

OBDScan Manual Version 2.00 03-2008

Congratulations for choosing the Harrison R&D OBDScan. We have made every attempt to insure your success with this product. Please take time to read through these operating instructions and become familiar with the operating procedure.

The OBDScan Tool, enables access to your vehicle's diagnostic information. Read and clear Diagnostic Trouble Codes from the vehicle's memory, turn off the "Check Engine" light, and read real-time sensor measurements are just some of the features offered by the OBDScan Tool.

What is a Scan Tool?

In today's cars the microcomputer is used extensively for engine control, antilock brakes, air bag control, active suspension and many other applications.

Microcomputers communicate with the outside world through a 'user interface', which could be a keyboard, mouse and CRT as on your home computer or a Scan Tool in the case of the OBD-II computer. Imagine trying to communicate with your home computer without a keyboard and CRT. Humans cannot communicate directly with a computer so a 'user interface' is required. The Scan Tool is the keyboard-CRT equivalent for your vehicle computer.

As mandated by U.S. law, the OBD-II Scan Tool has a single, standard interface connector used to mate with the vehicle. This connector has been defined by the standard SAE-J1962 and MUST be located within 1 meter of the steering wheel and must not require any tools to access.

Using the Scan Tool

The Scan Tool provides access to the vehicle sensor readings, emission system status and trouble codes. Many mechanics make use of a scan tool to assist in diagnosing and repairing problems. Repair shops charge \$80 or more to read the Diagnostic Trouble Code one time. Purchasing a OBDScan can pay for it's self in as little as two uses! Even if you don't do your own repair work, the knowledge you gain from reading the trouble codes yourself can keep the repair shop honest and demonstrate to the shop that they are not dealing with an uninformed customer.

The OBDScan can clear the trouble code and turn off the Check Engine light after the repair has been made.

Supported Vehicles:

The OBDScan will support all OBD-II compliant vehicles. This means all cars and light truck sold in North America beginning with the 1996 model year. There are a few known OBD-II problems on certain vehicles, the 2000 Nissan Maxima and Altima, some 2000 Suzuki's, 1996-1997 Hyundai and 1996-2000 Daewoo. We do support the 1996-1999 Ford F-250/350 Diesel engine vehicles at this time in a limited manner. We can read the trouble codes with our standard software, to get other sensor data the optional Ford PWM Enhanced software package is required.

OBDScan for Windows 2000 and XP Software

The OBDScan application is a fully Windows 2000 and XP compliant program, written in Microsoft Visual Basic.NET. As of this writing we have not tested the the software on Microsoft VISTA. To install OBDScan, follow directions on the CD or download from the web site at www.obdscan.net/software.htm. We recommend getting the latest software from our web site. The install program will install the executable file and all required DLL's. In some instances you may receive a warning message, if so it is usually safe to choose to ignore the warning.

Getting Started with OBDScan Version 6.00 software

Locate the OBD-II connector, it's required by U.S. law to be within 1 meter of the steering wheel. It's usually located under the dash, but if not there then check behind ashtrays and in any console compartments. Be sure your computer is within cable reach of the OBD-II connector, it's required by U.S. law to be within 1 meter of the steering wheel. It's usually located under the dash, but if not there then check behind ashtrays and in any console compartments. With the ignition off, plug in the OBD connector on the protocol converter to the mate in the vehicle.

Before connecting the protocol converter, launch OBDScan by either double clicking the icon or selecting it from the PROGRAMS menu. You should see the screen shown in Fig1.



Figure 1 OBDScan Display Screen

Select the USB option. Once you have clicked the START button, the software will attempt to communicate with the vehicle. This should not take more than 10 seconds if the OBD-II cable is connected and the Key is in the full ON position or the engine is running.

Once the scan tool is communicating with the vehicle you will get the display shown in figure 2. Once the ECU Status is green, click the "Scan Vehicle" button. You should get a display in the vehicle status window like figure 3. If your MIL light is ON and/or you have trouble codes set, then your display should indicate so. You can find the definitions for the SAE trouble codes on the Harrison R&D web site. As defined by SAE-2012, diagnostic trouble codes (DTC) consist of a three digit numeric code preceded by an alphanumeric designator. If the alphanumeric designator is 'P0' then the trouble code is SAE defined, however if the alphanumeric designator is 'P1' then the DTC is manufacturer defined and you will need a shop manual for the vehicle to decode the DTC. For example, if a trouble code of P0150 was displayed, then it is SAE controlled and would indicate a problem in the O2 sensor. If the DTC was P1298

then you would have to consult the shop manual for an explanation. To clear any trouble codes and turn off the MIL, select the function “Clear/Reset Diagnostic Trouble Codes”. This clears all trouble codes and turns off the MIL.

