OT-2

OBD-II USB/WiFi Interface for PCs & Smartphones User Manual

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1 OT-2

The OT-2 is an OBD-II USB/WiFi Interface for PCs & Smartphones. The unit is capable of reading up to 16 channels of "OBD-II" ("On Board Diagnostic) information directly from your vehicle's ECU and integrate it into an Innovate MTS ("Modular Tuning System") "Log Chain". The data from the OT-2 can be logged and analyzed on a personal computer using Innovate's award winning LogWorks software or on your iPhone or iPod touch with the LogWorks Mobile app available in the Apple App store.

USB/Wifi: The light will flash when a USB or Wifi connection is established.

Vehicle: The light will flash when the OT-2 has established connection with the ECU. The rate of flash is directly correlated to the speed at which the ECU is delivering information.

MTS: This light will flash at a constant rate if there is nothing connected to the SERIAL IN port or if a compatible MTS product is correctly connected.

Power: This light will come on and remain steady whenever power is applied to the unit.

SERIAL OUT: This connector is used to connect the OT-2 to the computer with a serial cable (purchased separately) or to output the signal to a compatible MTS device, such as an XD-16 gauge.

SERIAL IN: This connector is used to feed a MTS compatible signal to the OT-2. One example of this is to feed a signal from an LC-1 to be able to record A/F with the rest of your OBD-II channels.

2   Initial Installation

The OT-2 can be connected to either a Windows PC with USB or Wifi capabilities or with your iPhone or iPod touch.

2.1 *Locating and connecting the OT-2 to the OBD-II port*

The OBD-II connector is required to be within 3' of the driver's seat in the vehicle and accessible without tools. Generally it is somewhere just behind the bottom edge of the dashboard, immediately in front of the driver, but it may be in a relatively obscure place, like hidden behind an ashtray. On many newer vehicles the connector is concealed behind a small door or removable plastic cover plate. Also, the connector itself may be covered with a small, removable, rubber cap.

1. Once you find the OBD-II connector, connect the OT-2 to it. The should light up and almost immediately, the "USB/WiFi" LED should light steadily for about 1 second. This indicates that the Wi-Fi services are being initialized. The "USB/WiFi" light will then go out.

2. Next the "MTS" light should come on steadily for about 1 second. After extinguishing for about 1 second, the "MTS" light should begin blinking, about 6 times per second.

3. Start the ignition on the vehicle and observe the "Vehicle" light on the OT-2. Initial connection to an ECU can take up to one minute, so be patient. When the ECU is found, the vehicle light will come on solid for about a second. Then both the MTS light and the Vehicle light will go out.

If your "Vehicle" light does not light, and the "MTS" light just keeps blinking, do not despair. contact Innovate Motorsports and provide the model year, make, and model for your vehicle. We are fully committed to making the OT-2 as widely OBD-II compatible as possible

⚠️ **Pay special attention to the routing of the cable from the OT-2 and the placement of the unit itself so that it does not get tangled up with your clutch, gas, or brake pedal.**

2.2 *Automatic Sleep Mode*

The OT-2 does not require an ON/OFF switch or any additional wiring. Instead, the OT-2 uses a different approach to the problem.

The OT-2 uses an automatic Sleep Mode. The OT-2 will automatically enter this mode in one of two conditions:

A. If there is nothing connected to the serial IN port, the OT-2 will automatically go into Sleep Mode if the unit is not connected to LogWorks Mobile or LogWorks via USB or Wi-Fi. Once the software is relaunched the OT-2 will automatically power back up and attempt to reconnect with the vehicle's ECU.

B. If another MTS device is connected to the serial IN of the OT-2 the unit will not go into Sleep Mode until those units cease to send data packets (other MTS devices are wired to a switched ignition source.) Once the OT-2 "hears" data packets it will automatically power back up.

Sleep mode does reduce actual OT-2 power consumption, primarily by changing how the Wi-Fi transmitter is configured. However, in automotive terms, OT-2 power consumption is modest. At

peak operation, the unit draws about 300 mA (.3 amps), and power down mode is about half that, generally 150-200 mA. The key benefit is that the ECU (and all it's affiliated sensing circuitry), is not inadvertently being kept awake.

If your vehicle is not operated regularly, or the electrical system does not have much excess capacity you can either unplug your OT-2 when not in use, or use an automotive relay to supply power to the unit only when the ignition is on. The OT-2 will retain your settings and preferences even when not powered.

2.3 *iPhone and iPod touch network configuration*

1. Install the **LogWorks** application from the Apple App Store. A search for "LogWorks" should quickly locate it. Once installed you should see the LogWorks icon.

2. Connect the OT-2 to your vehicle's OBD-II port. At minimum you should see the OT-2's Power light come on and stay steady.

3. In your iPhone or iPod touch go to *Settings* then *Wi-Fi.* Make sure that Wi-Fi is set to ON.

4. Under "Choose a Network…" select the INNOVATE_XXXX network. (Note: the discovery process can take up to one minute.)

Once you see a check mark next to the INNOVATE_XXXX network you may exit out of the settings page.

5. You can now launch the LogWorks application

2.4 *Connecting the OT-2 to a Windows PC*

It is important to install the provided software on the computer prior to connecting the OT-2. Failure to do so may lead to connection complications.

2.4.1   Installing software

1. Install the CD that came with your OT-2 in your Windows computer.
2. The installer will automatically start; follow the prompts to install the software.
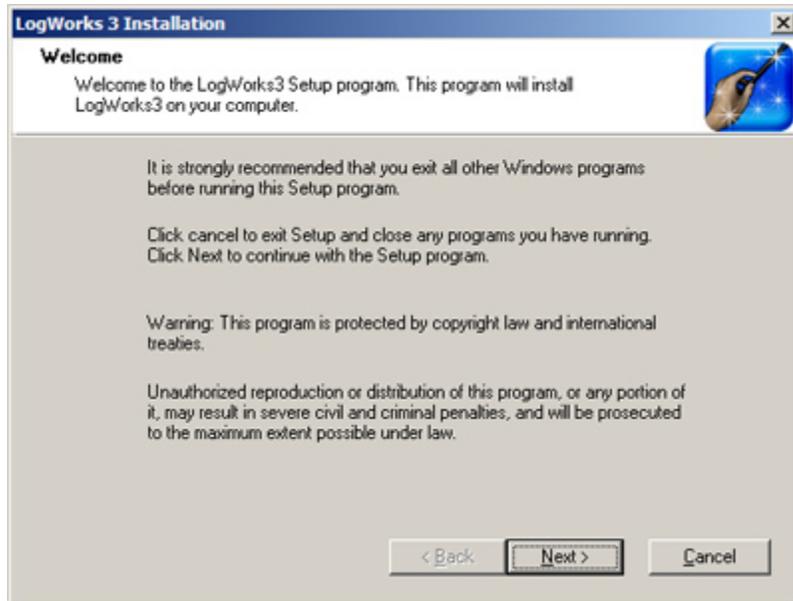
2.4.2   Wireless connection

The exact steps for this will vary based on your network adapter and flavor of Windows you are using, the screen shots below are taken from a Windows Vista machine.

Launch the wireless network connection manager. A dialog similar to the following showing all the available wireless networks will appear:
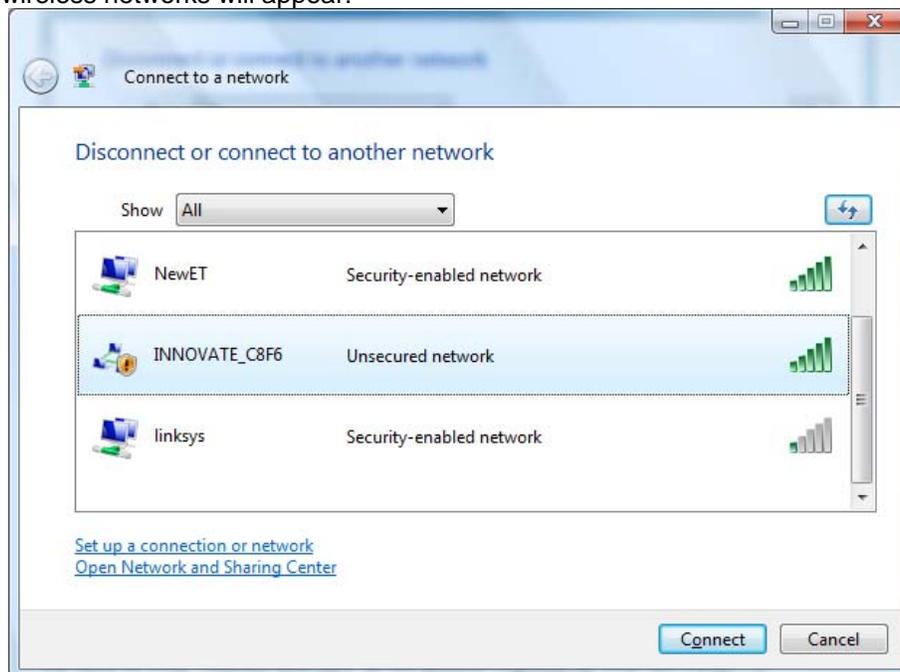
The OT-2 network will always start with "INNOVATE_" and end with four characters (like the "C8F6") above. The four characters are part of the unit's unique serial number and are there so that you can distinguish between multiple OT-2s.

