USER MANUAL FOR GENERATION 2 HARDWARE

The purpose of this device is to regulate the turbocharger boost, make tuning easier to monitor, reduce the clutter in your interior (ie. separate boost guage, WBO2 displays, etc) and save some money by consolidating many devices into one. One particular important benefit by combining these together is now you can have an aftermarket boost controller that can respond to engine knock and safely reduce boost.

This one device can communicate to ALL year model Dodge Stealths, Mitsubishi 3000GTs, Mitsubishi GTO, Japanese GTO. What has been referred to as the hybrid models (94-95) also work. DSM cars from model years 90-99 will also work too. If you have an existing OBD1 datalogging cable, this will work. If your cable was designed to work with a palm device, you only need to purchase a null-modem serial adapter to make it work. All OBD2 style serial cables won't work unless they're modified for MUT communication. Inexpensive OBD2/MUT cables can be purchased from me to guarantee it will work properly. I'll be offering OBD1 datalogging cables in the near future.

This new design utilizes a larger microprocessor that doubles it's memory storage capacity from it's previous generation, allowing more software features to be added. A new expansion slot was added making it flexible for future features. The idea behind this is to allow the user to customize their device, such as serial datalogging, bluetooth datalogging, and microSD datalogging.

The first expansion card available is serial datalogging. This allows the user to plug in their notebook to the device via serial port and use familiar datalogging programs such as Hand Held Halo, or Evoscan. My device adds two new datalogable items such as Boost and WBO2 to the said programs making the datalogs very useful for tuning purposes. If the user does not have these programs, they can use CoolTerm which is free, and capture the serial data stream such as Time stamp, Boost, WBO2, Knock, RPM, EngineLoad, and Timing in CSV format and import to Excel for viewing.

SETUP CONFIG

To enter config menu, press and hold down on knob and then power up the device. Release when you see the Copyright message displayed on the screen. It will soon flash the message Config Menu and the software version number.

ECU Type=OBD1. Use this for 1991-1993 Dodge Stealth / 3000 GT / GTO , or 1990 – 1994 DSM.
ECU Type=MUT. Use this for 1994-1999 3000 GT / GTO, 1994-1996 Dodge Stealth, or 1997-99 DSM.
ECU Type=MUToverOBD2. Use this for 95-96 DSM, or if you're unable to communicate as MUT.

PSI Add step = xx. For use with an external pressure sensor, to make your display read 0.00 PSI.

WBO2 input= EGRT. Use this if you have your WBO2 wire fed into an unused Exhaust Gas Recirculation Temperature input on your ECU. Datalogging will be faster if this is moved directly to the WBO2 input on the device.
WBO2 input =wire. Use this if your WBO2 wire is wired directly to the device (preferred method).
WBO2 input =none. If you have no WBO2 at all, set this to none and the main screen will switch to NBO2 (narrow band O2) and display the front O2 sensor voltage.

WBO2 low = 10 Set the lowest AFR value that your wideband reads.

WBO2 high= 20 Set the highest AFR value that your wideband reads.

WBO2 factor=1.00 Multiplies the WBO2 wire by this value . In case of weak signal use this.

WBO2 offset=0.0 Adds a small correction value to your WBO2 results.

Contrast=50. Adjusts the contrast display, low value=darker, high value=lighter. If the display flickers, the contrast value is set too high, go to a lower number.

SETUP CONFIG continued...

Push to toggle color. Sets the power on default color: Red, Green, Blue, Purple, Cyan, Yellow, White or none.

Car type = 3/S for Mitsubishi 3000GT / GTO / Dodge Stealth cars.
Car type = DSM for Talons, Eclipse, Lasers.

Aux input= latch. If the auxiliary input receives a ground signal, it will remain triggered until the device is powered off. Example usage: Water/Alchy injection fluid level indicates low fluid or empty, the Aux will remain triggered and Aux Duty Cycle can reduce boost to preset safe level.
Aux input= normal. When auxiliary input receives a ground signal, it only stays triggered while the ground signal is present. Example usage: Toggle switch that selects low/high boost. Low boost could be used for Valet mode.

PSI Sensor= Intrnl. Uses internal pressure sensor 0.0psi to 36.3psi, vacuum is not measured.
PSI Sensor= Gr4Bar. Uses external 4 BAR greddy pressure sensor (vacuum to 43.5psi). Tested to work with the original Greddy pressures sensor, and black plastic clone version too. The silver metal clone version does not work properly.
PSI Sensor= GM3Bar. Uses external 3 BAR GM pressure sensor (vacuum to 32psi). Untested.

ECU Clock=100%. 100% = normal ECU clock speed. If you added a 15% faster clock speed crystal, enter 115%.