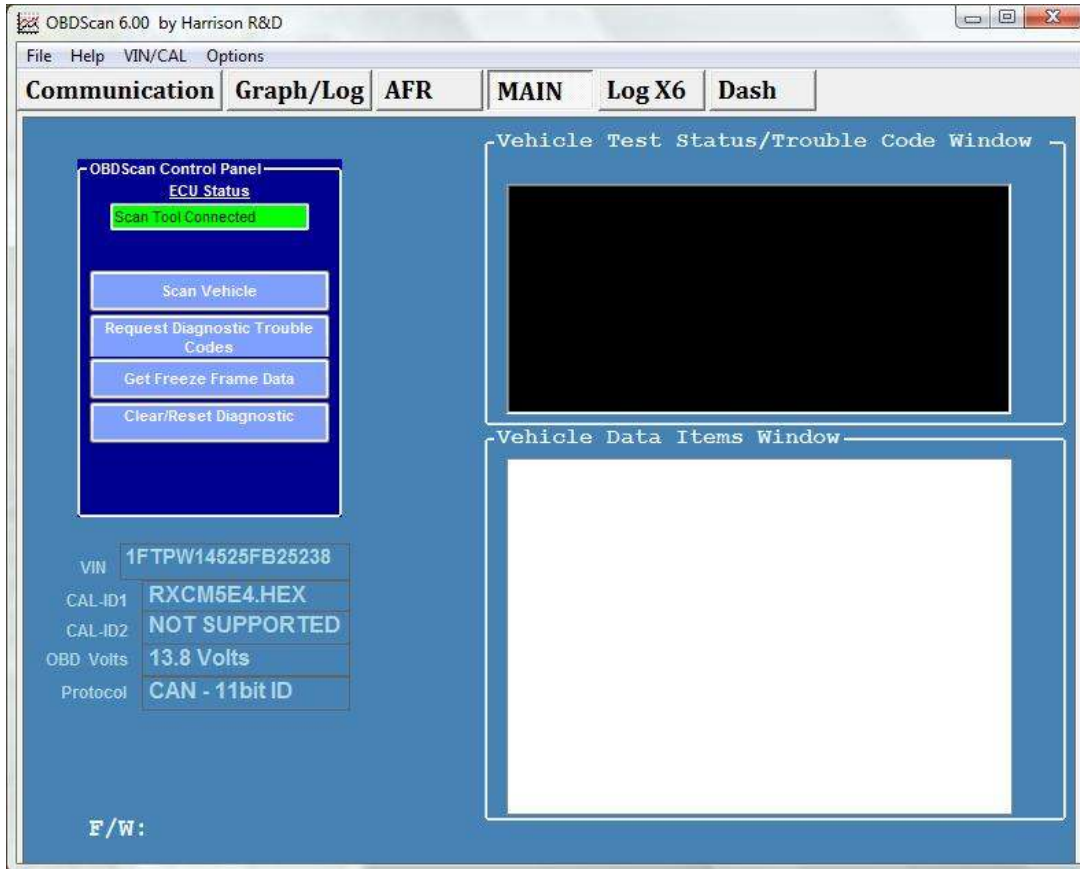


Figure 2

Figure 3 – Vehicle Scan

Now select the “Graph/Log” tab the Graphing Data Display will be shown as in figure 4. Any data appearing the Vehicle Data Window of figure 3 can be selected for real time display by clicking the item. A check will appear in the Check Box on the left of the data item. For example, to see Coolant Temp, click the Coolant Temp line in the box and the Check box will become checked. Any other data items you want to see can be checked also. Click the Start button and this window will continuously display the selected data until the Stop button is clicked, see figure 5.

