VAD Mobile Wireless

OBD-II User's Manual
Version 1.0

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What Is VAD Mobile Wireless?

VAD Mobile Wireless is scan tool platform. It consists of a wireless adapter powered by Bluetooth, which, when accompanied by a Bluetooth PDA or Smartphone, provides the user with the latest in diagnostic technologies. The integrated CAN bus circuitry means VAD Mobile Wireless can be used even with the newest cars. The touch screen is easy-to-use and the compact size means it can be used both outside and inside the vehicle, at distances exceeding 30' away.

What is the OBD-II Module?

The OBD-II module implements the OBD-II diagnostic protocol as defined in ISO-15031-5 and found in all post-1996 vehicles. With CAN bus support, the OBD-II module will work with the newest vehicles that do not provide the old diagnostic buses.

The OBD-II module supports all nine Service IDs:

- 01 Current Data – Current Powertrain Data
- 02 Freeze Frame – Powertrain Freeze Frame Data
- 03 DTCs – Emissions-Related Diagnostic Trouble Codes
- 04 Clear ECU – Clear/Reset Emissions-Related Diagnostic Information
- 05 O2 Tests – Oxygen Sensor Monitoring Test Results
- 06 Monitor Tests – On-Board Monitoring Test Results for Specific Monitored Systems
- 07 Pending DTCs – Emissions-Related Diagnostic Trouble Codes Detected During Current or Last Completed Driving Cycle
- 08 System Control – Control of On-Board System, Test or Component
- 09 Vehicle Info – Vehicle Information

The OBD-II module also contains an extensive list of fault codes as defined in ISO-15031-6.

Where to Get a VAD Mobile Wireless System

VAD Mobile Wireless is available from http://www.vadmobile.com/products.htm , or calling the Versatile Automotive Diagnostics division at HPA Motorsports directly at 604.598.8520.

Installing the OBD-II Module

The OBD-II module comes as an option on the VAD Mobile Wireless system. There is a CD-Rom copy provided.

To install an update to the OBD-II module, use the Palm Desktop application found on the CD-ROM that came with you Bluetooth PDA or Smartphone device. Use the HotSync procedure to install the new **obd2.prc** application.

Attaching VAD Mobile Wireless to the Vehicle

Attach the supplied OBD-II (J1962) adapter to the OBD-II diagnostics port in the vehicle.

After making both connections, turn the ignition switch to the ON or RUN position.

Running the OBD-II Module

The OBD-II module must be installed on the VAD Mobile Wireless PDA and can be found with the other installed applications. To view the installed applications, tap on the silk-screened *House* icon to the left of the graffiti area on the VAD Mobile Wireless PDA.

If you see some applications displayed, but not the OBD-II module, check the category displayed in the upper right corner of the display. Only applications in the selected category are displayed. The OBD-II module is found in the **Utilities** category and the **All** category. If you are viewing a different category, tap on the category name and select **All** or **Utilities** from the list.

Tapping on the *House,* icon when the application list is already displayed will also cycle through the different categories.

Tap on the OBD-II icon, , to launch the OBD-II module.

Exiting the OBD-II Module

There is no explicit Exit button. To quit the OBD-II module, tap on the silk-screened *House* icon found at the bottom on the screen, to the left of the graffiti area.

The First Screen

When you first run OBD-II, you will see the following screen:

Screen 1 :First screen

Tapping the **Connect** button will begin a diagnostic session with a vehicle. Tapping the **Configure** button allows you to change some operating parameters and tapping the **PIDs** button allows you to define PID sets when not connected to a vehicle. The **Configure** and **PIDs** buttons will be discussed first.

Configuring OBD-II

After tapping the **Configure** button, you will see the following screen:
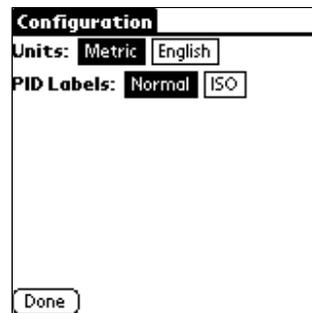
Screen 2: Configure

The first item allows you to select either Metric or English units. Vehicles report metric units. If you choose English units, these will be calculated by converting the metric measurements.

The second item allows you to select either Normal PID label or labels specified in the ISO-15031-5 standard. Typically the Normal labels are easier to comprehend, though some might prefer the standardized labels.

After configuring the OBD-II module as desired, tap on the **Done** button.

Using PID Sets

PID sets provide a method of defining groups of PIDs that are useful for particular diagnostic tests. PID stands for Parameter Identification. Each PID reports one or more readings showing operating conditions for the vehicle.

For example, 'Engine RPM," "Ignition Timing Advance" and "Time Since Engine Start" are all PIDs. ISO-15031-5.6 defines 87 PIDs, of which 85 can be viewed. ECUs do not support all PIDs, with newer vehicles typically reporting more PIDs than older vehicles.

Normally, you are not interested in viewing all PIDs at once. If no PID sets are defined, the OBD-II module will show almost all PIDs when viewing **01 Current Data**. This can become unwieldy. PID sets provide a method of defining groups of PIDs that you find useful for various diagnostic tasks. For example, you might define a PID set that contains only oxygen sensor readings. Another example might be engine speed, engine load and timing advance.

Creating PID sets also allows you to get date updates faster. The more PIDs you view, the longer it takes to get the data from the vehicle and the longer it takes to display it. By creating pared-down PID sets you don't waste time getting data you don't need.