To connect, select the network by clicking on it so it is highlighted (as shown above), and then pressing the "Connect" button in the bottom right corner of the screen. Since the Ad Hoc network that the OT-2 creates is unsecured, you may get a warning like this:
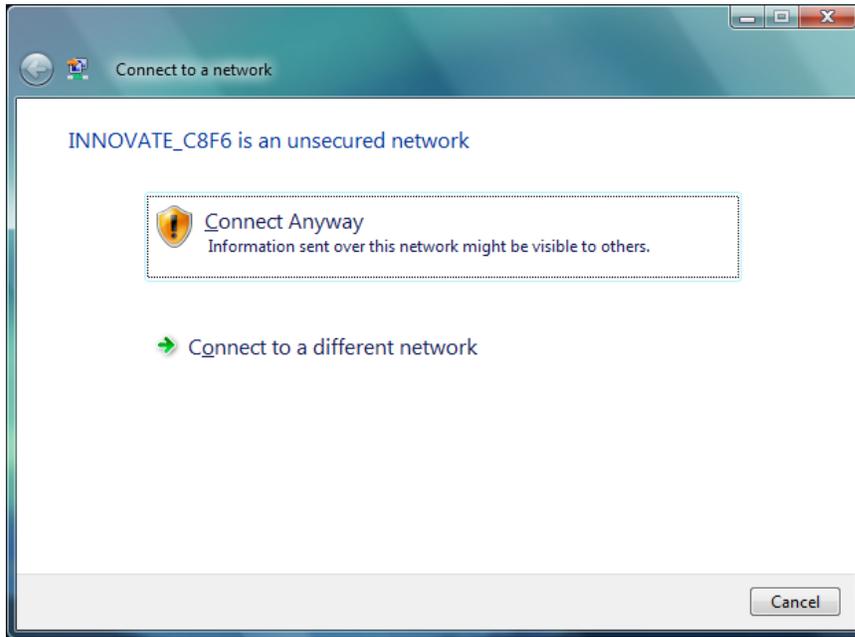
Select "Connect Anyway". After Windows reports that you have joined the network, there is a brief period of 1-5 seconds while the computer is still obtaining some additional information from the OT-2 (just like joining any other network). After that, you are good to proceed.

2.4.3   USB Connection

1.   Connect one end of the USB cable to the OT-2 and the other end to your computer.
2.   Windows will now recognize the device and prompt the "New Hardware Wizard." Click Next.
3.   Select "Install the Device Automatically" and click Next.
4.   A progress screen might appear. During this installation process the screen below will pop up. Click "Continue Anyway."

5.   The last screen will inform you that the unit has been successfully installed. Click "Finish." The unit is installed and ready to use.

3 LogWorks Mobile (iPhone and iPod touch)

The LogWorks Mobile application can be installed from the Apple App Store. A search for "LogWorks" will yield results for the application. Once installed you should see the LogWorks icon on your iPhone or iPod Touch.

The LogWorks Mobile application has 5 different "Tabs" which can be selected on the bottom of the application pane: Dyno, Economy, LogWorks, DTC, and OT-2. Many of the tabs offer multiple screens. These can be accessed by 'swiping' left and right.

Individual screens often have an 'i' button. This allows you to configure that screen. The button also indicates OT-2 hardware connection status. Green means connected, yellow means negotiating/configuring, and gray means no connection.

3.1 *Dyno Tab*

The Dyno tab is for making vehicle performance runs. If you have OT-2 hardware, the data from dyno runs will be much more precise because information such as RPM and vehicle speed can be read from the vehicle's dedicated sensors.

To make a dyno run (5 steps):

1. Find a suitable test course. Ideally this is straight, level, and secluded pavement.

2. Press the button on the dashboard and select the type of run- either Distance Run or Fixed Gear. Then enter the associated vehicle information.

3. With the vehicle stopped, place the iPhone/iPod Touch so that it is as flat as possible and the top (power switch end) is pointed towards the front of the vehicle.

 If you have OT-2 hardware, this is only necessary for power (HP) readings. If you do not have hardware, this is VERY critical for all readings. Arbitrary orientation is not allowed because, unlike many G-meter applications, all three accelerometer axes are used for measurements and computations. For best results, the iPhone/iPod Touch should also be kept as stationary as possible for the entire run.

4. Press the blue 'Start' button. When the button turns green with the word 'Go', begin the run. It is not critical to start the run the instant that the indicator changes. The indicator simply means that the software is ready. Measurements will begin automatically when you put the vehicle in motion.

5. When the run is complete the software will freeze the dashboard so that you can review the overall results.

For more detailed results, swipe left to the run log and then select the last entry. You can also cancel a run early by pressing the green 'Go' button.

3.1.1 Types of Dyno runs

The Dyno supports 2 types of runs, distance and fixed gear.

A Distance Run is speed, time, and power measured over a quarter-mile. These can be useful for gauging general vehicle performance.

Fixed Gear runs are generally made in one gear over a user specified RPM range (OT-2 hardware required). This is generally more useful for performance tuning, particular with the addition of wideband (lambda/AFR) measurements from an MTS compatible device (like the Innovate Motorsports LC-1).

⚠️Dyno supports up to two AFR channels as part of run data. If you need more than two channels of AFR it is recommended that you record runs with the LogWorks tab and analyze the results using our free LogWorks desktop software.

3.1.2 Accuracy

With OT-2 hardware, measurements of time, speed, RPM, and distance should have good accuracy. With proper orientation, acceleration measurements taken from the iPhone/iPod touch should also be good to fair.

However, with or without OT-2 hardware, power readings should not be taken as 'absolute' measurements but as 'relative' measurements for tuning and performance purposes. This is because of the number of variables involved. Although the software attempts to correct for many of them, like the shift in vehicle pitch normally experienced in acceleration, other factors, like the drag coefficient of a particular vehicle and current atmospheric conditions, are not.

3.2 *Economy Tab*

The Economy tab will allow you to track your driving habits and see them real-time. By swiping the screen to the left you will also find a very hand fuel log giving statistics on your GPM (Gallons per Mile), CPM (Cost per Mile), and CPG (Cost per Gallon).

3.2.1 Measuring Fuel Economy

Select the real-time screen. Monitoring will start automatically.

The exact meaning of 'Fuel Economy' will depend upon the data available from your vehicle's ECU (OT-2 only). In all cases, a higher number means better fuel economy and a lower number means poorer economy.

'Acceleration analysis' can be thought of as a 'smoothness' score. Again, higher numbers are better than lower numbers. For best accuracy, the iPhone/iPod touch should be kept stationary and isolated from vibrating surfaces.
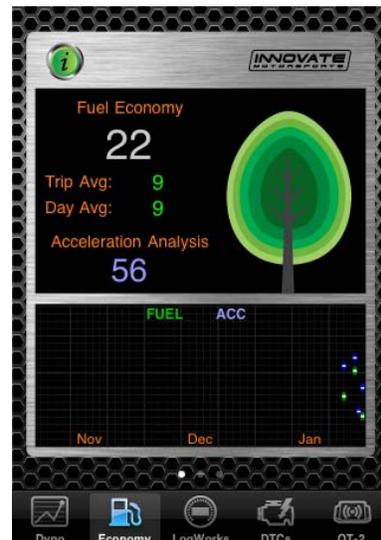
3.2.2 Entering Fill-Up Information

Swipe left until the fill-up summary screen is in view. Press the "Fill-up" button.