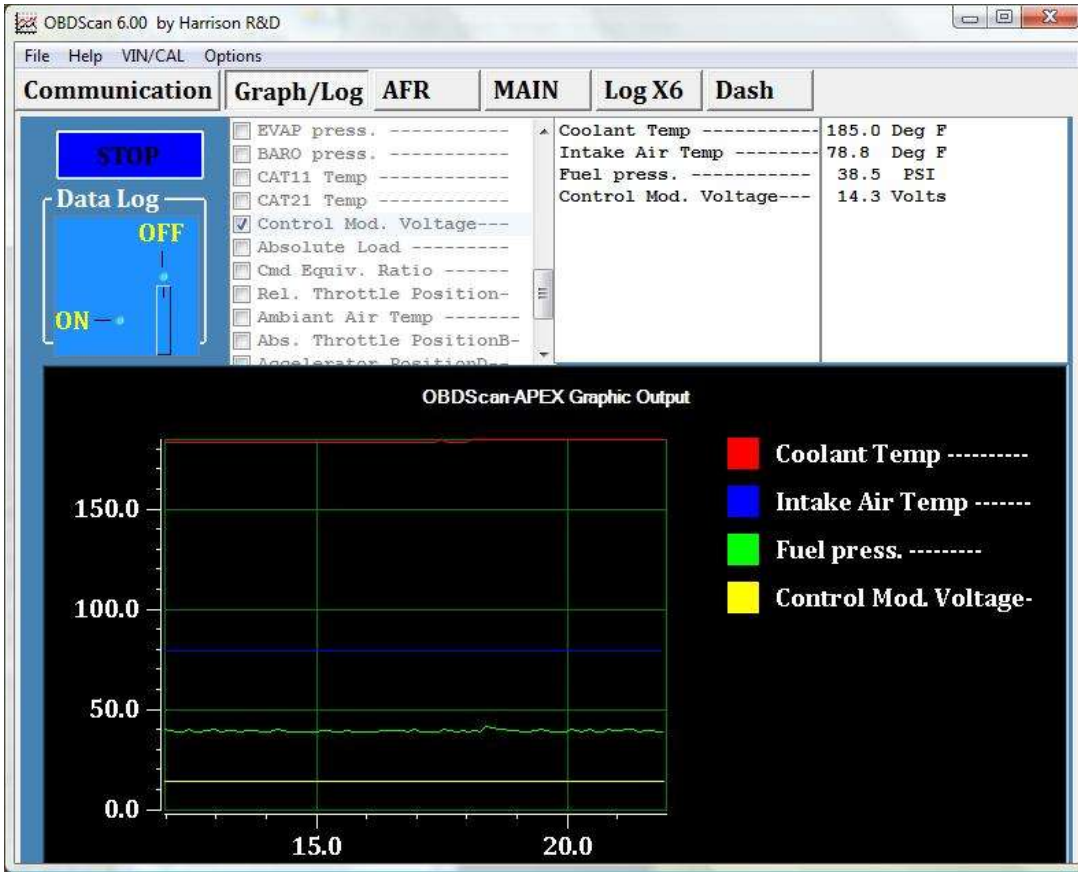


Figure 4. Graphing Data Display

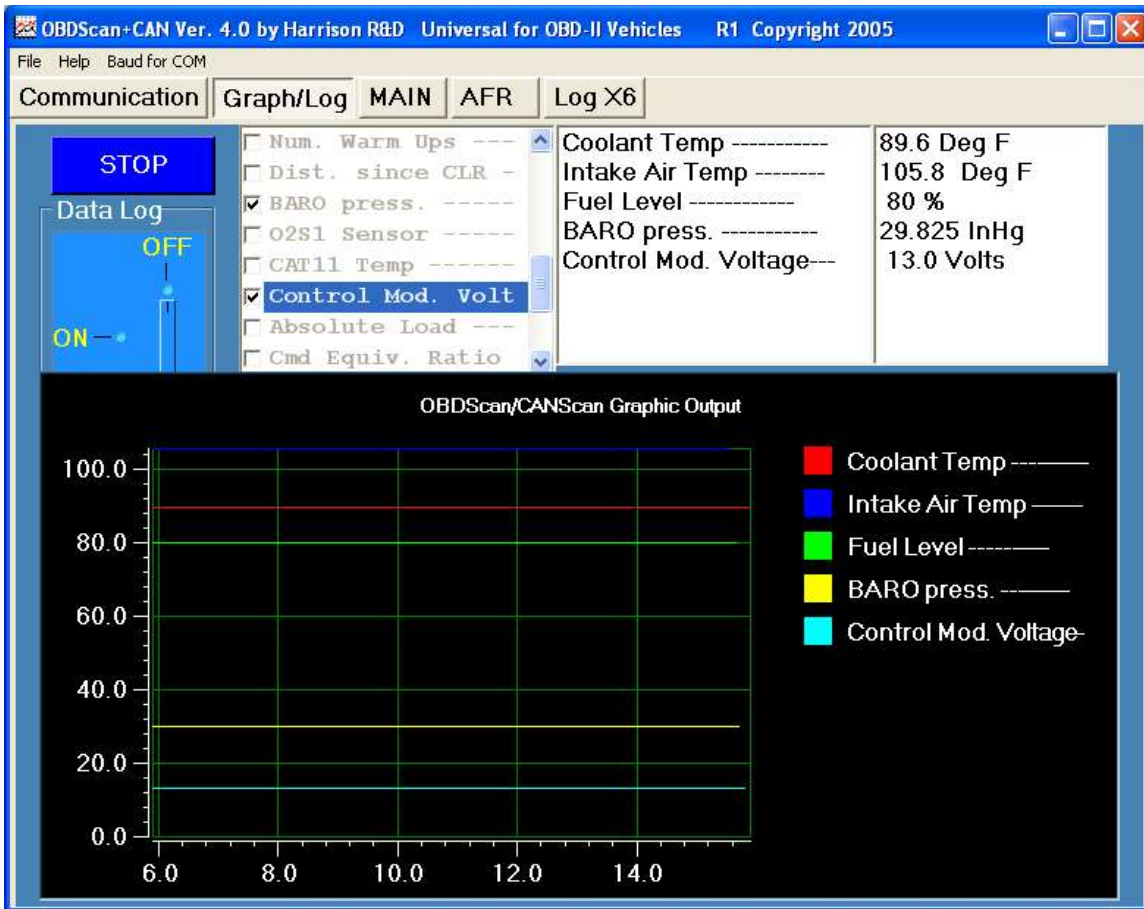


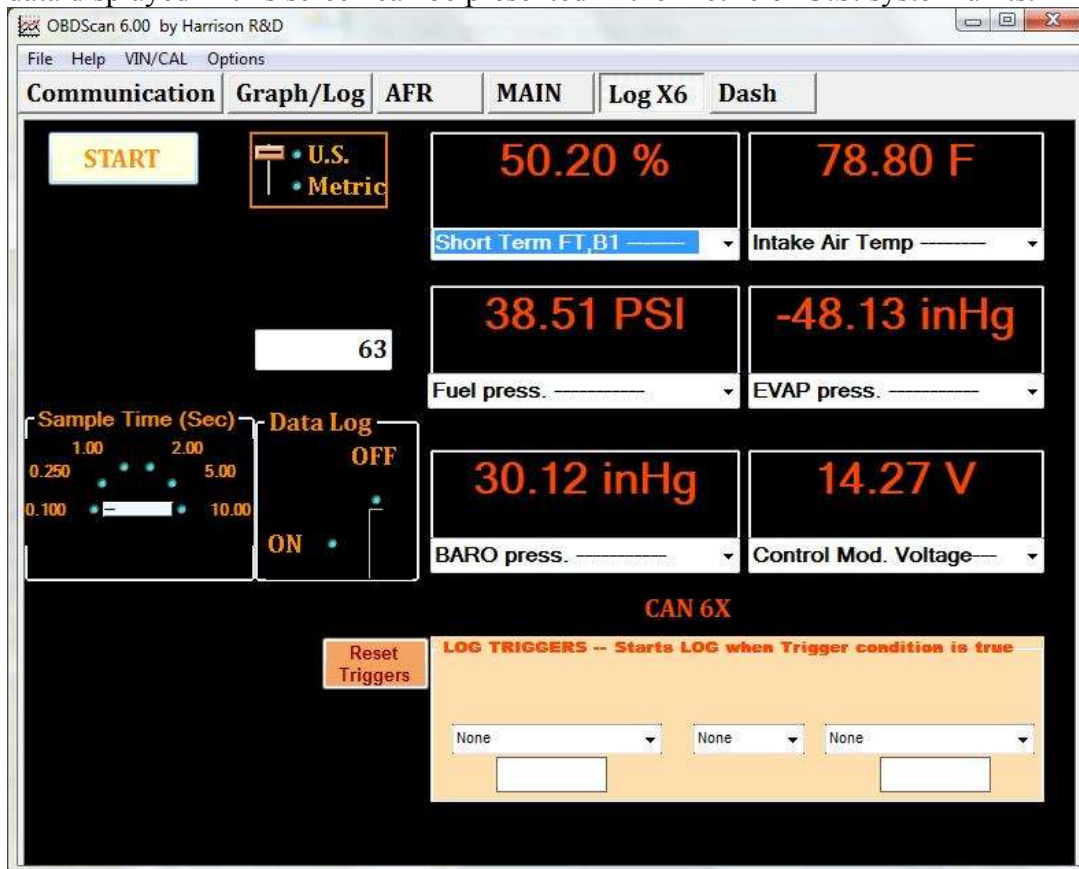
Figure 5. Graphing Data Display, running

Logging Data to Disk

This function allows the saving of selected data, up to 6 parameters, to disk using the data log control. Simply turn ON or OFF the data log before starting the graphing display. More information on data logging is found in the Log 6X function description.

Data Logger with Triggers and 6X CAN speed.

You get to this screen by clicking the “Log X6” tab. The Log X6 has two behaviors, one for vehicles equipped with CAN bus and the other for legacy OBD-II vehicles. All data displayed in this screen can be presented in the Metric or U.S. system units.



CAN Bus Vehicles - In the screen shot above, you notice the “CAN 6X Data” label. This indicates that the vehicle connected is equipped with CAN bus and the Log 6X data logger will use the new CAN bus only 6X sample mode. This lets the scan tool access 6 parameters at once, giving effective data rates of over 100 samples/sec. The CAN bus function always defaults to six data samples. Each sample can be selected from the data set supported by the vehicle by using the drop down box selection. Sample #1 is shown with the drop down activated.

Legacy OBD-II Vehicles – You will notice that a new control for selecting the number of samples is available in this screen. Since the legacy OBD-II is much slower than the CAN bus, you may not want all 6 samples selected, so this give you the choice of 2,3,4,5 or 6 samples.

All Vehicles – The sample time interval is selectable if maximum sample rate is not desired. Use the rotary switch to select the desired sample interval. For example, if 2.00 sec is selected, the data logger will sample the selected number of data items every 2 seconds.