Only those PIDs found in the PID set and also supported by the vehicle are used. PIDs found in PID sets that are not supported by the vehicle are ignored.

PID sets can be created either before you connect to a vehicle by tapping on the **PIDs** button or after you have connected by viewing **01 Current Data** and tapping on the PID set name in the upper right corner.
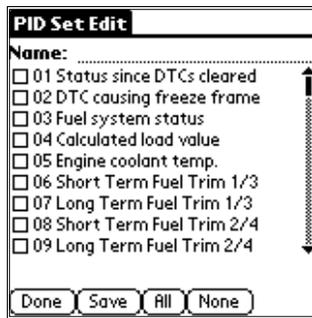
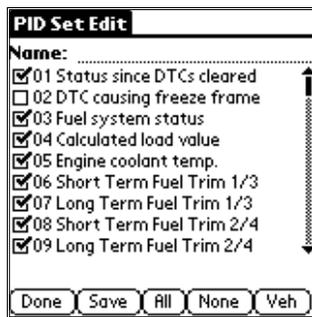When you enter the PID set screen, you will see:
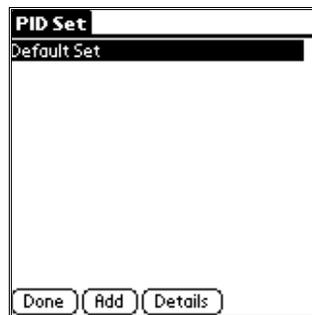
Screen 3: PID Set List

This shows a list of all currently defined PID sets. Initially, only the Default Set will be listed. As you create PID sets, they will be shown on this screen. The currently selected PID set is highlighted (Default Set in this case). To use a different PID set, just tap on the one you want and then tap **Done**. The new set will be used the next time you view **01 Current Data**.

The **Add** button allows you to define a new PID set. When you tap on it, you will see:

PID Set Edit

Name: ....
- ☐ 01 Status since DTCs cleared
- ☐ 02 DTC causing freeze frame
- ☐ 03 Fuel system status
- ☐ 04 Calculated load value
- ☐ 05 Engine coolant temp.
- ☐ 06 Short Term Fuel Trim 1/3
- ☐ 07 Long Term Fuel Trim 1/3
- ☐ 08 Short Term Fuel Trim 2/4
- ☐ 09 Long Term Fuel Trim 2/4

(Done)(Save)(All)(None)

Screen 4: Adding a PID set

In this case, we are not connected. If we were connected, we would see an additional button and by default, the PIDs supported by the vehicle would already be checked. This is shown below:
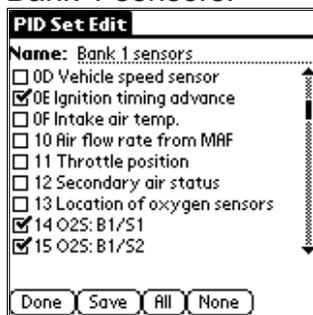
PID Set Edit

Name: ....
- ☑ 01 Status since DTCs cleared
- ☐ 02 DTC causing freeze frame
- ☑ 03 Fuel system status
- ☑ 04 Calculated load value
- ☑ 05 Engine coolant temp.
- ☑ 06 Short Term Fuel Trim 1/3
- ☑ 07 Long Term Fuel Trim 1/3
- ☑ 08 Short Term Fuel Trim 2/4
- ☑ 09 Long Term Fuel Trim 2/4

(Done)(Save)(All)(None)(Veh)

Screen 5: Adding a PID set while connected

To create a new PID set, check the boxes for the PIDs you want in your set. Then tap on the dotted line after **Name:** and enter a name for the set. Then tap **Save**. This will create a new set that you can use.
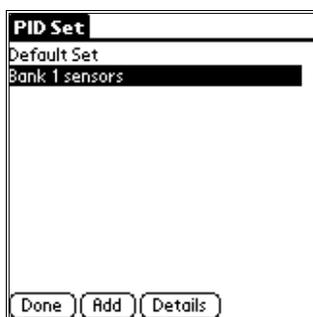
The other buttons do the following: **Done** exits the screen without saving, **All** checks all the PIDs, **None** unchecks all the PIDs and **Veh**, if present, selects only the PIDs supported by the vehicle.

In this example, we will create a PID set containing the engine speed, ignition timing and bank 1 oxygen sensors. We will call this "Bank 1 sensors."
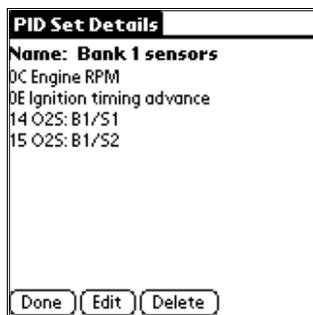
PID Set Edit

Name: Bank 1 sensors
- ☐ 0D Vehicle speed sensor
- ☑ 0E Ignition timing advance
- ☐ 0F Intake air temp.
- ☐ 10 Air flow rate from MAF
- ☐ 11 Throttle position
- ☐ 12 Secondary air status
- ☐ 13 Location of oxygen sensors
- ☑ 14 O2S: B1/S1
- ☑ 15 O2S: B1/S2

(Done)(Save)(All)(None)

Screen 6: Adding a PID set for bank 1 sensors

After tapping **Save**, we will see:

PID Set

Default Set
Bank 1 sensors

(Done)(Add)(Details)

Screen 7: Added a new PID set

We can verify the contents of the new PID set by tapping **Details**.