Knock Alert > xx. If knock exceeds this threshold, it will warn the driver with a flashing screen, and audio alert will only sound during knock.

CoolantAlert > xxx. If coolant temperature exceeds this threshold, it will warn the driver with a flashing screen, and audio alert will sound.

ScreenRefresh=xx. Think of this as a screen refresh delay. A low number updates the LCD screen with new data quickly, and a high number updates the screen less frequently. During the winter months you might want to increase this number because LCD screens are sluggish in the cold.

SETUP CONFIG continued...

Datalog=Off Datalogging is turned off.
Datalog=PassThru External datalogging software programs such as Hand Held Halo, or Evoscan can make requests. The device allows HHH and Evoscan to datalog Boost, and WBO2 as new datalog items.
Datalog=TxtMode1 Serial datalog stream at 57600 baud that prints out Time Stamp, Boost, WBO2, Knock, RPM. Use a free program such as CoolTerm to capture results and view results on Excel.
Datalog=TxtMode2 Serial datalog stream at 57600 baud that prints out Time Stamp, Boost, WBO2, Knock, RPM, EngineLoad.
Datalog=TxtMode3 Serial datalog stream at 57600 baud that prints out Time Stamp, Boost, WBO2, Knock, RPM, EngineLoad, Timing.

PassThru=1953 baud. Configures passthru for OBD1 datalog speed.
PassThru=57600 baud. Configures passthru for 57600 for HHH, Evoscan.
PassThru=15625 baud. Configures passthru for 15625 MUT speed, for Evoscan.

AudioBuzzer=On. Allows device to use audio buzzer to get driver's attention.
AudioBuzzer=Off. Turns off audio buzzer completely.

98/99 3000GT=Yes. Adds support for different real fuel trim codes on 98/99 3000GT cars.
98/99 3000GT=No. Uses standard rear fuel trim codes (94-97 cars).

Test solenoid Activates boost solenoid at 50% duty cycle for 2 seconds.

Test Buzzer Activates audio buzzer for 1 second.

Calibration=xxx Factory calibration can be tweaked for more reliable 57.6K serial connection. When editing the calibration number, the datalogging port will broadcast a string of "0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmn opqrstuvwxyz" continously. If the string appears incorrectly, your calibration number is no good. Generally there are 16 valid calibration numbers, the ideal calibration number is not the highest value but the third highest.
A free program called CoolTerm can be used to monitor the serial port at 57600 baud (8N1).

SETUP CONFIG continued...

Units = Imperial – **temperature in degrees Fahrenheit and boost in PSI.**
Units = Metric – **temperature in degrees Celsius and boost in BAR.**

Push to exit config menu – quits the config menu and takes you to normal operation.

OPERATION OF DEVICE

When powering up OBD1 users will jump directly to the default screen as there's no handshake needed when communicating to the ECU. For MUT or MUToverOBD2 users, a handshake is required before communication to the ECU, the user doesn't have to do anything, as this is done automatically. A two second handshake will take place, and then transfer over to the main screen.

The default main screen is shown below:

14.7	**0.0**	**0**
WBO2	**PSI**	**KNOCK**

First value shows the wideband O2 AFR. The second value is the pressure sensor in PSI. The third value is knock sum reported from the ECU.

Pressing down on the knob quickly will dim the screen (good for night time driving), pressing it again will brighten the screen. This function only works on the main screen.

Pressing down on the knob for 1 second or more will change the color. This is handy so you don't have to go through the config menu. To make this color permanent you will need to go to config menu. Powering down the device will lose this temporary color change.

To navigate to other screens use the rotary knob. Turning the rotary knob clockwise will display ECU related screens and turning counter-clockwise will show boost controller menus. To edit information, you must push down on the knob and the screen characters will go into capital characters to let you know that you're in edit mode. To exit edit mode, press down on the knob again or follow the instructions on the screen.