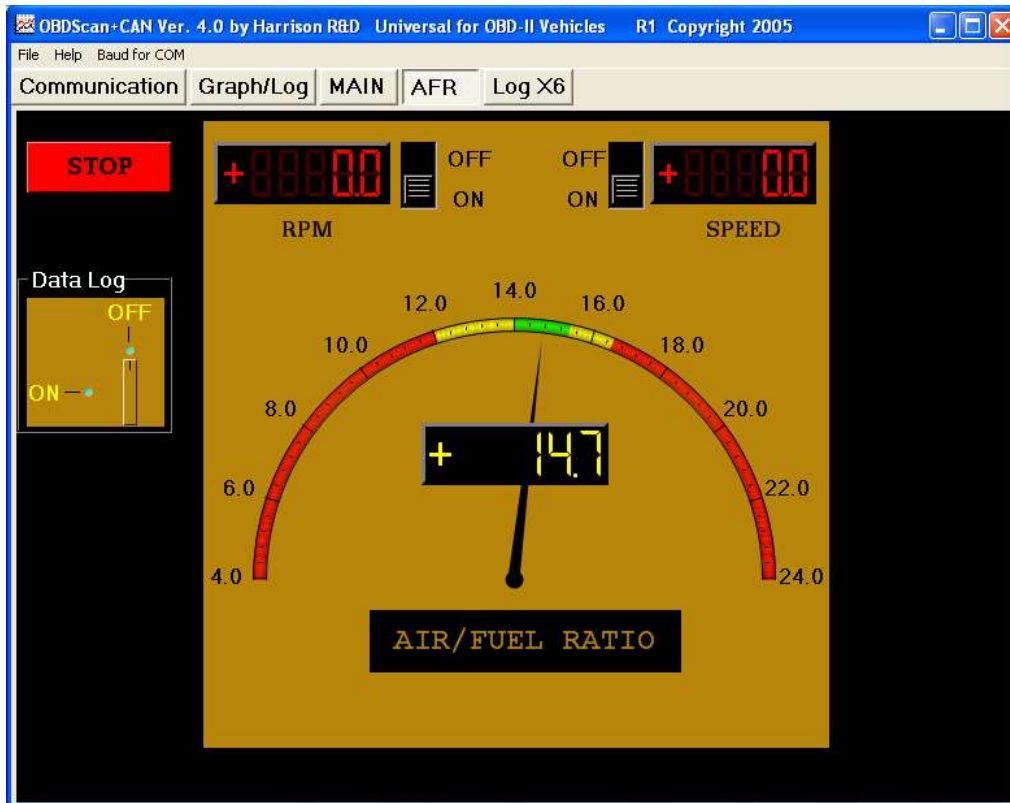
Data Log – The Data Log switch is used to turn ON or OFF the data log function. When the data log is ON, every data sample is stored in memory and when the log is stopped, you will be prompted for a file name for the data log. The default file type is .log. The data file format is shown below:

```
Coolant Temp ,Intake Air Temp, Fuel Level, Control Mod. Voltage ,Time
87.8 ,107.6 , 80 , 12.8 ,0.234
87.8 ,107.6 , 80 , 12.8 ,0.734
87.8 ,107.6 , 80 , 12.8 ,1
87.8 ,107.6 , 80 , 12.8 ,1.266
87.8 ,107.6 , 80 , 12.8 ,1.531
87.8 ,107.6 , 80 , 12.8 ,1.781
87.8 ,107.6 , 80 , 12.8 ,2.047
87.8 ,107.6 , 80 , 12.8 ,2.312
87.8 ,107.6 , 80 , 12.8 ,2.578
```

This format can be imported into Excel or Star Office and can then be analyzed or graphed.

Data Log Triggering – In some cases it's convenient to start the data log when a certain data value exceeds some level. For example, if you are trying to log a timed run of 50 to 100Kph (61MPH) then you want the data log to start when the speed reaches 50Kph. The data log gives you Speed, RPM and System Time as triggers. You can use any single item as a trigger or you can combine two triggers in an AND or OR fashion. Another example, you can start a data log if the speed is 25KPH OR the RPM is 2500RPM, which ever comes first. The AND function is similar but more restrictive. If you set the speed to 25mph AND the RPM to 2000, the data log will only start when both the speed=25 or greater and the RPM=2000 or greater.

Air/Fuel Ratio – Some cars are equipped with what's called Wide Band O2 sensors which can provide a signal which is proportional to the Air/Fuel ratio. For those cars we have an AFR screen as shown below:

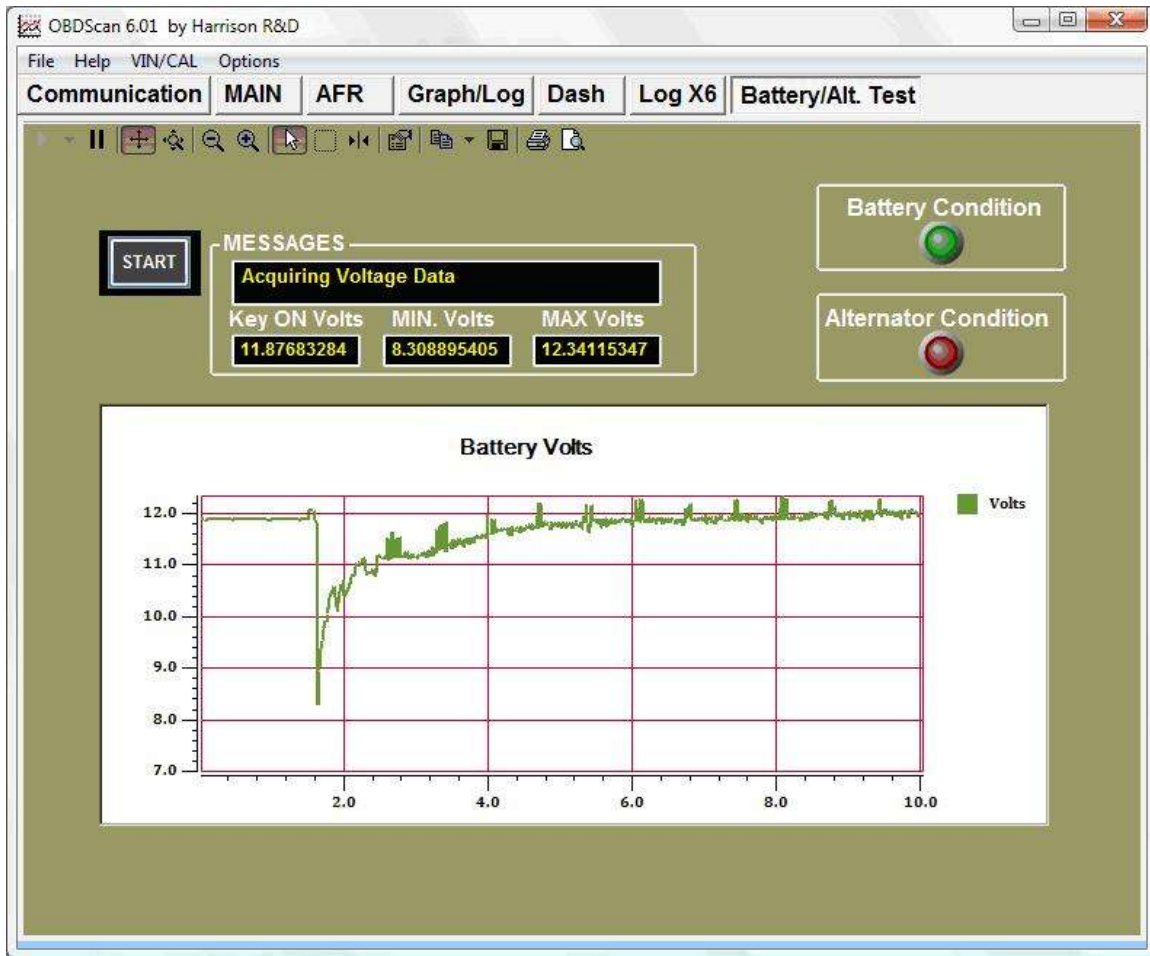


The AFR function is similar to the other OBDScan 4.0 functions. You can select the data log if desired and it's possible to select both RPM and Speed for display along with the AFR by using simple slide switches. Those persons tuning the vehicle with aftermarket equipment will find this function valuable.

Dashboard – New in version 6: the Dashboard. The Dashboard has 7 gauges, Speedometer, Tach, Air Flow or Manifold Pressure, Short Term Fuel Trim, Battery Volts, Intake Air Temp, and Coolant Temp.



Battery and Alternator Test – New in version 6: battery/Alternator test function. Now you can test the battery and alternator performance without opening the hood. Connect the scan tool, start the OBDScan 6.01 software and then select the Battery/Alt. Test tab. Click the start button to begin, you will be asked to shut off the engine if running and then turn key to ON position and start engine. The battery voltage is monitored during this time for average low voltage and charging system voltage once the engine is running. The Battery and Alternator condition is displayed on two color coded indicators.



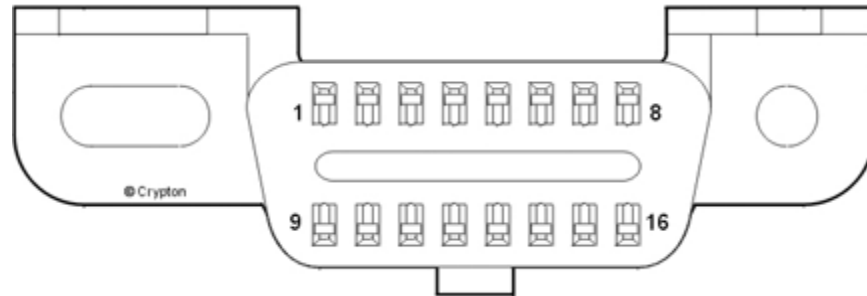
OBDScan Users Guide

Using OBDScan

A scan tool is one of the most important tools a mechanic can have today. With virtually all engine control under the guidance of a computer the need for visibility into the vehicle control system is absolute. OBDScan provides the data required to diagnose and repair engine problems quickly and efficiently.

1. Connecting OBDScan to a vehicle

Be sure that the OBDScan software was installed from the disks supplied per the instructions before proceeding. Locate the OBDII connector in the vehicle (The connector must be located within one meter of the steering wheel and must not require any tools to be revealed. Look under the dash and behind ashtrays) and connect the mating OBDScan connector to it. It will look like the figure below:



Helpful link for finding the

connector: <http://www.epa.gov/otaq/cert/dearmfr/vpcd9814.pdf>

Next connect the RS-232 cable with the DB9 connector to the serial port of either a laptop or desktop computer. You will need to know if the serial port you're using is COM1, 2 or 3. Consult your user manual for the computer to find out. If more cable length is needed you can use a standard RS-232 extension cable which has a 9 pin male on one end and a 9 pin female on the other, the extension cable can be up to 50 feet if needed.

2. What does the data mean?

The OBD II specification requires onboard diagnostic software that looks at system efficiency, and system failures. The ECU does this with very sophisticated software monitors, which are constantly evaluating the health of the vehicle emissions system. To the professional or shadetree mechanic, it's like having an expert mechanic living under the hood.

As you use the scan tool to read test status and diagnostic data, you may find some of the tests are complete and others not complete. A test which is not complete does not necessarily indicate a problem, the ECU may be evaluating an OBD trip or drive cycle. To complete an OBD trip the vehicle must reach at least 160 deg F., the conditions for the monitoring tests must be met, and the tests completed to a pass/fail point. Remember, not all OBD-II vehicles support all possible status and data items.

OBD Status Items:

A. Misfire Monitoring

The diagnostic monitor must determine if there is single or multiple cylinder misfires. This test measures flywheel acceleration after firing each spark plug to determine if there was a misfire or not. If misfires exceed 2% then an error condition exists

B. Number Of Oxygen Sensors

Number of O2 sensors on the vehicle. Since OBD-II mandates two O2 sensors

per catalytic converter, the number should always be even.