PID Set Details

Name: Bank 1 sensors
0C Engine RPM
0E Ignition timing advance
14 O2S: B1/S1
15 O2S: B1/S2

(Done)(Edit)(Delete)

Screen 8: PID set details

This shows the PID set name, "Bank 1 sensors", and the PIDs included in this set. If we wanted to modify this set, we would then tap the **Edit** button. The **Details** screen is also where you delete PID sets. Do this by tapping the **Delete** button and then tapping the **Confirm Delete** button which will appear.

Connecting

To begin a diagnostic session, tap on the **Connect** button. The OBD-II module will attempt to connect to the vehicle using a variety of different physical interfaces.

Depending on what the vehicle supports, this process might take a couple seconds. After you have connected, you will see:
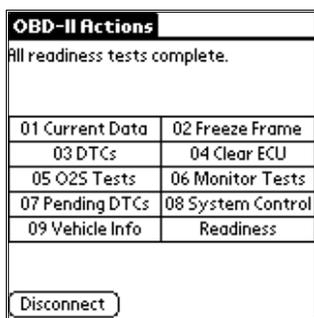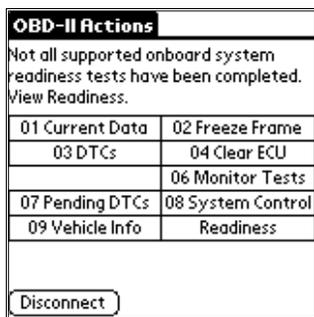
```
OBD-II Actions
All readiness tests complete.


01 Current Data   02 Freeze Frame
     03 DTCs          04 Clear ECU
   05 O2S Tests     06 Monitor Tests
 07 Pending DTCs  08 System Control
   09 Vehicle Info      Readiness


 Disconnect
```
Screen 9: Connected

The OBD-II module automatically checks readiness after it connects. In this case, all the readiness tests are complete.

Vehicles that use the CAN bus for diagnostics will show a slightly different screen after connecting. CAN does not support the **05 O2S Tests** service (**06 Monitor Tests** supersedes it) and therefore it is not shown.

The following screen shows an example of a CAN vehicle that has not completed all of its readiness tests.

```
OBD-II Actions
Not all supported onboard system
readiness tests have been completed.
View Readiness.
01 Current Data   02 Freeze Frame
     03 DTCs          04 Clear ECU
                    06 Monitor Tests
 07 Pending DTCs  08 System Control
   09 Vehicle Info      Readiness


 Disconnect
```
Screen 10: Connected (CAN)

To perform diagnostic tasks, just tap on the appropriate service. All nine services defined in ISO-15031-5 are available as well as a **Readiness** check that retrieves PID 01 and displays the readiness status in a simple format.

When you are done with your diagnostic session, tap the **Disconnect** button.

01 Current Data

Service 01, allows access to current (real-time) emission-related data values, including analog inputs and outputs, digital inputs and outputs and system status information. Each PID contains one or more readings reflecting these values. While accessing **01 Current Data**, the OBD-II module retrieves the PIDs in the current PID set and displays the values as quickly as it can get and process the data. This speed will vary depending on the diagnostic protocol, number of PIDs and PID type.

The following screen shot shows the **01 Current Data** function using the **Bank 1 sensors** PID set we defined on page 6.
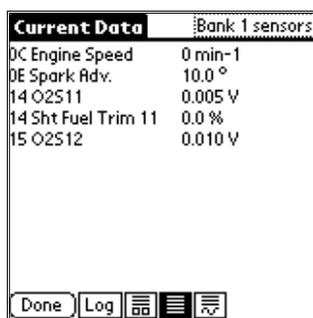

Screen 11: Current data using PID set

Starting in the upper right, we see the current PID set name. Tap on the set name if you want to change PID sets or define a new one. This is how you access PID sets when you are connected.

Below the PID set name, we see a list of readings. The PID number is on the left of the line, followed by the reading name and then the value. In this example, PIDs 0C, 0E and 15 each contain a single reading while PID 14 contains two readings.

At the bottom of the screen, we see a series of buttons. Tap **Done** when you wish to exit. Tap **Log** to record the readings to a Memo Pad file (more on this later).

The next three buttons control how the PID data is displayed. In the screen shot above, a flat list view is selected. As many readings as possible are displayed on the screen. The icon to the left selects a "big box" view. An example of this is shown below.
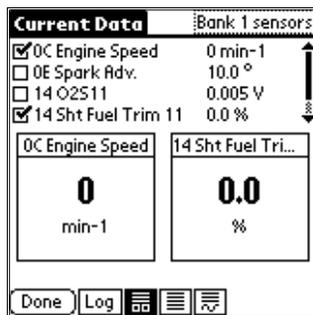
Screen 12: Current data - big box view

We are viewing the same data, only now the lower part of the screen has been replaced by two large boxes. This makes is easier to read two values. You select the reading you wish to view by checking the appropriate box. A scroll bar has also appeared to allow access to all readings if more than four are present.

The third viewing icon is for graphing. Tap on it to enter graph mode. The bottom part of the screen is now used for graphing. Select the readings you want to graph by checking the appropriate boxes.

