P1121	Accelerator Pedal Position Sensor Range/Performance Problem
P1125	Throttle Control Motor Circuit Malfunction
P1126	Magnetic Clutch Circuit Malfunction
P1127	ETCS Actuator Power Source Circuit Malfunction
P1128	Throttle Control Motor Lock Malfunction
P1129	Electric Throttle Control System Malfunction
P1130	Air-Fuel Sensor Circuit Range/Performance
P1133	Air-Fuel Sensor Circuit Response Malfunction
P1135	Air-Fuel Sensor Heater Circuit Response Malfunction
P1150	A/F Sensor Circuit Range/Performance Malfunction
P1153	A./F Sensor Circuit Response Malfunction
P1155	A/F Sensor Heater Circuit Malfunction
P1200	Fuel Pump Relay Circuit Malfunction
P1300	Igniter Circuit Malfunction No. 1
P1305	Igniter Circuit Malfunction No. 2 (1998-2000 Land Cruiser, 2000 Celica & Tundra)
P1310	Igniter Circuit Malfunction No. 2 (Except 1998-2000 Land Cruiser, 2000 Celica & Tundra)
P1310	Igniter Circuit Malfunction No. 3 (1998-2000 Land Cruiser, 2000 Celica & Tundra)
P1315	Igniter Circuit Malfunction No. 4 (1998-2000 Land Cruiser, 2000 Celica & Tundra)
P1320	Igniter Circuit Malfunction No. 5 (1998-2000 Land Cruiser & 2000 Tundra)
P1325	Igniter Circuit Malfunction No. 6 (1998-2000 Land Cruiser & 2000 Tundra)
P1330	Igniter Circuit Malfunction No. 7 (1998-2000 Land Cruiser & 2000 Tundra)
P1335	No CKP Sensor Signal Engine Running
P1340	Igniter Circuit Malfunction No. 8 (1998-2000 Land Cruiser & 2000 Tundra)
P1346	VVT Sensor /Camshaft Position Sensor Circuit Range/ Performance Problem (Bank 1)

Code	Definition
P1349	VVT System Malfunction
P1400	Sub-Throttle Position Sensor Malfunction
P1401	Sub-Throttle Position Sensor Range/Performance Problem
P1405	Turbo Pressure Sensor Circuit Malfunction
P1406	Turbo Pressure Sensor Range/Performance Problem
P1410	EGR Valve Position Sensor Circuit Malfunction
P1411	EGR Valve Position Sensor Circuit Ranger/Performance
P1500	Starter Signal Circuit Malfunction
P1510	Boost Pressure Control Circuit Malfunction
P1511	Boost Pressure Low Malfunction
P1512	Boost Pressure High Malfunction
P1520	Stop Lamp Switch Signal Malfunction
P1565	Cruise Control Main Switch Circuit Malfunction
P1600	ECM BATT Malfunction
P1605	Knock Control CPU Malfunction
P1630	Traction Control System Malfunction
P1633	ECM Malfunction ECTS Circuit
P1645	Body ECU Malfunction
P1652	IACV Control Circuit Malfunction
P1656	OCV Circuit Malfunction
P1658	Waste Gate Valve Control Circuit Malfunction
P1661	EGR Circuit Malfunction
P1662	EGR By-Pass Valve Control Circuit Malfunction
P1690	OCV Circuit Malfunction
P1692	OCV Open Malfunction
P1693	OCV Closed Malfunction
P1780	PNP Switch Malfunction

INTRODUCTION

This Glossary contains definitions for abbreviations and terms you may find in this manual or in your vehicle service manual.

GLOSSARY OF TERMS AND ABBREVIATIONS

CARB – California Air Resources Board

CCM – Central Control Module

Computer Control System – An electronic control system, consisting of an on-board computer and related sensors, switches and actuators, used to ensure peak performance and fuel efficiency while reducing pollutants in the vehicle's emissions.

DIY – Do-It-Yourself

DLC – Data Link Connector

Drive Cycle – An extended set of driving procedures that takes into consideration the various types of driving conditions encountered in real life.

Driving Condition – A specific environmental or operation condition under which a vehicle is operated; such as starting the vehicle when cold, driving at steady speed (cruising), accelerating, etc.

DTC(s) – Diagnostic Trouble Code(s)

EGR – Exhaust Gas Recirculation

EPA – Environmental Protection Agency

EVAP – Evaporative Emissions System

Fault Code – See DTCs

Freeze Frame – A digital representation of engine and/or emissions system conditions present when a fault code was recorded.

FTP – Fuel Tank Pressure

Generic Code – A DTC that applies to all OBD 2 compliant vehicles.

I/M Readiness – An indication of whether or not a vehicle's emissions-related system are operating properly and are ready for Inspection and Maintenance testing.

I/M Test / Emissions Test / Smog Check – A functional test of a vehicle to determine if tailpipe emissions are within Federal/State/Local requirements.

LCD – Liquid Crystal Display

LED – Light Emitting Diode

Manufacturer Specific Code – A DTC that applies only to OBD 2 compliant vehicles made by a specific manufacturer.

MIL – Malfunction Indicator Lamp (also referred to as "Check Engine" light

OBD 1 – On-Board Diagnostics Version 1 (also referred to as "OBD I")

OBD 2 – On-Board Diagnostics Version 2 (also referred to as "OBD II")

On-Board Computer – The central processing unit in the vehicle's computer control system.

PCM – Powertrain Control Module

Pending Code – A code recorded on the "first trip" for a "two-trip" code. If the fault that caused the code to be set is not detected on the second trip, the code is automatically erased.

Trip Drive Cycle – Vehicle operation that provides the necessary driving condition to enable a vehicle Monitor to run and complete its diagnostic testing.

VECI – Vehicle Emission Control Information Decal

LIMITED ONE YEAR WARRANTY

The Manufacturer warrants to the original purchaser that this unit is free of defects in materials and workmanship under normal use and maintenance for a period of one (1) year from the date of original purchase.

If the unit fails within the one (1) year period, it will be repaired or replaced, at the Manufacturer's option, at no charge, when returned prepaid to the Service Center with Proof of Purchase. The sales receipt may be used for this purpose. Installation labor is not covered under this warranty. All replacement parts, whether new or remanufactured, assume as their warranty period only the remaining time of this warranty.

This warranty does not apply to damage caused by improper use, accident, abuse, improper voltage, service, fire, flood, lightning, or other acts of God, or if the product was altered or repaired by anyone other than the Manufacturer's Service Center.

The Manufacturer, under no circumstances shall be liable for any consequential damages for breach of any written warranty of this unit. This warranty gives you specific legal rights, and you may also have rights, which vary from state to state. This manual is copyrighted with all rights reserved. No portion of this document may be copied or reproduced by any means without the express written permission of the Manufacturer. THIS WARRANTY IS NOT TRANSFERABLE. For service, send via U.P.S. (if possible) prepaid to Manufacturer. Allow 3-4 weeks for service/repair.

SERVICE PROCEDURES

If you have any questions, require technical support or information on UPDATES and OPTIONAL ACCESSORIES, please contact your local store, distributor or the Service Center.

USA & Canada:

(800) 544-4124 (6:00 AM-6:00 PM, 7 days a week PST)

All others: (714) 241-6802 (6:00 AM-6:00 PM, 7 days a week PST)

FAX: (714) 432-3979 (24 hr.)

Web: www.innova.com

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Instruction MRP #93-0068 Rev. B