xx.xPSI Peak
xx Knock Peak

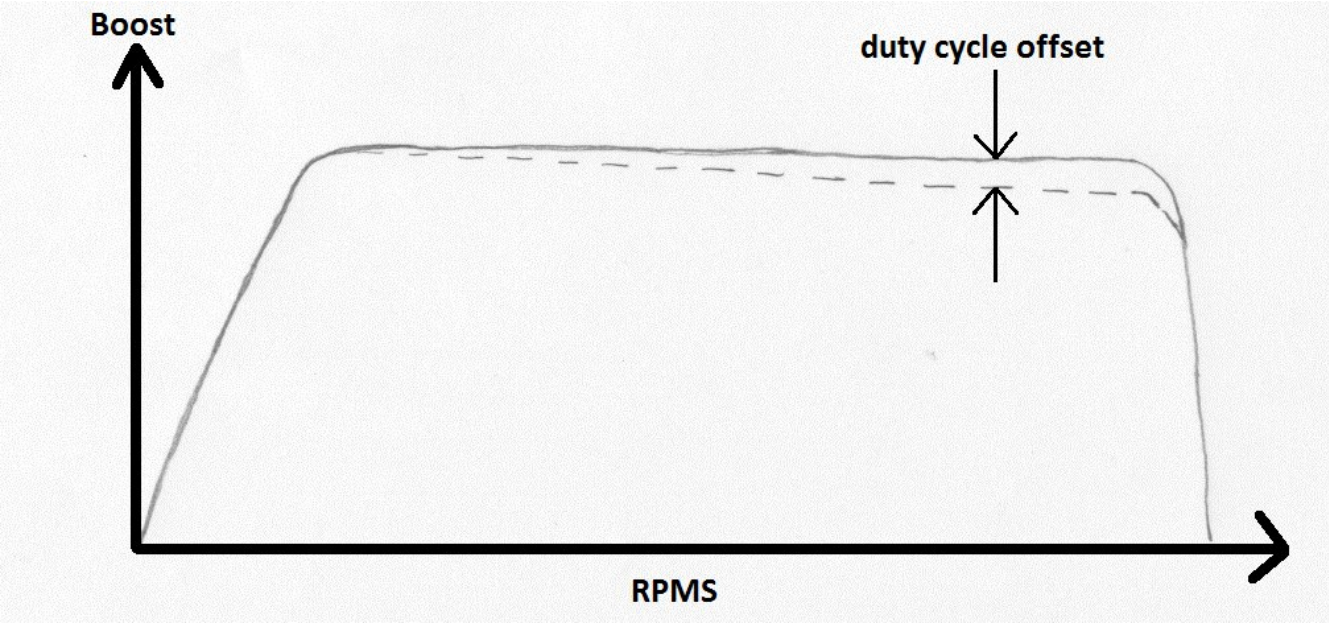
Displays highest recorded boost pressure and knock values. To the right you may notice a small graph. It's a small datalog of PSI vs RPMs. The PSI scales from 1 to 17psi. Because the display is not a graphics display but a character display, the scale for 9psi will be absent. You can easily see your boost response curve. By pressing down on the knob, you reset the values.

Dutycycle=xx.x

This works just like many electronic boost controllers out there. Small duty cycle numbers gives you low boost, large duty cycle numbers gives you high boost. Start off with small numbers and gradually work your way up. Examples: 30% duty cycle=10 PSI, 50.0% = 18 PSI on my 15G turbos.

Dutycycle offset (adjust boost curve)

Allows you to add or subtract duty cycle based on RPM, starting at 4000 RPMs, 4500 RPMs, etc. Add duty cycle if you have wastegate creep problem, subtract duty cycle if you have boost creep problem. The picture below shows an example of wastegate creep problem with boost falling off at higher RPMs (dotted line). By introducing extra duty cycle, the boost curve becomes more consistent (solid line). Here's the values I used on my car. 4000 +0, 4500 +0.6, 5000 +1.3, 5500 +2.0, 6000 +2.6, 6500 +3.3, 7000 +4.0, 7500 +4.0, 8000 +4.0.



BOOST CONTROLLER MENUS continued...

-DC% / Knock = x.xx

If we get engine knock, this will reduce our duty cycle numbers and lower our boost pressure. The greater amount of knock, the more duty cycle is reduced. Note, on 3/S vehicles, the maximum amount of knock that can be read is 28. On DSM vehicles the maximum amount of knock is 43.

For example, if a value of -0.50 ratio is programmed in, and let's say we had a knock value of 20, multiplied we would have -10.0% duty cycle reduction (or about 5psi drop on my car). When knock is gone, the original duty cycle is restored. As boost ramps up again, you may experience knock again. It is quite possible for the driver to experience a bouncy boost curve if the driver continues to drive in this manner. If you do not want any boost reduction when knock occurs, set the ratio value to 0.00.

Alarm Boost=xx.x PSI

When boost reaches this amount or more, the boost solenoid will shut down for 1 second, reducing turbo boost pressure to wastegate levels. An overboost warning message along with peak offending boost pressure will be displayed for 5 seconds. An audible alert will only be heard if boost is above alarm boost preset. Should the driver ignore the warnings, and because the boost solenoid is only shut down for 1 second, it is quite possible for the driver to experience a bouncy boost (high boost, low boost, high boost, low boost).