In the screen below, we are viewing engine speed and timing advance.
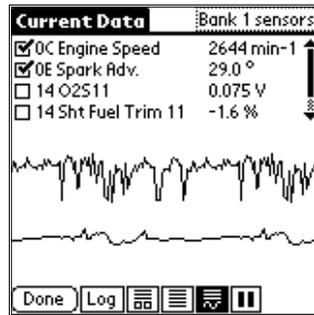
Screen 13: Graphing current data

We also see that a new button has appeared. This is the pause button. It is a toggle button and when it is selected the screen will not update (though data is still being recorded). Tap the pause button a second time to allow the screen to update the new data.

You can read specific graph values by tapping anywhere in the graphing area. A vertical marker bar will appear and the reading values for that marker appear below the graph.

The following screen shows how the marker can be used.
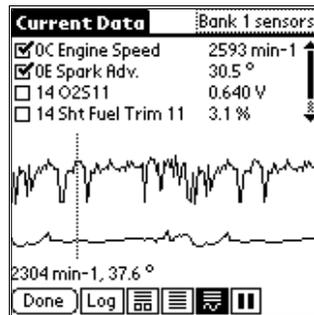
Screen 14: Reading graph values

We can see that the engine speed was 2304 RPM while the timing advance was 37.6°.

The **Log** button is a toggle button. When highlighted, logging is enabled. When you are logging, data is displayed on the screen and also written to one or more Memo Pad files. When one Memo becomes full, another is automatically created. The data is stored in comma separated value (CSV) format, using semicolons in place of commas. If you wish to import the data into a spread sheet, simply HotSync the VAD Mobile Wireless system using the Palm Desktop application. The Memo Pad data will automatically be transferred to your desktop computer. Then connect the Memo Pad records and import them into your spread sheet.

You can also use the Print module to view data logs. Like the OBD-II module, the Print module is sold separately for your VAD Mobile Wireless PDA/adapter. You can use the Print module not only to view graphs on the VAD system, but to print them wirelessly on your printer. The Print module is described separately in the Print User Manual.

02 Freeze Frame

Freeze frame data is similar to current data in that the readings are from PIDs. However, while current data shows the real-time status of the vehicle, freeze frame data shows readings at the time a DTC occurred. PID sets are not used with **02 Freeze Frame**. All PIDs in the freeze frame are displayed. The following screen is an example of freeze frame data.
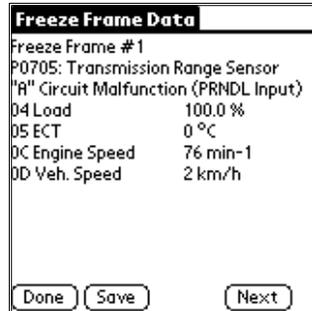
Screen 15: Freeze frame

Some vehicles can store more than one freeze frame. Tapping on the **Next** button will display other stored freeze frames if they are available. If only one freeze frame is available, tapping the **Next** button will either display a message saying there are no more frames, or will display the data from freeze frame #1. The exact behavior is dependent on the vehicle.

At the top of the screen, the DTC causing the freeze frame is displayed. Following the DTC description is a list of the associated PIDs.

The freeze frame data can be stored by tapping the **Save** button. The **Save** button will disappear, telling you that the data has been saved, and the freeze frame information will be available as a new Memo Pad record, and can be printed using the Print module.

03 DTCs

The **03 DTCs** services allows you to obtain "confirmed" emission-related DTCs. The OBD-II module will retrieve and display all DTCs from the ECU(s) in the vehicle.

An example is shown below.
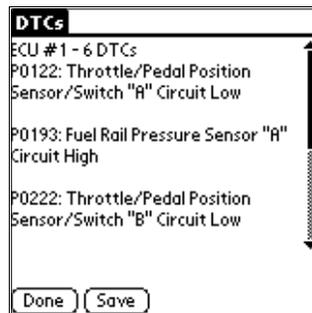
Screen 16: DTCs

In this case ECU #1 had six faults, of which we can see the first three. If the fault codes are defined in ISO-15031-6, the OBD-II module will display the fault description in addition to the fault code. Some DTCs are manufacturer specific and their description is not defined in any standard. In these cases, only the DTC number will be displayed.

ISO-15031-6 also defines DTC codes that contain a sub-fault. These codes are in the form P0000-00. They are only available when using the CAN diagnostic protocol and only some vehicles support them. The OBD-II module checks for them and if present will display them. An example is shown below.
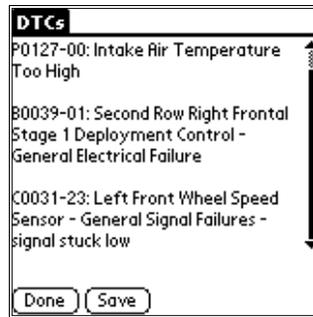
Screen 17: DTCs with sub-fault bytes

DTCs can also be saved. Just tap on the **Save** button and a new Memo Pad record will be created containing the DTC information. The DTC list can then be view or printed using the Print module.

04 Clear ECU

04 Clear ECU allows you to clear all emission-related diagnostic information. This includes:

- MIL and number of diagnostic trouble codes
- Clear the I/M (Inspection/Maintenance) readiness bits
- Confirmed diagnostic trouble codes
- Pending diagnostic trouble codes
- Diagnostic trouble code for freeze frame data
- Freeze frame data
- Oxygen sensor test data
- Status of system monitoring tests
- On-board monitoring test results
- Distance traveled while MIL is activated
- Number of warm-ups since DTCs cleared
- Distance traveled since DTCs cleared
- Time run by the engine while MIL is activated
- Time since diagnostic trouble codes cleared

Other manufacturer specific "clearing/resetting" action may also occur.