⚠️ The fill-up summary utility tries to detect missed entries (fill-ups not entered) so that averaging over time will not be distorted. The distance threshold for 'missed' can be set by pressing the 'i' button.

It is generally cheaper and better for the environment to fill up completely each gas stop, however, do not hesitate to log partial fill-ups. The fill-up summary averages over all contiguous entries so your long-term data will still be correct.

Similarly, it is not necessary to 'top up' the tank to the absolute fullest for accuracy. Again, the tool averages over time. 'Topping up' tends to be bad for the environment.

There are many 'tips' on saving money on gas. But, based on the data we collected in testing there are three that we can recommend. First, slow down! Simply obeying posted speed limits saved our testers an average of 11% in fuel. Second, cruise control. If you have it and can use it, it appears to improve economy an average of about 9%. Third, fill up early in the morning, on Wednesdays.

Yes, that last one is odd, but it is two factors combined. Statistically, fuel prices appear to be lowest on Wednesdays and early morning is generally when the fuel is dispensed at its lowest temperature.

3.3 *LogWorks Tab*

There are three pages in the LogWorks. The first gauge display can be configured to display any three channels and allows the start and stop of a log. The second page displays all the channels selected.

 Before using the LogWorks tab it is necessary to configure which channels are in the OT-2 tab which is reviewed in the next section.

3.3.1 Channel Selection in the OT-2 tab

1. Press the OT-2 tab.

2. On the upper left-hand corner you will see a (i) icon which is used to enter a configuration screen, alternatively press the HW SETUP button.
    (Note: The main OT-2 page serves as a status page giving you information about the hardware, network, and OBD-II connection.)

3. The configuration screen has three parameters to configure:

Channels to Provide: Select how many channels to display and data log. (Note: It is best to start with a small number of channels in the beginning to be able to gauge the speed of the ECU.)

OBD-II Protocol: Select which OBD-II protocol to connect with. We suggest leaving this setting set at Automatic.

Channel Functions: The channels that are listed are the channels that the ECU reports as available. You will notice that you have the option of selecting whether you want the channel to be Normal or Low priority. This feature will allow you to scan non essential channels less often to gain greater speed for more important channels. See chapter 6 on OBD-II Channel speed for more information,

4. Press Done on the upper right hand corner when done configuring.

3.3.2 Selecting Channels to Display in the Gauge Display

1. Press the LogWorks tab.

2. On the upper left-hand corner you will see a icon, press it to enter the configuration screen.

3. The configuration screen has three parameters to configure:

Imperial Units: Allows you to select Imperial Units or Metric

Lambda or AFR: If there is any Innovate Motorsports A/F meter connected to the OT-2 you can chose to display the channels as AFR or Lambda.

Gauges: Chose which channel to display on the gauge. Note: Channels available for display must be enabled from the OT-2 tab first.

4. Press Done on the upper right hand corner when done configuring.

3.3.3 Data Logging

To record a log press 'R' on the first page. The 'R' will blink while you are recording. Press 'R' again to stop.

To email a log swipe left until the Log List is in view. Select the log you wish to email.

 The emailed file can be opened for viewing and analysis with the Windows PC version of LogWorks. Free for download at www.tuneyourengine.com.

3.4 *DTCs Tab*

This tab is for viewing and clearing 'Diagnostic Trouble Codes' on your vehicle. It requires OT-2 hardware to operate. Within this tab you can scan for DTCs, clear DTCs, and view the status of emission tests

3.4.1 Scan for DTCs

If hardware is present and connected a scan will happen automatically when you select this tab. To scan again, press the 'Re-Check' button.

Note: If there are more codes than can fit on the screen you can scroll the text by swiping up and down. If you are running OS 3.0 or newer you can also copy and paste the results.

3.4.2 Clear DTCs

Press the 'Clear All' button.

Pressing the 'Clear All' button sends a *request* to the ECU that all trouble codes be cleared. But, ultimately, the ECU decides if a code can be cleared. If the same failure conditions are detected, the light will stay on and some codes can only be cleared by a series of special steps or special vendor specific commands.

3.4.3 Emissions Tests Status

Press the 'Advanced' button.

In California, and a growing list of other parts of the US, cars must be smog tested. As part of these tests, some self test information is taken from the vehicle's ECU. When all available self tests report "Ready", the vehicle can be smog tested. If any report "Not Ready", the test must be deferred. Usually "not ready" will appear after DTCs have been cleared, the battery has been disconnected, or a set of specific fault conditions has been detected. If the 'MIL', or 'Check Engine' light is off, the tests will generally transition to 'Ready' simply with driving and the passage of time.

3.5 *OT-2 Tab*

This tab shows basic information about your OT-2 hardware and your vehicle's ECU (Engine Control Unit). It also allows you to configure your OT-2.

3.5.1 Channel Configuration

1. On the upper left-hand corner you will see a icon which is used to enter a configuration screen, alternatively press the HW SETUP button.

2. The configuration screen has three parameters to configure:

Channels to Provide: Select how many channels to display and data log. (Note: It is best to start with a small number of channels in the beginning to be able to gauge the speed of the ECU.)

OBD-II Protocol: Select which OBD-II protocol to connect with. We suggest leaving this setting set at Automatic.

Channel Functions: The channels that are listed are the channels that the ECU reports as available. You will notice that you have the option of selecting whether you want the channel to be Normal or Low priority. This feature will allow you to scan non essential channels less often to gain greater speed for more important channels. See chapter 6 on OBD-II Channel speed for more information,

3. Press Done on the upper right hand corner when done configuring.

4   LogWorks and LM Programmer (Windows PC)

The LogWorks application is used to read and analyze previously logged data or you can stream data from the OT-2 real-time. With the LogWorks software you may chose to either connect via a wireless network or the USB cable.

LM Programmer is used to configure and select the OBD-II channels, read and clear DTC codes, and update the firmware. The LM Programmer software allows you to chose to either connect via a wireless network or the USB cable, but a USB connection is required to update the firmware.

4.1 *Establishing a connection to LogWorks*

Depending on your network and personal firewall settings, you might receive a warning about network access being blocked when you first run either LogWorks or LM Programmer. It is very important that you select "Unblock", otherwise the applications will not be able to access the hardware wirelessly!

1. Connect the OT-2 to the USB port on your computer or establish a WiFi connection.

2. Run LogWorks (version 3.04 or newer)

LogWorks can be found under "All Programs", "LogWorks3". After a few moments a screen like this should appear:
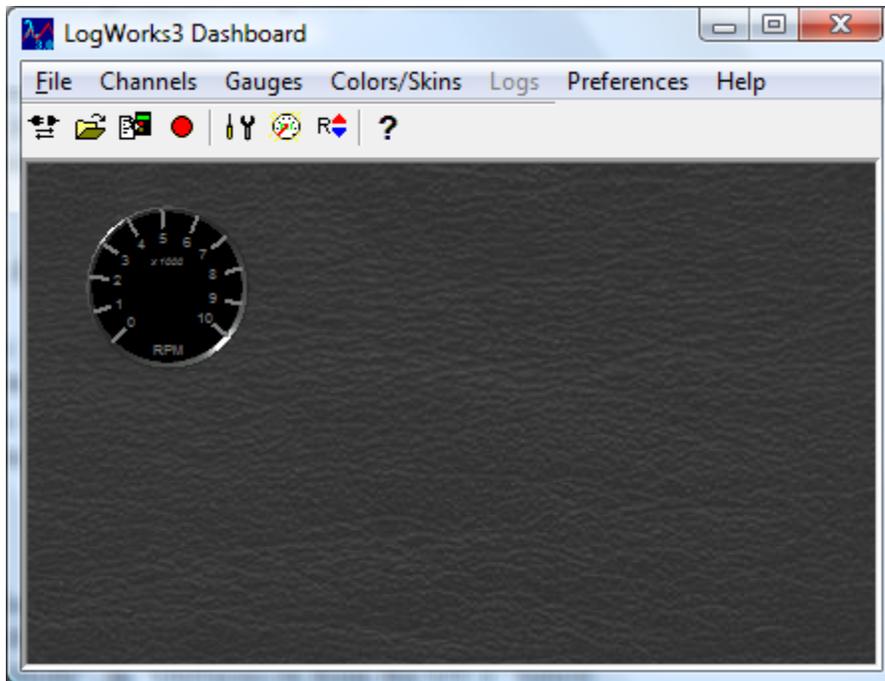
3. Select "Connect", either the leftmost icon on the toolbar (it is supposed to be a male and female socket with arrows in both directions below) or select "Connect" from the "File" menu. A box like this should appear:
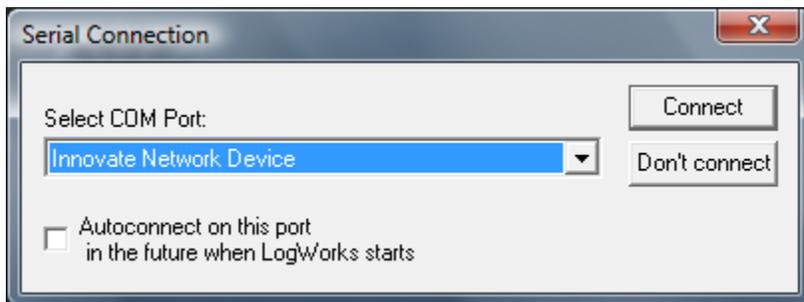
The 'combo box' will also show any COM ports that you have attached to your computer. If you are connected via Wi-Fi, select "Innovate Network Device" (like above). If you are connected via USB, select "Innovate USB Device". In both cases, finish by pressing the "Connect" button.