C. Component Monitoring

A comprehensive test of the emissions related sensors and effectors to validate their operation.

D. Catalytic Converter Monitor

A test to determine the efficiency of the catalytic converter. The OBD software compares the O2 sensors pre and post catalytic converter. The post converter sensor should show very little change in output voltage over time with respect to the pre converter O2 sensor.

E. Heated Catalytic Converter Monitor

Measure the length of time it takes for the catalyst to begin operation after a cold start. If the time exceed a manufacture set limit an error condition is set.

F. Evaporative System Monitor

Amount other things, will detect a missing or loose gas cap and leaks in the unpressurized fuel system

G. Secondary Air System Monitor

Monitors the performance of the secondary air system by evaluating the catalytic converter performance when the secondary air is engaged.

H. A/C Refrigerant Monitor

Monitors the pressure of the refrigerant

I. Oxygen Sensor Monitor

This test monitor the operation of the O2 sensor as the fuel/air mixture is adjusted between rich and lean. The time needed to make the transition from rich to lean cannot surpass 100ms on the pre-catalytic converter O2 sensor.

J. Oxygen Sensor Heater Monitor

This test monitors the length of time it takes for the O2 sensor to begin operation. The turn-on time varies with the vehicle and O2 sensor and is set by the manufacturer.

K. EGR Monitor

A change in MAP is used to determine the status of the EGR system. The EGR valve will be forced open during closed throttle deceleration and a change in MAP is used to determine proper operation.

L. Fuel Trim Monitor

Fuel trim monitoring looks at the average short- or long-term correction needed to bring the air/fuel ratio into line. If these fuel trim values reach and stay at their limits for a period of time, a malfunction is indicated.

M. Commanded Secondary Air Status

Indication of secondary air engaged or not.

Emissions Related Engine Data

The next set of data consists of mostly sensor data and two calculated values, Calculated load and Short and Long Term Fuel Trim. The calculated load is a relative number estimating engine load (torque) for the given RPM. The fuel trim numbers represent the average short- or long-term correction needed to bring the air/fuel ratio into stoichiometry. If these fuel trim values reach and stay at their limits for a period of time, a malfunction is indicated. The ignition timing is the value set by the ECU and does not include any mechanical advance, however most of today's engines are totally electronic and have no mechanical advance.

Table 1. Possible OBD Data Items

Air Flow Rate From MAF - This sensor provides a voltage which is representative of the airflow into the intake manifold. Most newer vehicles use a 'hot wire anemometer' type sensor for this measurement.

Absolute Throttle Position – This sensor generates a voltage proportional to instantaneous throttle position (0-100%).

Calculated Load Value – indicates a percentage of peak available torque. Reaches 100% at wide open throttle at any altitude or RPM for both naturally aspirated and boosted engines.

Engine Coolant Temp – Represents the temperature of the engines coolant. Normally about 185-195 Deg. F. on most cars.

Engine RPM – displays the current engine revolutions per minute value.

Fuel Rail Pressure (gauge) – Represents the regulated pressure on the fuel rail. This is a very important value; the fuel/air ratio is determined by length of time the fuel injector is pulsed on. If the fuel pressure is not constant, then the ECU cannot maintain the correct fuel/air ratio, causing emissions or performance problems.

Ignition Timing Advance – ignition timing advance for #1 cylinder (not including mechanical advance).

Intake Manifold Pressure - This sensor creates a signal that is proportional to the average pressure in the intake manifold. The pressure should be low and fairly

steady at idle and light loads and will go higher as the load increases, up to atmospheric pressure.

Long Term Fuel Trim– indicates the correction being used by the fuel control system in both open and closed loop modes of operation.

O2 Sensors– indicates the voltage for conventional 0 to 1V oxygen sensors. O2 sensors with a different full-scale voltage shall be normalized to this range or, if a wide range sensor, may use the wide range parameters instead.

Short Term Fuel Trim – indicates the correction being used by the closed loop fuel algorithm. If the fuel system is open loop, 0% correction should be reported.

Time Since Engine Start – shall increment the time since the engine was started while the engine is running.

Vehicle Speed – displays the vehicle road speed.

Absolute Load Value – is the normalized value of air mass per intake stroke displayed as a percent.

Absolute Throttle Position (up to 3) – the absolute throttle position (not the relative or learned) throttle position. Usually above 0% at idle and less than 100% at full throttle.

Accelerator Pedal Position (up to 3) - the absolute pedal position (not the relative or learned) pedal position. Usually above 0% at idle and less than 100% at full throttle.

Ambient Air Temperature – displays the ambient air temperature.

Barometric Pressure – barometric pressure normally obtained from a dedicated barometric sensor. Note some weather services report barometric pressure adjusted to sea level. In these cases, the reported value may not match the displayed value.

Catalyst Temp Bank X – Sensor X (up to 4) – displays the catalyst substrate temperature.

Commanded EGR – display 0% when the EGR is commanded off, 100% when the EGR system is commanded on, and if the EGR is duty cycled somewhere between 0% and 100%.