After the clearing service is performed, you will see:
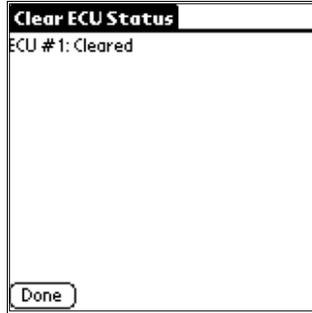

Screen 18: ECU cleared

05 O2S Tests

05 O2S Tests allows access to on-board oxygen sensor monitoring test results. This is only supported on non-CAN bus systems. The same information can be obtained from **06 Monitor Tests**.

There are two kinds of test results: constant readings and those that must be within a minimum/maximum value range. The following screen shows fixed values.
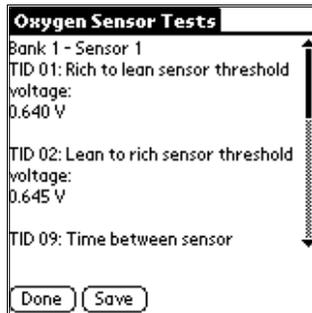
Screen 19: Oxygen sensor test results (constant values)

The next screen shows an example of a test result (TID 09) that must fall between a minimum and a maximum. In this case, the value is within the range and the test is passed.
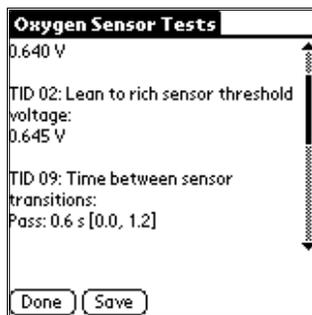
Screen 20: Oxygen sensor test results (ranged value)

Tapping the **Save** button will store the test results in a Memo Pad file. These results can then be viewed or printed using the Print module.

06 Monitor Tests

06 Monitor Tests is similar to the oxygen sensor test results, but is more flexible. It can report test results from more than just the oxygen sensors. For example, service 06 can report test results for catalyst monitoring and evaporative system monitoring. Vehicles using non-CAN diagnostic buses report the test result data in a more limited form. They report a test result value and either a maximum or minimum limit for the test. CAN based diagnostic systems report a wider range of values and provide both minimum and maximum limits.

The following screen is an example of monitor test results from a non-CAN vehicle.
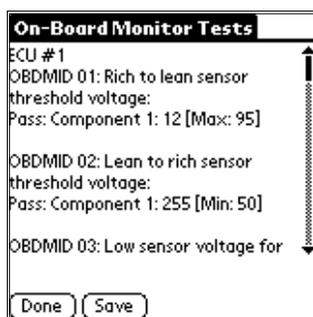
Screen 21: Monitor test results, non-CAN

The test results from a CAN vehicle look like the following.
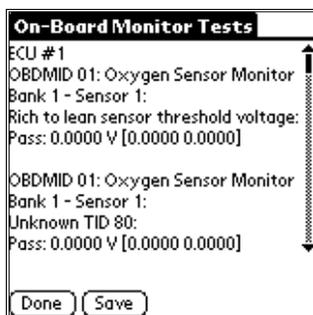
Screen 22: Monitor test results, CAN

In this case, the ECU was not in a vehicle and that is why the voltages read zero. The unknown TID 80 refers to an on-board test that is not defined in the ISO standard.

As with other services, tapping the **Save** button will create a new record in the Memo Pad application.

07 Pending DTCs

Service **07 Pending DTCs** reports emission-related diagnostic trouble codes detected during the current or last completed driving cycle. These are referred to as pending DTCs to distinguish them from the confirmed DTCs reported by service **03 DTCs**.

The following screen shows an example of pending DTCs.
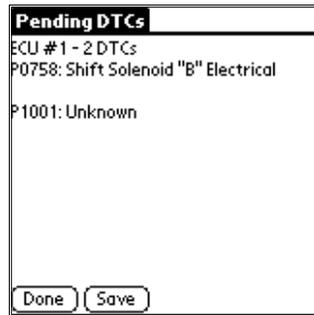
Screen 23: Pending DTCs

In this particular case, one of the faults is a manufacturer defined trouble code and is not part of the ISO/SAE standard. You must consult your service manual to determine the meaning of trouble codes that are not part of the standard as they vary from manufacturer to manufacturer.

Tapping the **Save** button will store the pending DTCs as a new record in the Memo Pad application. You will then be able to view and print them using the Print module.

08 System Control

This service allows the VAD Mobile Wireless system to control the operation of an

on-board system, test or component. Possible uses of the **08 System Control** service include:

- Turn on-board system/test/component ON
- Turn on-board system/test/component OFF
- Cycle on-board system/test/component for 'n' seconds.

Since the test parameters and test result data varies by test, the OBD-II module only supports control of systems, tests and components that are defined in the ISO-15031-5 standard.

The list of controllable systems is shown in the table below.

| System	Description
Enable EVAP system leak test	Enable the conditions required to conduct an evaporative system leak test. The test itself is not run, only the conditions required to run the test are enabled.