Please note, if the correct option is not present, you need to check your network or USB connection to the device. The options are only presented when the software has already found a suitable device using that type of connection.

After you select "Connect" you will be presented with a "Wizard" for configuring the channels. You can just press next/accept (the Wizard can be re-run later).

Lastly, click "Auto define" if you get the 'No gauges defined' dialog box.

4.2 *Select OBD-II Protocol and number of MTS Channels*

1. Connect the OT-2 to the USB port on your computer or establish a WiFi connection.

2. Run LM Programmer (version 3.27 or newer). LM Programmer can be found under "All Programs", "LogWorks3".

3. The Protocol/Channels tab allows you to set the OBD-II protocol to be used and the number of MTS channels to generate:
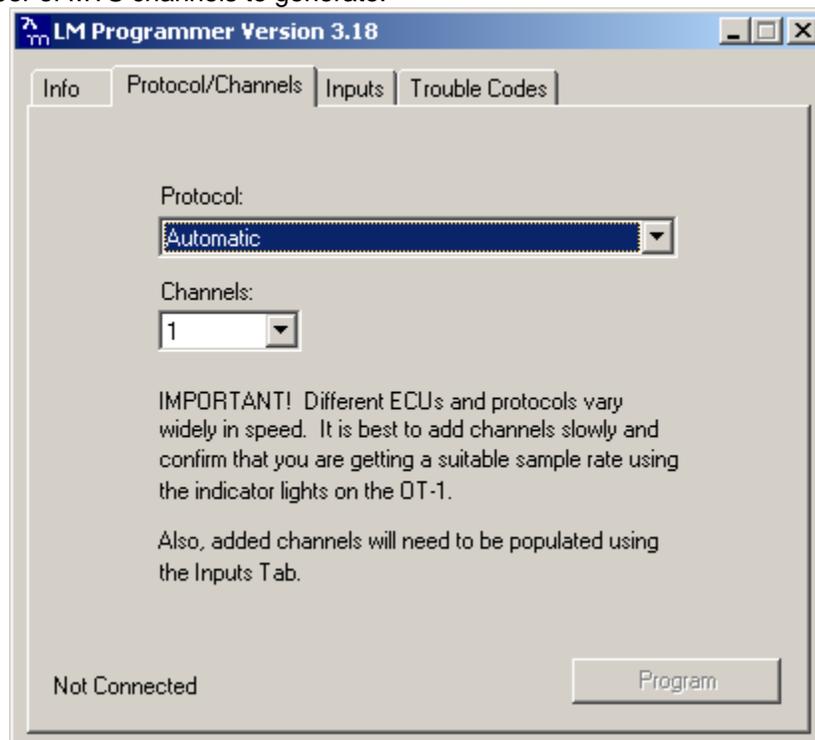
The current connection status with the ECU is shown in the lower left hand corner:

This page also lets you set the number of MTS channels to generate. This can be from 1-16. As the text on the page notes, just because the OT-2 can generate 16 channels of MTS data does not mean that all ECU's can fill them at a reasonable speed.

Also, once channels are added, they need to be associated to OBD-II data values using the Inputs tab (see the next section).

Changes made in Protocol or Channels become effective when the Program button in the lower right corner is pressed.

4.3 *Assign MTS Channels to OBD-II Inputs*

The Inputs Tab allows you to assign the generated MTS channels to a particular OBD-II value:
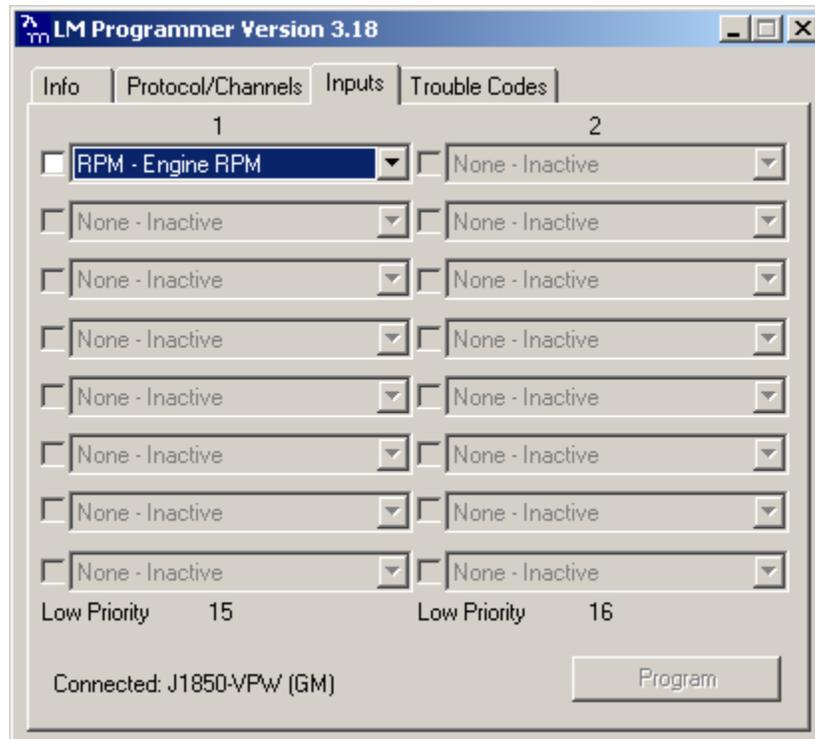
In order to do this, the OT-2 must be connected to the ECU in the vehicle (vehicle light on and blinking). If it is not, you will be warned and the current input assignments will be displayed but you will not be able to edit them. If this happens, you can turn on the vehicle, wait for the vehicle light, leave the Inputs tab, and return to it.

Only the number of channels selected on the Protocol/Channels page can be edited. The available values for logging on the connected ECU are listed in the drop list for each Input. Some vehicles will support larger lists than others.