Dutycycle temp

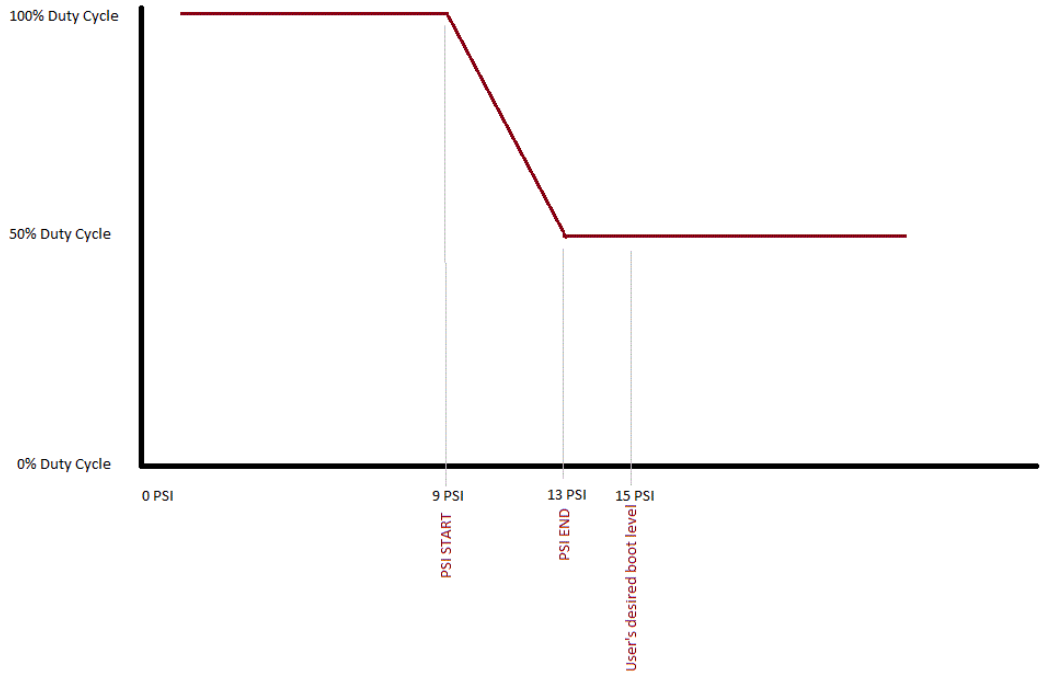
This compensation allows you to add or subtract duty cycle based on temperature readings from the MAF. All boost solenoid are slightly influence by temperature. Instead of the driver compensating for weather changes, it would make sense for this to be automatic. Here's the calculated values I have setup on mine, 20F -3%, 50F -1.5%, 80F 0%, 110F +1.5%, 140F +3%.

Aux Duty =xx.x

When the auxiliary input is triggered by a ground signal, the aux duty cycle is added to the overall duty cycle. So for example, if Aux Duty is set to -10.0 and duty cycle=50.0 the result would be 50-10=40. This feature can be used to run a high/low boost setting with a switch, or low boost for valet mode. Another use is when water/alchy is low on fluid, is for the boost controller to automatically switch to low boost mode. A latching option should be also set in the config menu for boost to stay in low boost mode until device is powered off.

PSI Start=xx.x

Default set to 1.0 PSI. This parameter allows your turbocharger(s) to spool up more quickly by delaying the opening of the wastegate. By keeping the wastegate completely closed the turbocharger reaches your desired boost pressure sooner. Having an on/off approach as some electronic boost controllers use can easily create boost spikes, so we use two parameters to ramp in this change and the boost spike problem is gone. "PSI Start" is where the ramp begins, and "PSI End" is where the ramp change is completed. For a more aggressive spool up increase the PSI Start parameter.



PSI End=xx.x

Default set to 2.0 PSI. The stock wastegate spring is 6psi on the 3S vehicles, and with a default value of 2.0 PSI any spool up assistance is effectively off. To turn on spoolup assistance, this value must be increased past 6 psi to realize any spool up gain. For example, if you want 18psi as your target boost value, I would suggest using "PSI END=16.0". This means anything below 16PSI is using a higher duty cycle temporarily to assist in spool up, however when it reaches past 16PSI it is using your normal target duty cycle numbers. If you want to be more aggressive try increasing the "PSI Start" value too.

BOOST CONTROLLER MENUS continued...

View tuner msg

This particular menu doesn't fit neither ECU or Boost controller description, it had to go somewhere. This device keeps a close eye on knock, boost, WBO2, RPMs and compares it against a chart. If the tune is deemed unsafe (due to weather changes, or poor tuning), it will alert the driver of the offending values (5 second warning display). These values are temporarily stored for the driver to view when he/she has time to view it by displaying the message again in this menu. Powering off the device erases the stored values, or new offending values will overwrite this.

ECU INFORMATION

100 115 98 81
TRIM LOW MED HIG

TRIM = Instant O2 feedback trim. Anything above 100 is adding fuel, anything below 100 is subtracting fuel.