Table 1: Supported controllable systems

After tapping on **08 System Control**, you will see a list of supported controllable systems, as shown below.
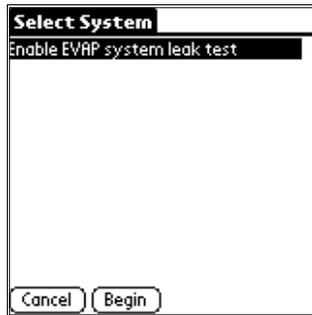
Screen 24: System list

Select a system and tap **Begin** to initiate the action. Once the action has been performed (enabling the evaporative system to be tested for leaks in this case), you will see this screen.
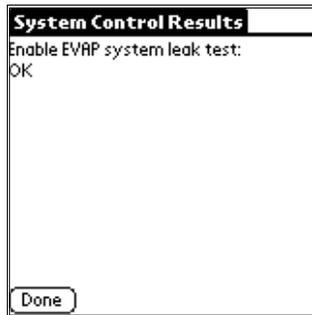
Screen 25: System test completed

Tap **Done** when you are finished.

09 Vehicle Info

The **09 Vehicle Info** service retrieves and displays vehicle specific information. For example, VINs and Calibration IDs. Only those information types defined in the ISO-15031-5 standard are displayed since the format of the data varies depending on type. When you tap on the **09 Vehicle Info** button, the OBD-II module will retrieve all supported information types and display them.

The following screen is an example of an ECU displaying a VIN number, a calibration ID and calibration verification number.

Screen 26: Vehicle information

Depending on the diagnostic protocol, some ECUs might take up to 60 seconds to respond with the vehicle information. The OBD-II module will display a wait message if the query takes longer than 1 second.

Again, tapping on the **Save** button will store the vehicle information in a Memo Pad record where is can later be viewed or printed using the Print module.

Readiness

The **Readiness** action is not a separate service. Rather it is the results of a query to PID 01 using the **01 Current Data** service. The OBD-II module will display a list of supported system and their readiness status.

 In the example below, the ECU supports eight systems, of which three are ready.
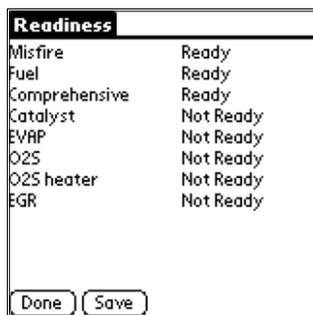
Screen 27: Readiness

If the vehicle contains multiple powertrain ECUs, the readiness status for each will be displayed. In the example above, only a single ECU is present.

Tapping the **Save** button will store the readiness status as a new Memo Pad record. The Print module allows you to view or print this saved readiness status.

Print Module Interaction

The Print module can be used to view and print data you have saved from the OBD-II module. The Print module is described in the Print User's Manual. Only the parts specific to OBD-II saved data are described here.

When the Print module is launched, you can select the type of data you wish to view. To view saved OBD-II data, select the OBD-II option as shown below.
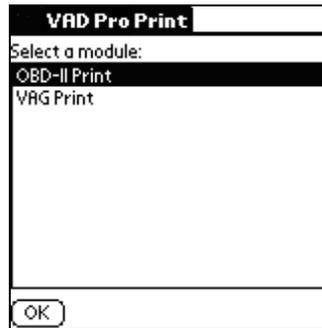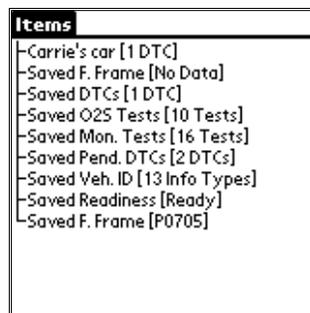

*Screen 28: Print module –
select OBD-II data*

In addition to viewing and printing data logs, which are covered in the Print User's Manual, you can view and print the following from the OBD-II module:

- Freeze Frames
- DTCs
- O2S Tests
- Monitor Tests
- Pending DTCs
- Vehicle Info
- Readiness

These items will look like the following when listed in the Print module.

*Screen 29: Print module -
OBD-II item list*

In this example, the first item has been annotated as "Carrie's car" the other items use their default list appearance.

Print Module – Freeze Frame

Freeze frame data looks like the following example when viewed on the VAD Mobile Wireless system.
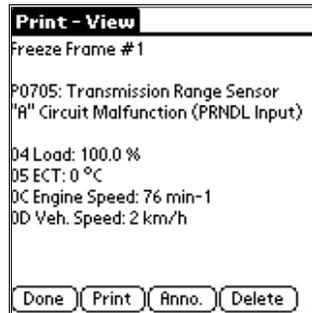
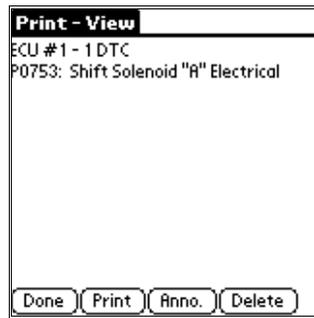
*Screen 30: Print Module -
Freeze Frame*