4.4 *Check and Clear DTC Codes*

The tab in LM Programmer displays any Diagnostic Trouble Codes ("DTCs") currently reported by your vehicle. Like the Inputs page, the OT-2 must be connected to the ECU for this page to work correctly.
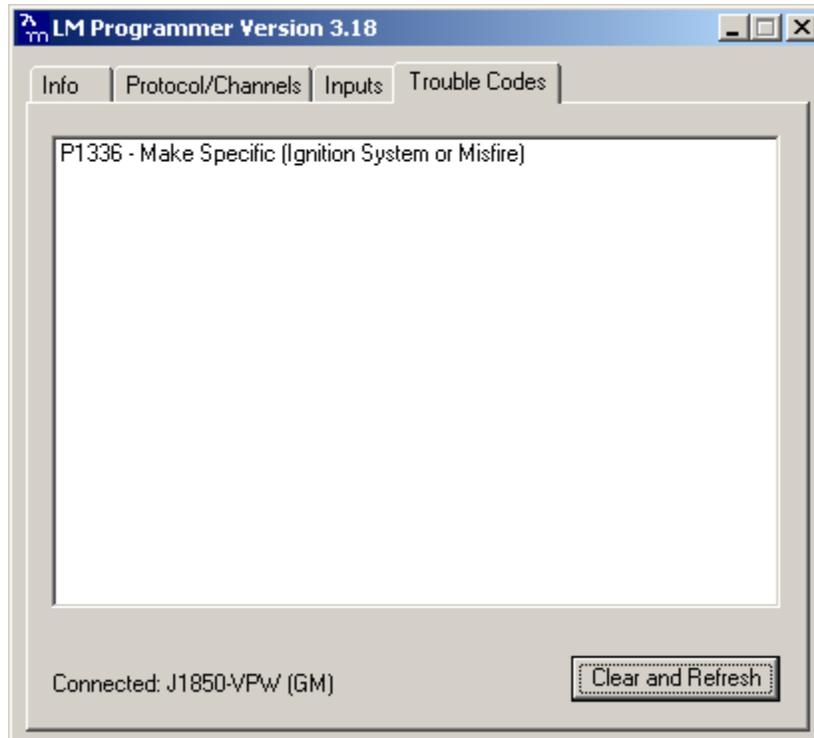
Standard Trouble Codes are listed both with a number and a description. Manufacturer specific codes will generally just appear as a number, though sometimes, like the case above, the general category can be identified.

You can request that the ECU clear the pending codes using the Clear and Refresh button at the bottom right corner of the page.

Note: *On some vehicles, the ignition must be on, but the vehicle not started, for the Clear DTC request to be accepted.*

Note: Pressing the 'Clear and Refresh' button sends a *request* to the ECU that all trouble codes be cleared. But, ultimately, the ECU decides if a code can be cleared. If the same failure conditions are detected, the light will stay on and some codes can only be cleared by a series of special steps or special vendor specific commands.

4.5 *Updating Firmware*

Updating the firmware requires you to connect the OT-2 to the computer via the USB cable.

On the 'Info' tab of the LM programmer software you will find a button to 'Update Firmware.' Click it. You will be presented with a file dialog box that allows you to select a firmware file. Firmware files end with the file extension .dld. OT-2 firmware file names start with: ot2b. The first part is followed by the version.

After you opened the firmware file, this new firmware will be downloaded in the DL-32 device

5 Installing an OT-2 with an LC-1 or other MTS compatible device

1. With **ALL MTS DEVICES OFF** (no power) and the **OT-2 DISCONNECTED FROM OBD-II**, connect the Serial **OUT** port from your last MTS device to the Serial **IN** port on your OT-2 with a suitable patch cable

2. Find the OBD-II connector in your passenger vehicle

3. Plug the OT-2 into the OBD-II port and observe the MTS light.

   At NO TIME should the MTS light come on!

   If the light comes on steadily for 1 second, then starts blinking, the OT-2 is in the wrong mode. That is, it believes that it is the 'head' unit. If this occurs, UNPLUG the OT-2 from the OBD-II connector and check all MTS connections. It is sometimes helpful to press firmly and twist slightly to make sure that the connectors are inserted all the way.

   Once the connections have been checked, repeat step 3 until the MTS light behaves correctly.

4. Start the ignition on the vehicle. Shortly after the ignition is started, the MTS light should start blinking. This indicates that MTS data is being received from the MTS hardware 'upstream' and everything is working correctly. If the light is not blinking, confirm that the other device(s) are, in fact, receiving power and that the serial connections are all secure and correct (remember, always power off all units when connecting or disconnecting the serial cables!)

6 OBD-II Channel Speed

The first is a log trace of one channel (RPM) from a 2001 Lexus:
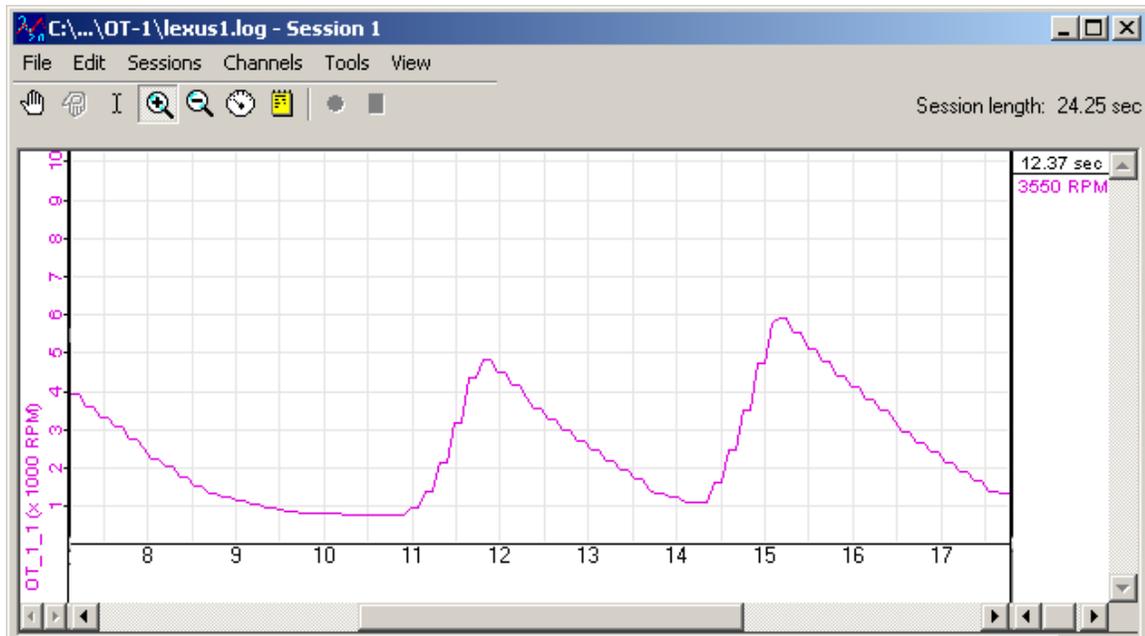
Notice that the data appears 'steppy' and, based on the timeline, appears to be updating about 6 times per second.

Next we have a log trace of 16 channels (RPM, MAF, MAP, TP, you name it) from a 2006 Saturn:
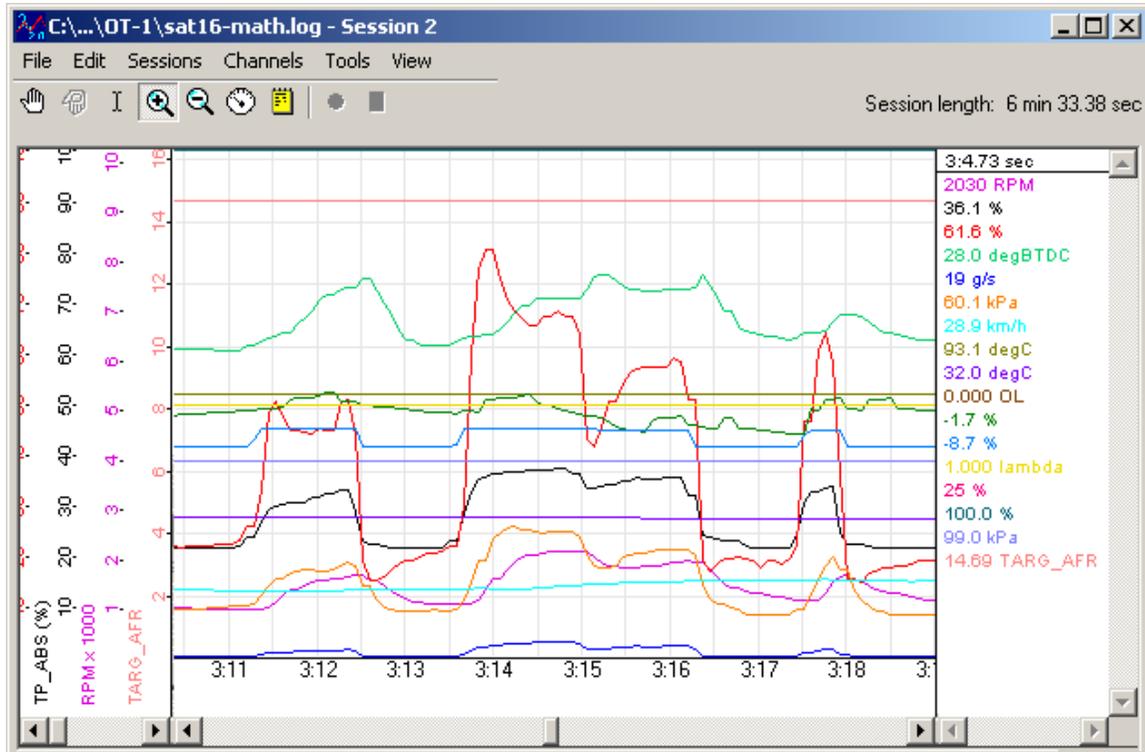
Even if we zoom in to a closer time scale, the data is quite smooth. Performance is controlled by two things:

- The Connection Speed
- ECU Responsiveness

The Lexus in the first example is using ISO 9141 and 10.4K bits per second. The Saturn is using ISO 15765 (CAN) at 500K bits per second. So it is easy to understand the difference in performance.