LOW = Low Hz fuel trim

MED = Medium Hz fuel trim

HIG = High Hz fuel trim

NOTE: For MUT users, if you press down on the knob it will switch from the default front O2 trims to the rear O2 trims.

Throttle 13.1 %
Airflow xx Hz

Throttle displays TPS sensor reading from 0 to 100%. Generally our cars will show more than 10% throttle at idle, anything below generally sets off bad TPS sensor code.

Airflow reported to the ECU. If you have a fuel controller that intercepts this signal from the MAF, you will see the change reflected here.

Pressing the knob quickly will toggle colors more quickly.

Coolant 200F
Air intake 80F

Shows engine coolant temperature and air intake temperature.

Timing xx
Engine RPMs xxxx

Shows engine timing number and engine RPMs.

ECU INFORMATION continued...

Inj Pulse 4.1 ms
Injector DC 5 %

Inj Pulse = fuel injector pulse width in milliseconds.
Injector DC = Injector Duty cycle from 0 – 100%.

Front O2 0.96 V
Rear O2 0.94 V

Front and rear O2 sensor voltages from 0 to 1.00 Volts

Battery 13.1 V
Barometer 0.97 BAR

Battery voltage at the ECU, not necessarily the battery voltage at the battery because of voltage losses of wire, etc. Barometer reading from MAF.

Idle Switch Off
Throttle xx.x %

The idle switch is located on the throttle body. At idle with the foot off the throttle the Idle Switch should read On. The throttle % lets you know at which point it switches from Off to On.

Active Faults
Push to Scan

This will display current CEL fault codes in english that were triggered recently. For 96 and newer cars, use “SCAN OBD2 codes”.

Stored Faults
Push to Scan

This will display stored CEL fault codes in english. For 96 and newer cars, use “SCAN OBD2 codes”.

ECU INFORMATION continued...

Clear Faults
Push to clear

Clears all engine fault codes. For 96 and newer cars, use “SCAN OBD2 codes”.

Scan OBD2 codes
Push to begin

For 96 and newer cars only, this will retrieve stored error codes. MUT mode is disabled during this time, and will operate in the slower OBD2 mode until the device is powered off.

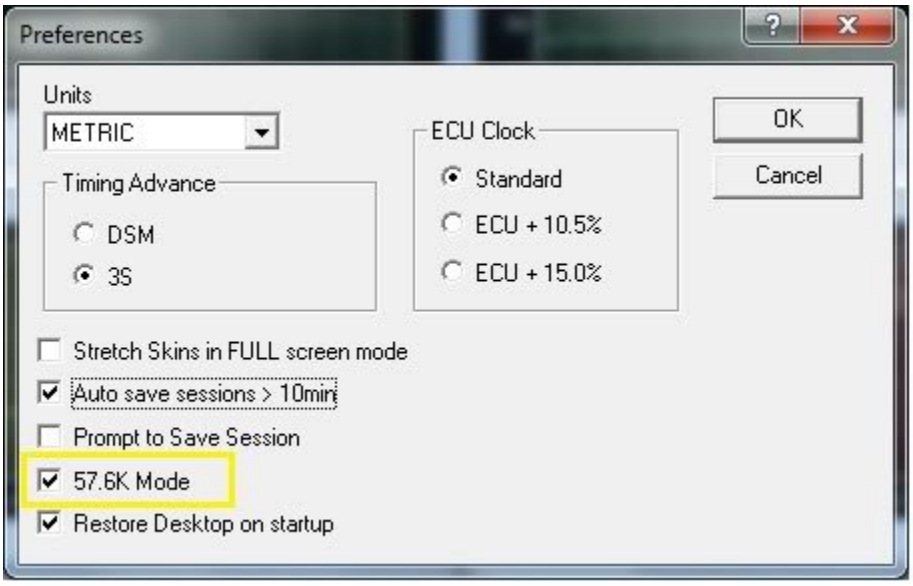
Clear OBD2 codes
Push to erase

For 96 and newer cars only, this will clear stored error codes. MUT mode is disabled during this time, and will operate in the slower OBD2 mode until the device is powered off.