When printed it looks like the following (but at a higher resolution and the size of a full page).
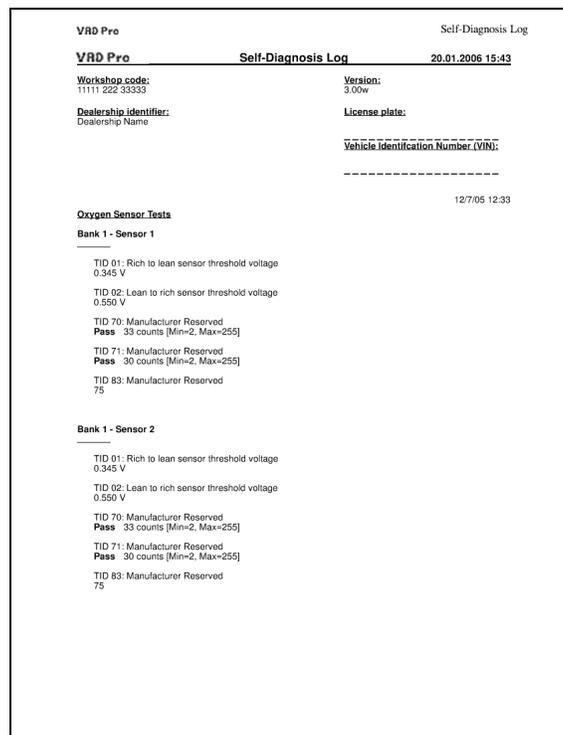
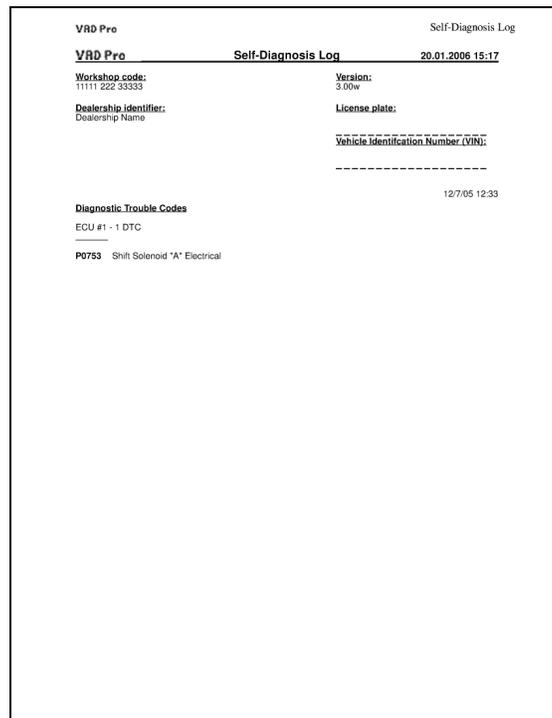*Print 1: Print Module - Freeze Frame Output*

Print Module – DTCs

DTCs, when viewed with the Print module, look like the following:
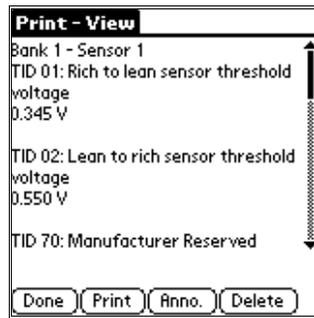

Screen 31: Print Module - DTCs

When printed, the output looks like:

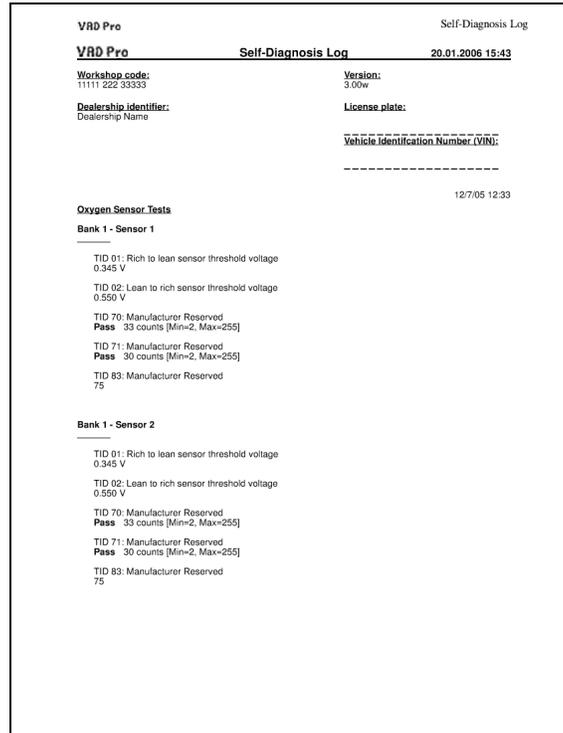*Print 2: Print Module - DTCs Output*

O2S Tests

O2S Tests, when viewed with the Print module, look like the following:
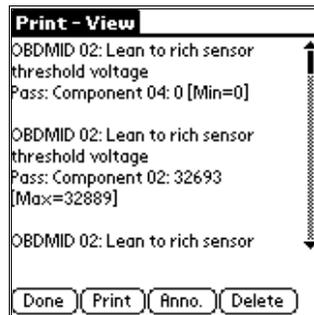

*Screen 32: Print Module -
O2s Tests*

When printed, the output looks like:

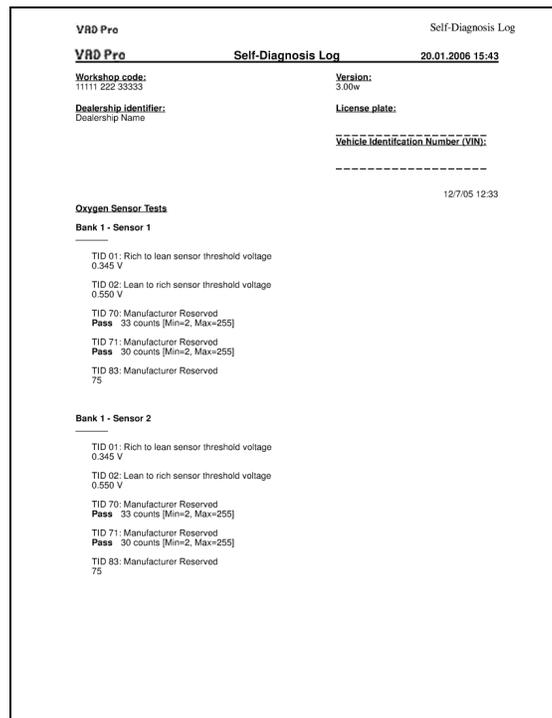*Print 3: Print Module - O2S Tests Output*