Commanded Equivalence Ratio – fuel systems that use conventional oxygen sensor displays the commanded open loop equivalence ratio while the system is in open loop. Should report 100% when in closed loop fuel. To obtain the actual air/fuel ratio being commanded, multiply the stoichiometric A/F ratio by the equivalence ratio. For example, gasoline, stoichiometric is 14.64:1 ratio. If the fuel control system was command an equivalence ratio of 0.95, the commanded A/F ratio to the engine would be $14.64 * 0.95 = 13.9$ A/F.

Commanded Evaporative Purge – displays 0% when no purge is commanded and 100% at the maximum commanded purge position/flow.

Commanded Throttle Actuator – displays 0% when the throttle is commanded closed and 100% when the throttle commanded open.

Control Module Voltage – power input to the control module. Normally the battery voltage, less any voltage drop between the battery and the control module.

Distance Since DTCs Cleared – distance accumulated since DTCs where cleared with a scan tool.

Distance Traveled While MIL On – accumulates the vehicle distance traveled while the MIL light is illuminated.

EGR Error – error as percent of actual commanded EGR. Negative percent is less than commanded and positive is more than commanded.

Evap System Vapor Pressure – evaporative system vapor pressure normally obtained from a sensor located in the fuel tank.

Fuel Level Input – indicates the nominal fuel tank liquid fill capacity as a percent of maximum.

Fuel Rail Pressure – indicates the fuel rail pressure at the engine referenced to atmosphere (gauge pressure).

Fuel Rail Pressure Rel Manifold – displays the fuel rail pressure referenced to the manifold vacuum (relative pressure).

Intake Air Temperature – - Usually a resistive device (thermistor) which is placed in the intake air stream, and provides a voltage proportional to temperature.

Minutes Run with MIL On – accumulated minutes of engine run time while the MIL light is on.

O2 Sensor BX-SX Wide Range mA (up to 8) – shows milliamps for linear or wide-ratio oxygen sensors.

O2 Sensor BX-SX Wide Range V (up to 8) – shows voltage for linear or wide-ratio oxygen sensors.

Relative Throttle Position – relative or “learned” throttle position.

Time Since DTCs Cleared – accumulated time since DTCs were cleared with a scan tool.

Warm-ups Since DTCs Cleared – number of warm-up cycles since all DTCs were cleared via a scan tool. A warm-up is defined as the coolant temperature rising by at least 22°C (40°F) and the engine temperature reaches at a minimum 70°C (160°F) (60°C (140°F) for diesels).

Oxygen Sensor Voltage - This sensor is much more complicated than the other sensors and deserves a more detailed explanation. Basically, the O2 sensor indicates the presence or absence of oxygen in the exhaust stream. The ECU, in order to keep emissions low, adjusts the fuel/air ratio at stoichiometry, the exact mixture which will completely burn all fuel with the oxygen present in the cylinder, leaving no fuel or oxygen in the exhaust. As the fuel/air ratio deviates from stoichiometry, then either oxygen or hydrocarbons (unburnt fuel) will be present in the exhaust. The oxygen sensor produces a low voltage, <0.1v, when oxygen is present in the exhaust and produces a high voltage, >0.8v, when there is no oxygen in the exhaust. The ECU uses the voltage output from the oxygen sensor to make slight adjustments to the amount of fuel injected to keep the fuel/air ratio near stoichiometry. It does this by increasing the fuel to get a high reading, meaning that there is no oxygen in the exhaust, the slightly decreasing the amount of fuel until the oxygen sensor reading drops low. This process goes

on continuously to keep the average fuel/air ratio as close to stoichiometry as possible. One last thing to know about oxygen sensors, they only operate reliably after being heated to 350 deg. C and higher.

4. Trouble Shooting Problems

- A. Errors or warnings during the installation – It is generally safe to ignore these messages. Some of the very old versions of Windows 98 are not compatible with the OBDScan software. Try to upgrade your OS to the latest version which your computer will support.
- B. The ECU status turns yellow when the com port is selected but never turns green - This could be due to several problems - Be sure that the OBDScan converter is plugged in the vehicle, the key is in the ON position or the engine is running, and the USB is securely connected to the OBDScan unit and the port on the computer. Try unplugging the OBD-II connector for 10 seconds then reconnecting it. Sometimes this is needed to get the system synchronized.
- C. The data values are not correct or vary widely – Use the OBDScan with the engine running. Some cars won't respond correctly unless the engine is running and, in some cases, the engine is at operating temp.
- D. The Gas Mileage numbers look wrong – The OBDScan program does a calculation based on sensor data from the vehicle. If the vehicle sensors are not calibrated then the reading will be wrong. You can still use the function to show where the mileage peaks in relative terms.

Contact Information:

Harrison R&D
9802 Sagequeen
Houston Tx. 77089

In conclusion, the OBDScan is designed to be both a useful vehicle repair tool and an aid in learning about and exploring the ODB-II Diagnostic Interface. Demystifying the OBD-II port and putting vehicle owners back in control of their property is important, after all, you paid a handsome price for that late model car or truck, don't let the automakers 'virtually weld the hood' on yours.

Phone 281-751-8836
email: sales@obdscan.net
internet www.obdscan.net

Please use the internet to get the latest information on the OBDScan products. All software updates and help are free as long as you own the product. If firmware changes or the protocol converter are required, there will be a small charge for the IC replacement.