However, the responsiveness of the ECU also can be a significant factor. Consider this log from a 2006 Pontiac GTO:
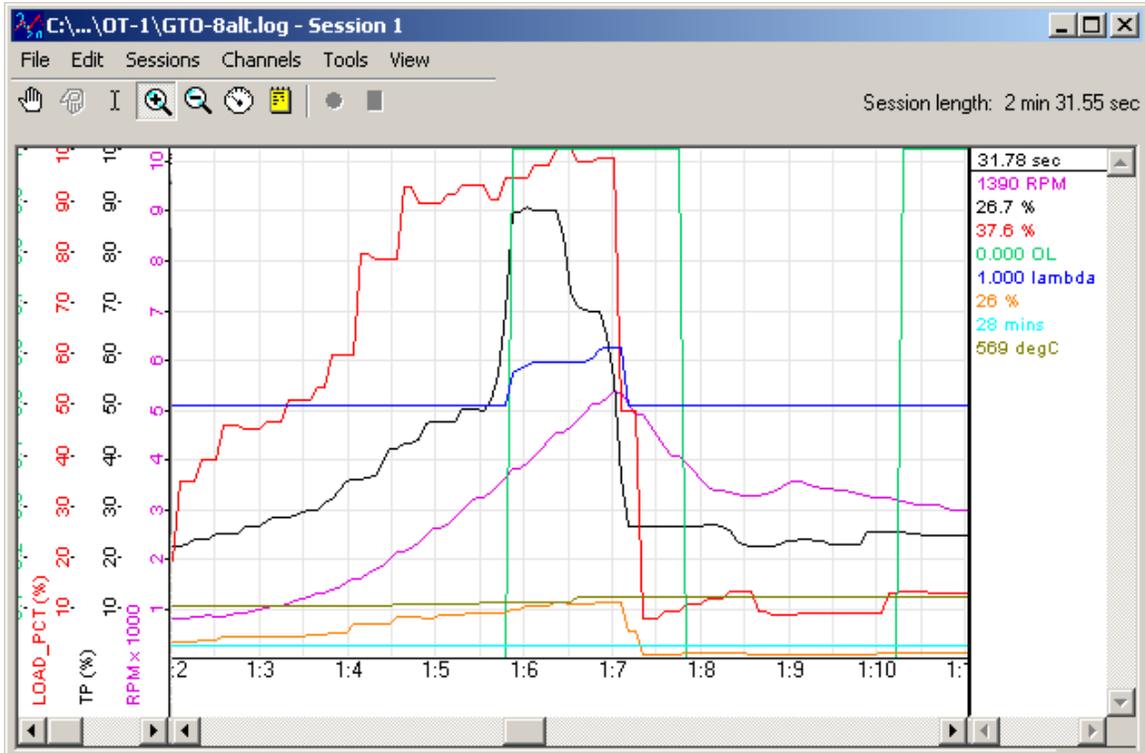
Like the Saturn, it is connected using 500K bit CAN, but we can begin to see some 'steppiness' in the RPM channel with only 8 channels being collected. In addition, some values, like the Calculated Load are courser still. Presumably because the ECU itself is only calculating them a few times per second.

With this in mind, it is probably best to assign channels only a few at a time and then select "Program". The ECU will disconnect, reconnect with the new choices, and then the overall sample rate of the current settings can be observed using the blinking vehicle light on the OT-2.

It is then up to you, the user, to decide what is an acceptable balance.

6.1 *Set the Priority of OBD-II Inputs (Optional)*

Next to each Input Selection on the Inputs page In LM Programmer there is a small checkbox labeled "Low Priority." This option is also available when selecting channels through the LogWorks Mobile software:
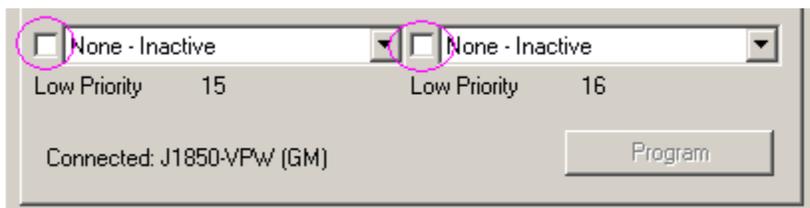
Since it is often a battle getting an ECU to deliver data fast enough, it is reasonable to ask why one would lower the priority of a channel? The simple answer is, some ECU values just do not change very fast. So, reading those values less often means that values that do change quickly

can be read more often. To understand how this works let's take a look at how the OT-2normally reads values:

As we can see from the diagram on the right, values are read from the ECU one after another, in a loop. Since takes the ECU has certain amount of time to respond to each query, the longer the list of channels, the longer it takes to complete the loop. Obviously, the longer to takes to complete the loop, the larger the time gap between each read of an individual value.

Read 1st Value

Read 2nd Value

Repeat

Read 3rd Value

Read last Value

Read 1st Value
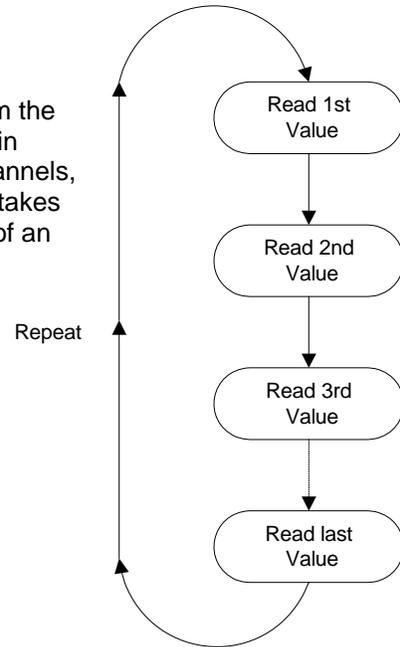
Now let's look at how Low Priority Values fit into this. Instead of being read once each time through the loop, only one Low Priority value is read each time through the loop. So, if you have three low priority values, it will take three passes of the loop to read them all once.