Monitor Tests

Monitor Tests, when viewed with the Print module, look like the following:

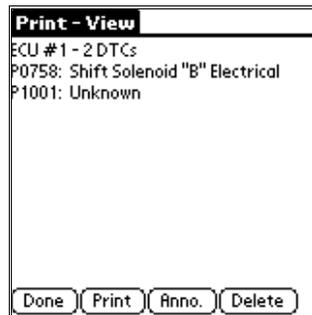*Screen 33: Print Module -
Monitor Tests*

When printed, the output looks like (only the first page is shown):

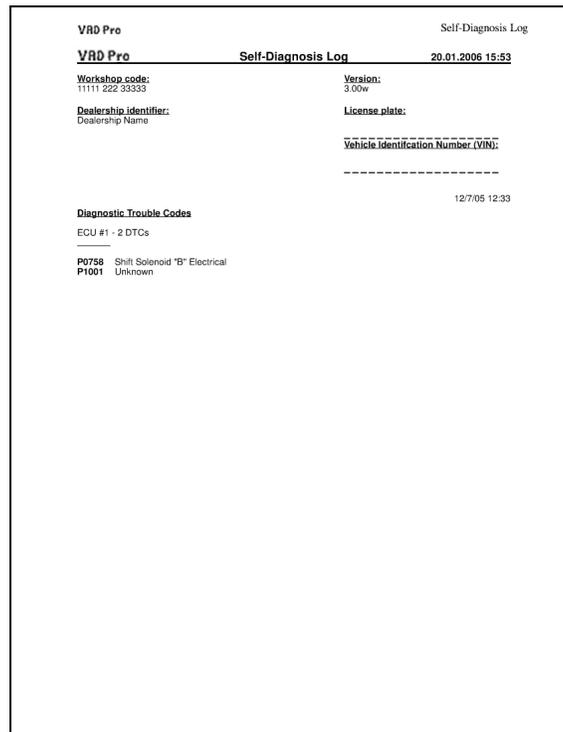*Print 4: Print Module - Monitor Tests Output*

Pending DTCs

Pending DTCs, when viewed with the Print module, look like the following:

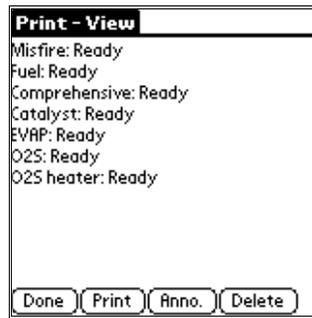*Screen 34: Print Module -
Pending DTCs*

When printed, the output looks like:

Print 5: Print Module - Pending DTCs Output
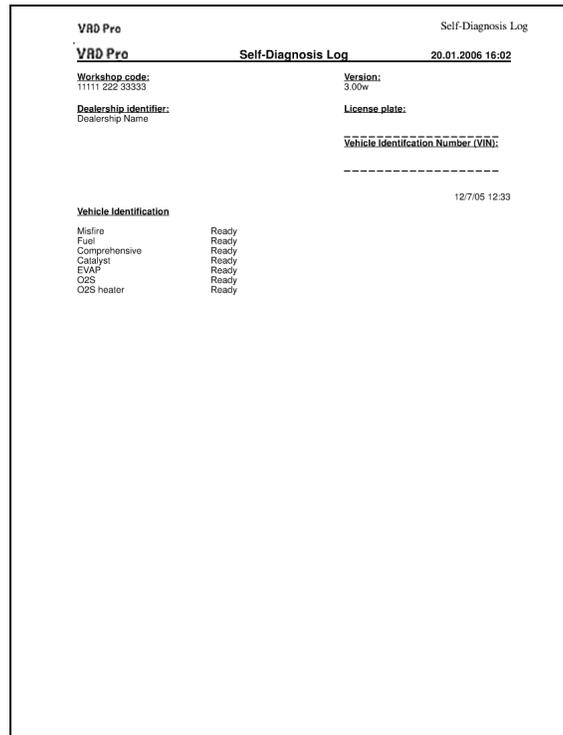
Vehicle Info

Vehicle Info, when viewed with the Print module, look like the following:

*Screen 35: Print Module -
Vehicle Info*

When printed, the output looks like:

Print 6: Print Module - Vehicle Info Output

Readiness

Readiness, when viewed with the Print module, looks like the following:

Print – View
Misfire: Ready
Fuel: Ready
Comprehensive: Ready
Catalyst: Ready
EVAP: Ready
O2S: Ready
O2S heater: Ready

[Done] [Print] [Anno.] [Delete]

Screen 36: Print Module - Readiness

When printed, the output looks like:

Print 7: Print Module - Readiness Output

Support for the OBD-II Module

If you have questions or need assistance with the VAD Mobile Wireless system or the VAD Mobile Wireless OBD-II module, please feel free to contact us at support@vadmobile.com.

Check the VAD Mobile Wireless web site, http://www.vadmobile.com/, often for software updates and other information.

Versatile Automotive Diagnostics can also be reached by phone at 604-598-8520.