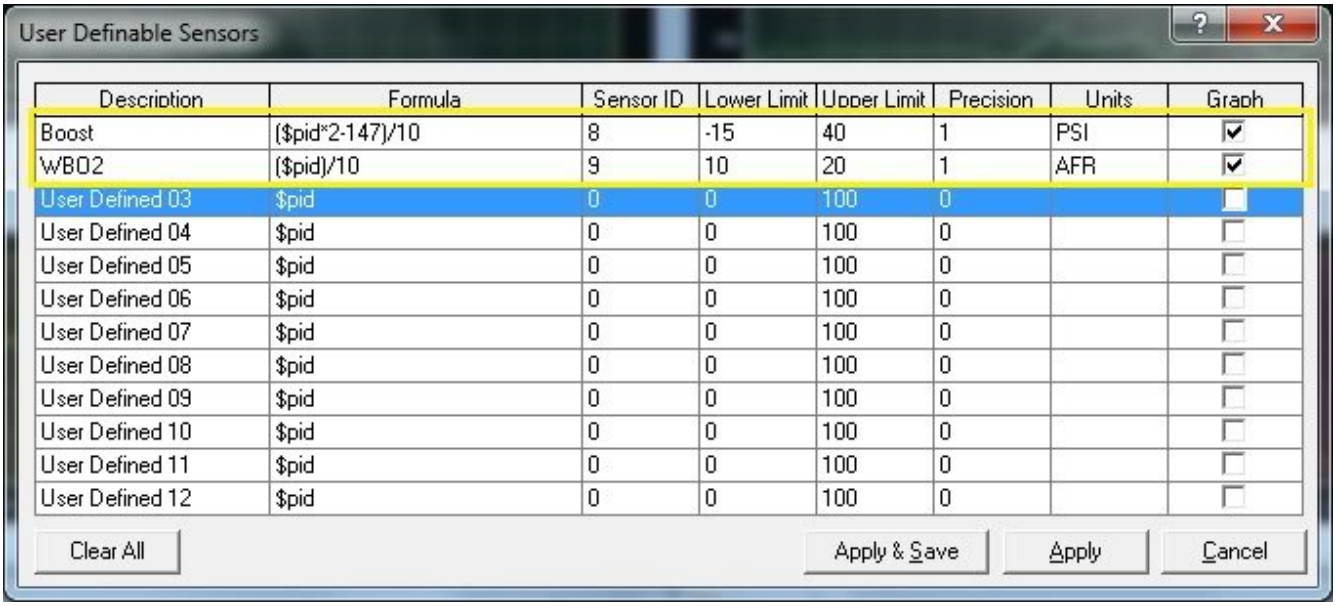
EXTERNAL DATALOGGING CONFIG

The device adds two new datalogging parameters making Hand Held Halo (HHH) and Evoscan more useful for tuning. These new items are WBO2 and Boost.

In Hand Held Halo OBD1 version, make the following changes:

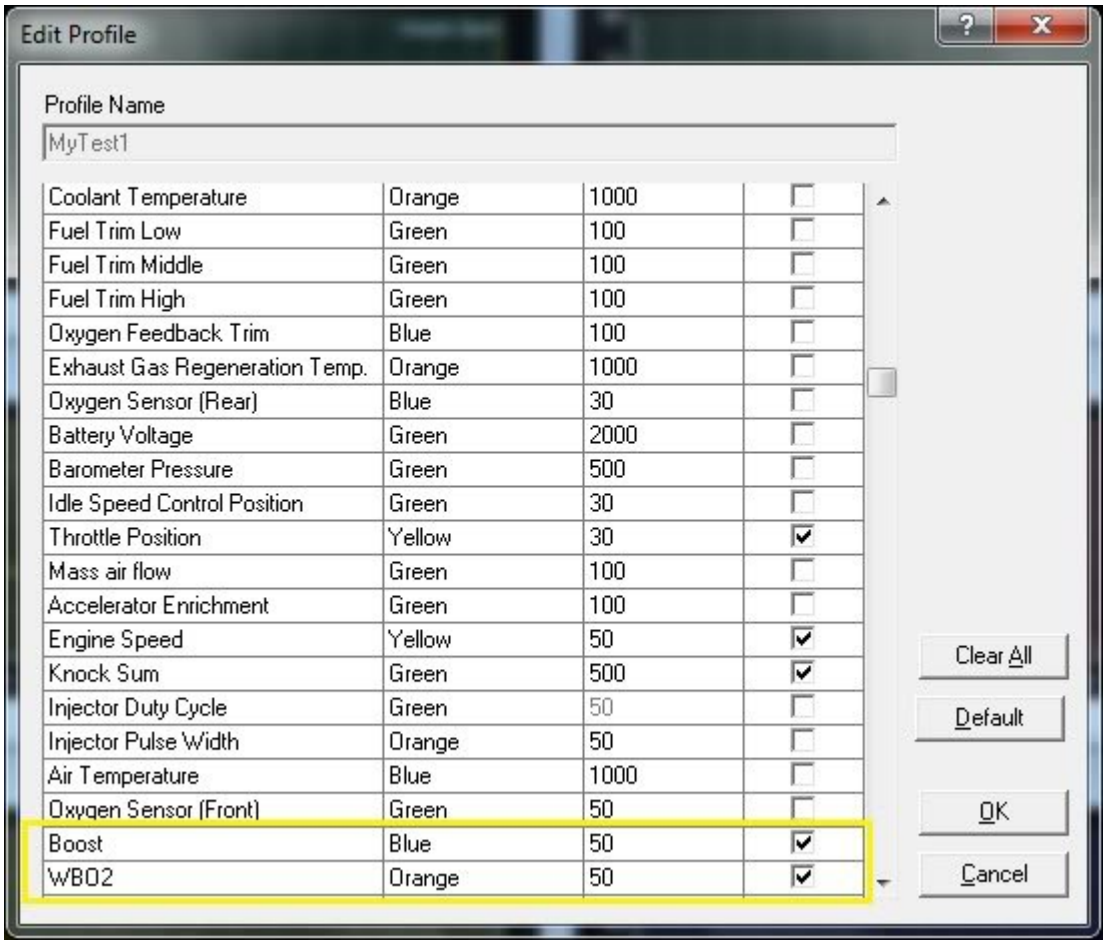


In the pull down menu, choose User Definable Sensors and create these two new entries:

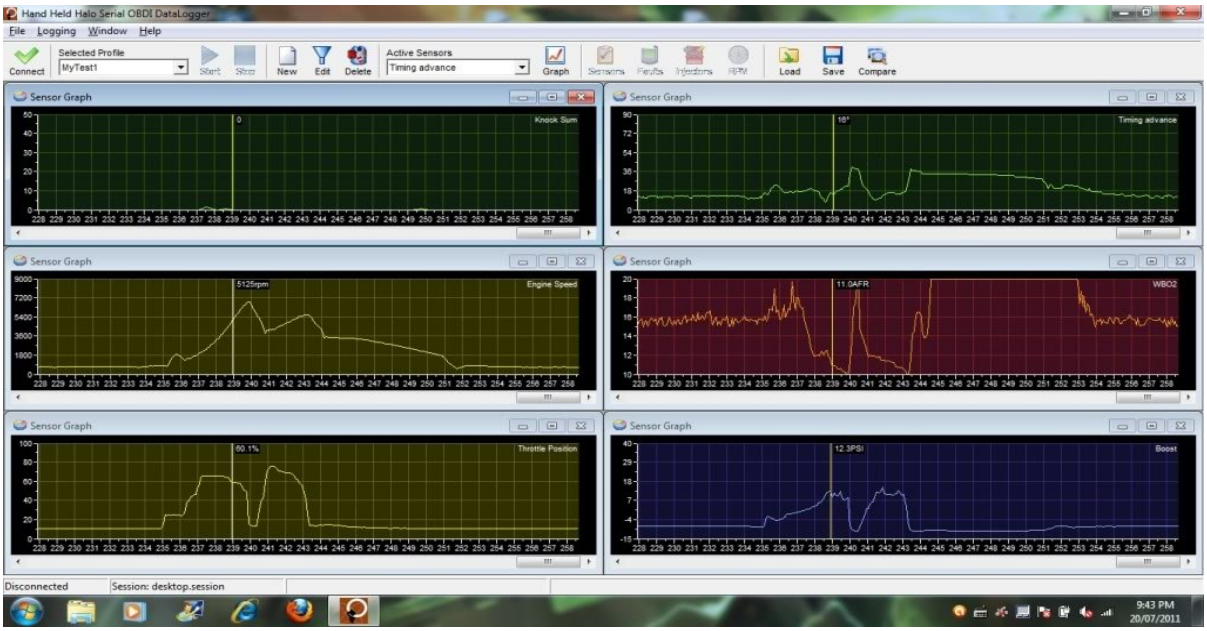


EXTERNAL DATALOGGING CONFIG continued...

Edit your current datalogging profile and add the following:

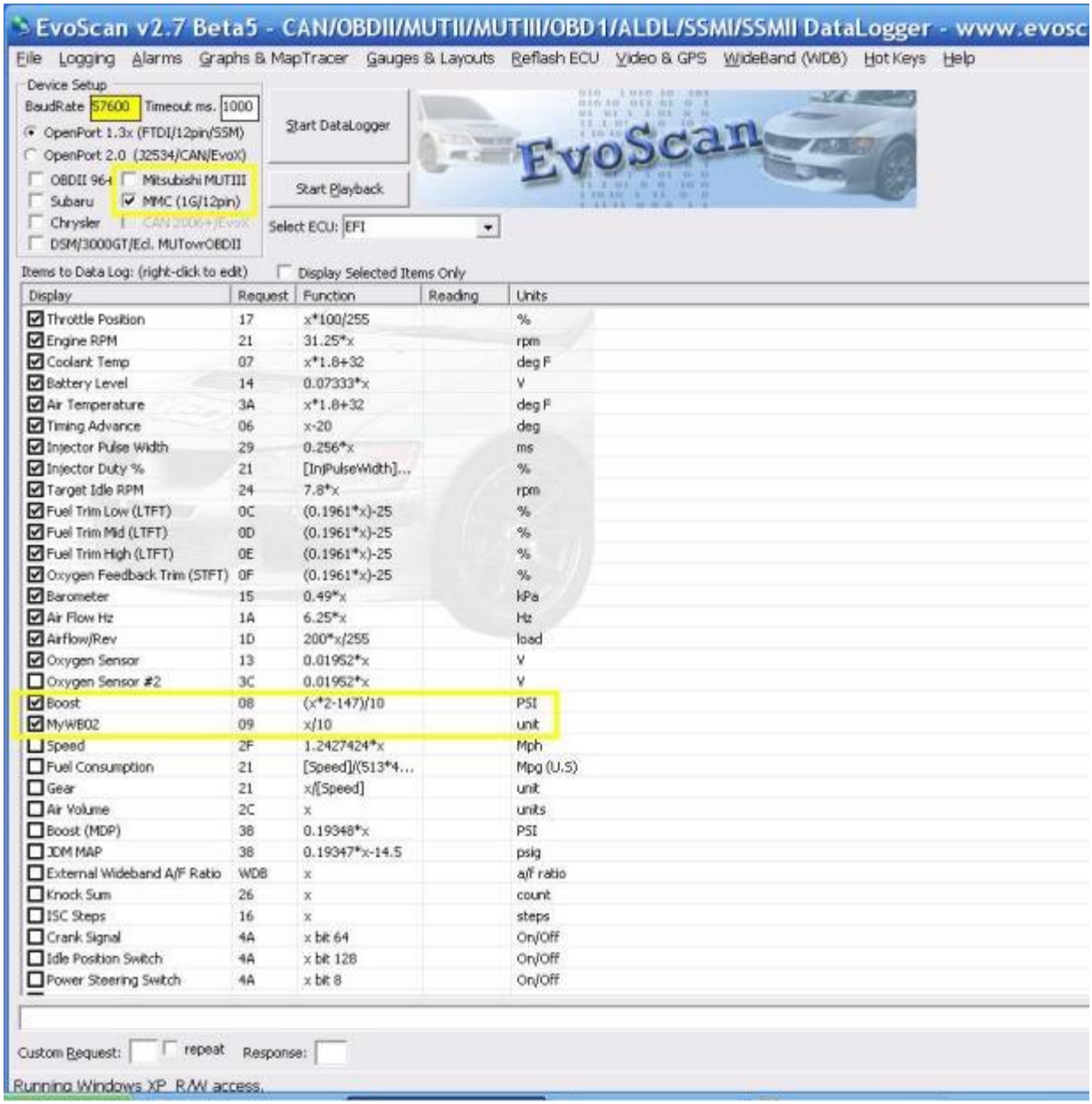


Example WBO2(orange chart) and Boost(blue chart).



EXTERNAL DATALOGGING CONFIG continued...

For EvoScan make the following changes:



ACTIVE TUNE MONITORING

Between season changes, our tunes may drift so this EBC is monitoring for this. If knock of 5 or more is detected and the WBO2 AFR is considered lean for the given boost pressure, it will alert the driver with a message of " **Tune is lean**" with flashing red lights. It will then display the following screen

xx KNOCK, xx.x PSI,
x.xx AFR, xxxx RPMS

OVERBOOST MESSAGE

Should you accidentally exceed your Alarm Boost setting, you will receive an overboost message flashing in red along with the peak overboost in PSI. The solenoid will shut down for 5 seconds dropping your boost down to wastegate pressure.

UPGRADING SOFTWARE

There are two ways of upgrading software. The first method is to use a PC with a serial port and using a null-modem serial cable, or a null-modem adapter and a regular serial cable. Plug the cable to the back of the black box and run the software I provide for flashing. The entire process takes about 60 seconds or less. The second method involves purchasing another microprocessor with the new software loaded and swapping. Swapping is made easy because the microprocessor sits on a socket so no soldering required.

FAQ.

1. Will USB style OBD2 datalogging cables (Tactrix 2.0, 1.3) work?
   No it won't work because they're not serial.

SOURCING BOOST SOLENOIDS

Go on www.ebay.com and search for "*AEM boost solenoids*". I found one vendor selling them for $25 + $5 shipping that included brass fittings. These AEM boost solenoids are manufactured by Mac valves (part number 35A-AAA-DDBA-1BA). You can also purchase these boost solenoid directly from www.macvalves.com for $17.50.

DISCLAIMER

Increased turbo boost pressure could harm your engine and/or turbocharger, the user assumes full responsibility for any damages that may occur.