Read 2nd Value

Repeat

Read last Value

Read one Low Priority Value

Low Priority Value List
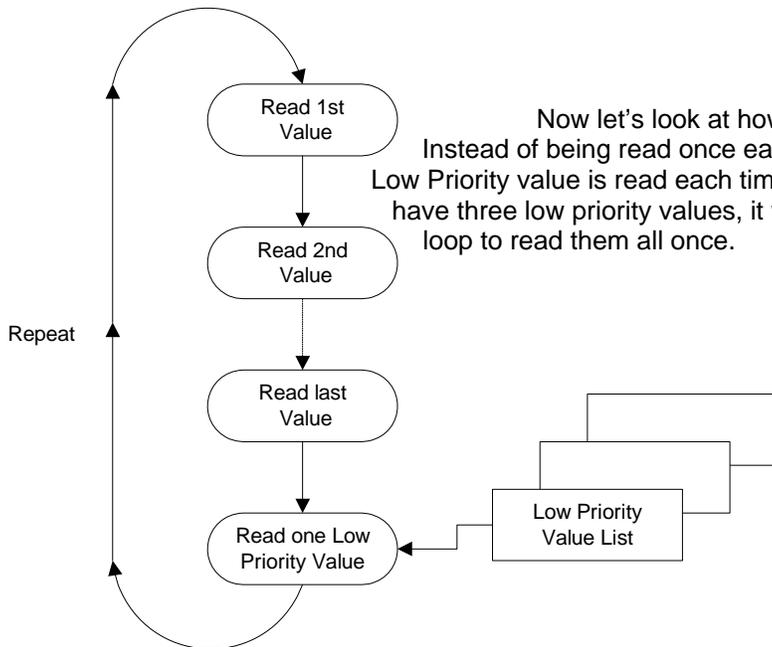
With our racetrack shaped diagram fresh in mind, let's look at Low Priority inputs in practice. In this example the vehicle can provide four OT-2 channels that update at full MTS rates. Even four channels are still very usable. For example, here is RPM, SPARKADV (ignition timing), FUEL1_OL (Open Loop Status) and VSS (Vehicle Speed Sensor):
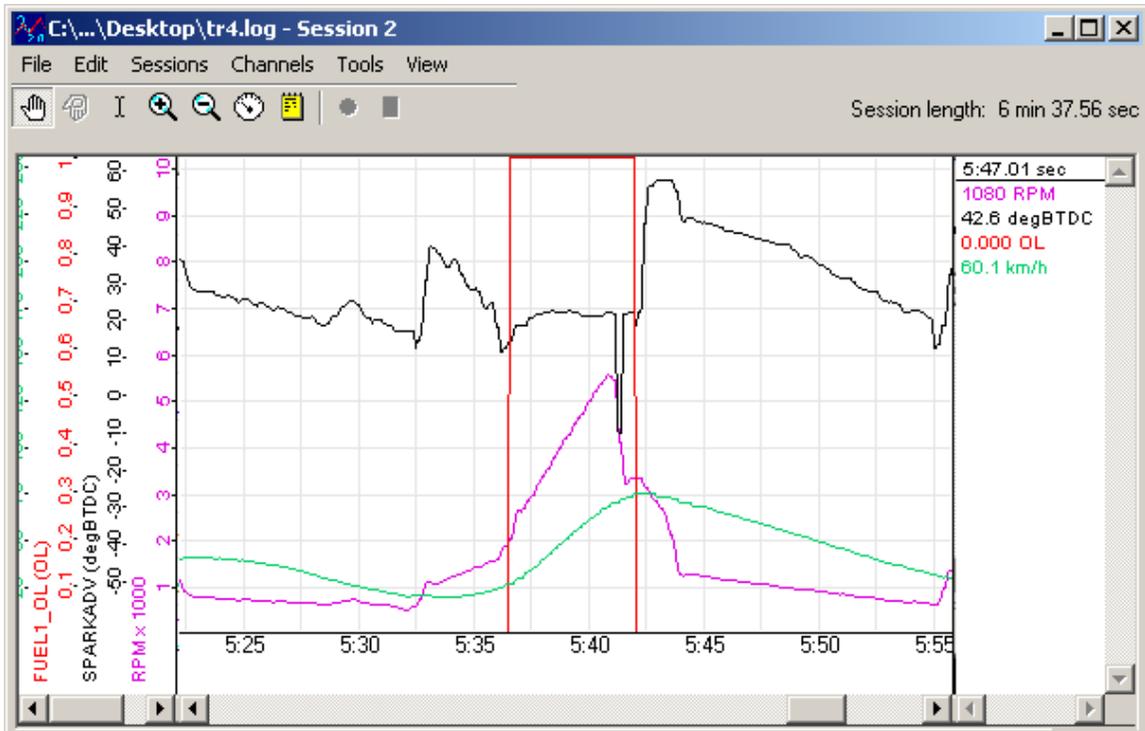
But what would happen if we also added ECT, IAT, MAF, and MAP? If we left all our channels at normal priority, some critical channels may not be fast enough for our purposes:
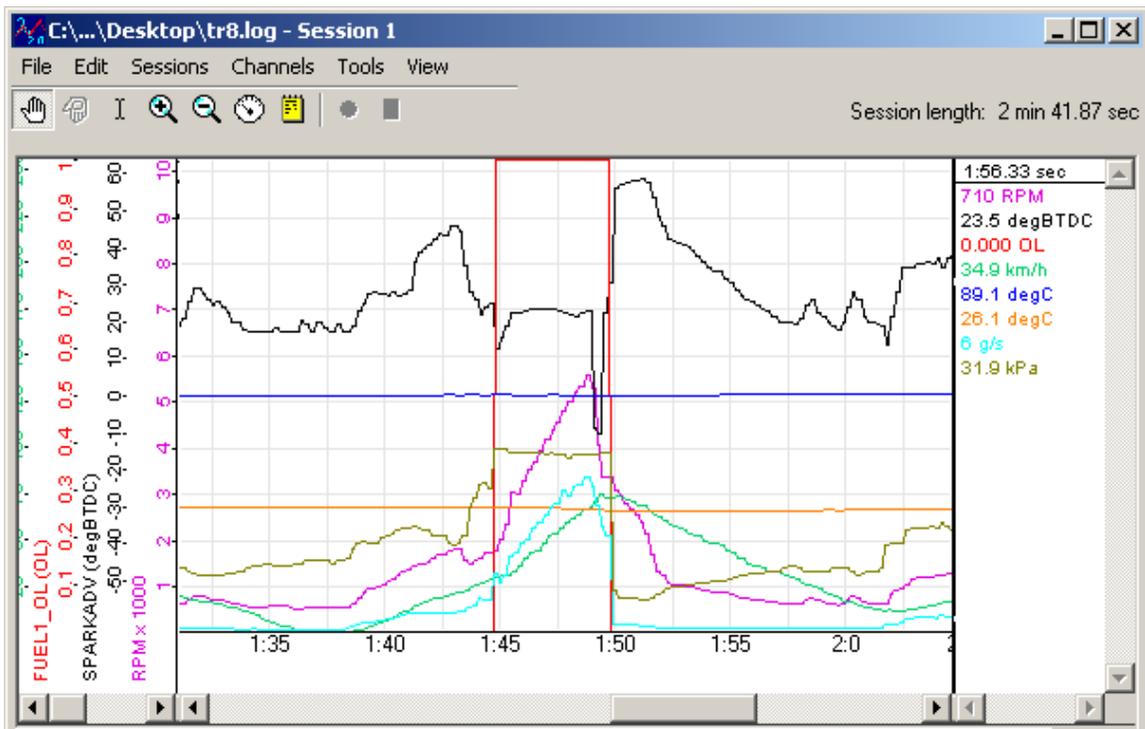

But not all channels change quickly and we are more concerned with some channels than others. For example, let's say we are primarily concerned with RPM, SPARKADV, and FUEL1_OL. We'd

like VSS, IAT, ECT, MAF, and MAP but we do not care if they update slowly. So, we can mark those channels as low priority:
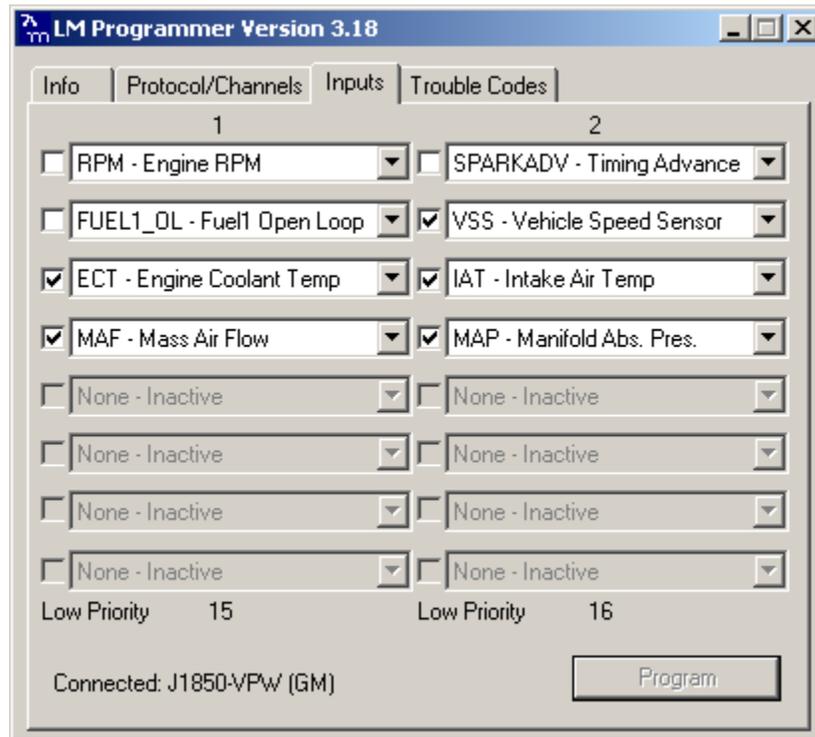
Now, when we log the data, RPM, SPARKADV, and FUEL1_OL, look like our original four channel log:
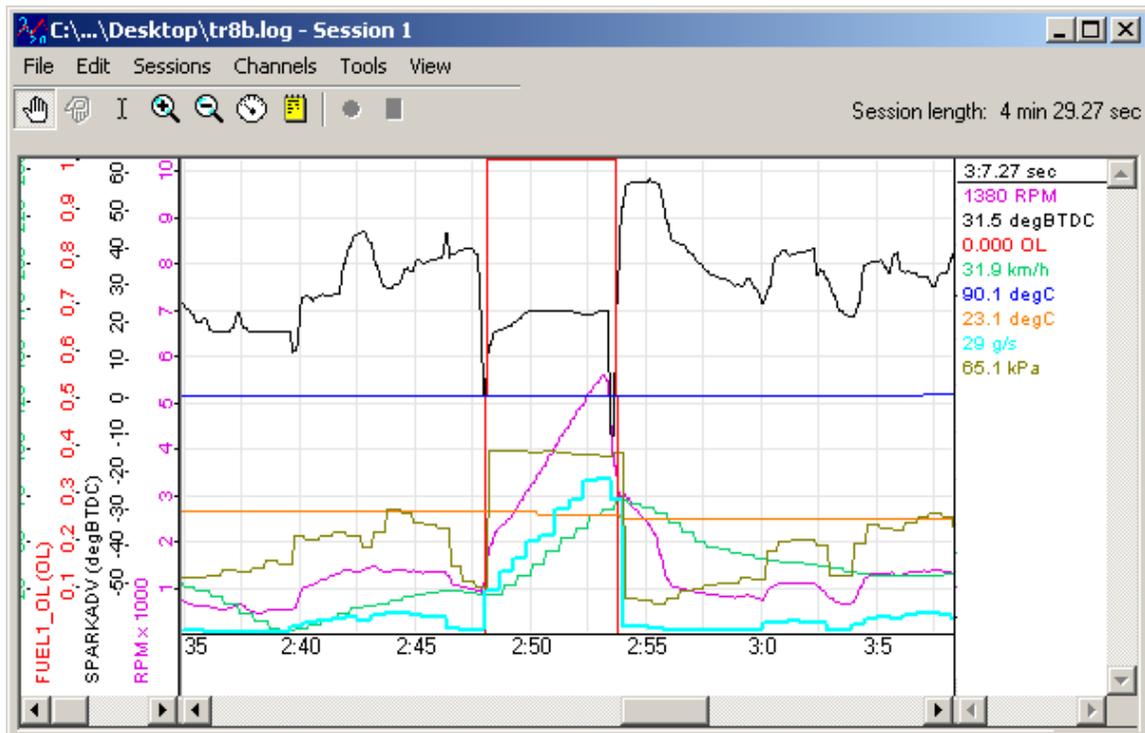
This extra resolution comes at the expense of our Low Priority inputs. These channels all share the ECU 'bandwidth' once used by VSS alone. But, this lets us have high resolution critical data combined with lower priority, lower resolution data in the same log.

7 Tip, Tricks, and Troubleshooting

1. **Can I use the Wi-Fi network advertised by the OT-2 for other things?**

Absolutely! In development we use the same network to move files between laptops and the iPhone in the vehicle. The OT-2 has a simple "DHCP server" built in, so there is no reason that you could not use it to, say, play a Wi-Fi multi player game between iPhones or gaming devices in the vehicle. However, we would advise that video gaming be limited to **passengers**! Also, only one client can be connected to the OT-2 for data logging at a given time and responsiveness will generally be better if the network is not otherwise in use at that time.

2. **Most the time my iPhone connects to my hardware right away, but sometimes I get a 'no hardware' warning and the software will connect 20-30 seconds later, why?**

We have strived to make connection as painless as possible. The OT-2 offers a unique network name for the iPhone to remember, the hardware offers DHCP services to expedite network initiation, and the software does automatic discovery, connection, and retry. Most the time, this works very well. You pull out the iPhone, start the app, and, the connection is there.

The times it does not work, network setup is delayed or the proper network connection is not established. This could be due to a number of factors. For example, the iPhone may still be getting a faint signal from another known network and is 'reluctant' to drop that connection and try a new one. Similarly, the DHCP services might have been 'missed' the first time around. They use a non-guaranteed form of network communication, and Wi-Fi is very susceptible to interruptions and errors.

As the question suggests, these issues often self resolve after a delay. But the following steps can virtually always expedite the process:

1. Exit the application
2. Open "Settings"
3. Select "Wi-Fi"
4. Confirm that the OT-2 is the selected network
5. Restart the application

Wi-Fi is a large battery drain on the iPhone, so the OS uses some pretty sophisticated rules for radio activation and power settings. So, even when the steps above do not involve 'doing' anything, simply opening the settings has the effect of powering up the Wi-Fi and activating the network connection (since the Wi-Fi tab itself activates the Wi-Fi circuitry to 'scan' for other networks).

3. **When I select "Wi-Fi" on the "Settings" page in my iPhone, I sometimes have to wait for my OT-2 network to appear, is this normal?**

Yes. The OT-2 advertises the network with something called a 'Beacon'. The beacon is sent periodically and the iPhone 'listens' and updates its network list periodically. Sometimes it takes a few scans before the two sides sync up. This is typical for all Wi-Fi devices.

4. **Why doesn't the Economy Meter just show MPG?**

A. The problem is that there is no standardized way to obtain MPG from the OBD-II port. Also, the available information varies between makes and models. Other concerns are the precision and the update rate of the data.

Take the example of many older Honda vehicles. Information available includes MAP, IAT, RPM, and VSS. So, in theory, fuel consumption is somewhat knowable. But, if you look up the equations you will find that there are other factors, like the displacement of the engine and its "VE", which varies with load and RPM. Even if we put in good estimates for these values, there are other factors. MAP is reported with fairly low precision. Also, the older ECU is very slow. It may only be possible to take the four readings once a second or so. This means that we are taking snapshots of MPG every second or so, without knowing what happens in between.

What the Economy Meter does is try to give a good indication of relative fuel consumption with the information a given vehicle provides. The purpose is not to replace your fuel gauge (the fill-up log in the application is the best long term measure of GPM), but to give you a tool to improve the economy of your driving. Variation in driving behavior can make a 35-40% difference in fuel consumption!

5. **Why does the Fill-up log report GPM instead of MPG?**

A. MPG is not a linear scale. A good way to illustrate this is with a question. If you wanted to help the environment, which would be better, trading in a 30 MPG vehicle for one that is 45 MPG, or exchanging a 12 MPG vehicle for one that gets 19 MPG?

If we turn the terms over, it is still not a linear scale, but it is easier to relate to day-to-day life. A good example of this is to turn on the 'Mileage by 100' option (press 'i' on the fill-up summary screen to find it). This simply shifts the decimal place on the results, but, suddenly, you can see 'I need x gallons to go 100 miles' or 'it will cost me x dollars to drive 100 miles'. Rather your goals are saving money or reducing your carbon footprint, we believe that GPM, which is similar to the European standard of liters per 100 kilometers, is generally more useful.

8 Software Developers Kit (SDK)

Information about the MTS data stream has always been available on request. In addition, Innovate Motorsports has long provided some basic SDK tools to make accessing measurement data from our hardware easier for third party applications.

What is different about the OT-2 SDK is that, in addition to documenting how to access the MTS data stream, it also provides information on how to dynamically configure the OT-2 (basically access and alter the features in LM Programmer). This allows software to dynamically pick which channels are polled at what time, and perform (previously) LM Programmer only features, like retrieving and clearing diagnostic trouble codes (DTCs).

In addition, the SDK offers an 'expert mode', where software can use the OT-2 to directly communicate with the ECU(s) in the vehicle. This potentially gives access to make/model specific information and features instead of just the 'generic' OBD-II information exposed via MTS.

Like our existing "MTS SDK", the OT-2 SDK is freely available for download. In addition to documentation, it includes sample applications for Windows, Mac (OS X), Linux, and iPhone.

9 Revision History

1.0 1/25/2010
Initial Release