Performance Vehicle Telemetry Displays

www.btigauges.com

CAN Bus Gauge for AEM V2 and EMS-4
Wiring and Installation Manual
Doc version 2.3

Notice: This product is intended for Off-Road use only.
Never take your eyes off of the road while using this device.
If you are uncomfortable with wire termination, please have
this device installed by a competent shop.

Patent Pending

Wiring harness installation:

Plug and play wiring harness for Infinity V2 ECUs with the AEM wiring harness:

Locate the 4 pin AEM NET wiring connector on the V2 harness. Connect the Plug and play harness into the AEMnet 4 pin harness and run the cable to the desired gauge installation location. Note that the gauge gets power and the CAN signal from this cable and no other wiring is necessary.

AEMnet CONNECTORS

The AEMnet has four wires, two are for communication (white pin 1 and green pin 2) and two are for powering (red pin 3 and black pin 4) certain AEMnet devices. Only the two communication wires (white pin 1 and green pin 2) are needed for the Series 2 EMS to send/receive data as the EMS is not powered by AEMnet. The red and black wires will need to be connected when using the Series 2 EMS with devices that are powered by AEMnet such as the Dyno-Shaft (see individual instructions for details). The AEMnet connectors are shown below in figure 1. See table 1 for the AEMnet connection pinout.

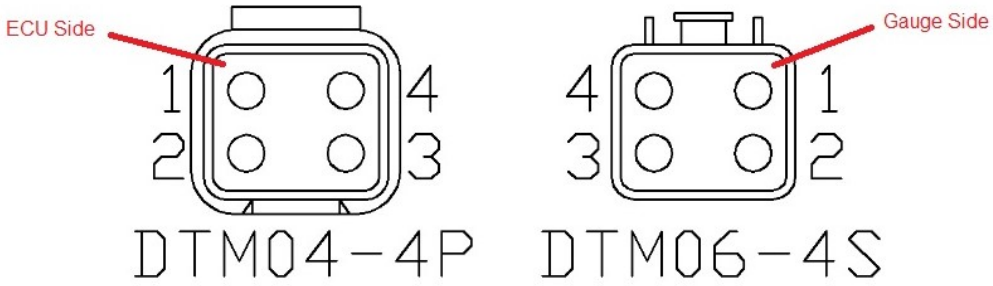


Figure 1: AEMnet connectors, wire entry view

AEMnet Connector		Series 2 EMS Connector
Pin 1	White	CAN1H
Pin 2	Green	CAN1L
Pin 3	Red	AEMnet Power (switched 12 volts)
Pin 4	Black	AEMnet Ground

Table 1: AEMnet connector pinout

INSTALLING THE AEMnet ADAPTER HARNESS

4. Table 2 below lists the corresponding CAN1L and CAN1H pin locations for each Series 2 EMS.

		CAN1L (Green wire)	CAN1H (White wire)
EMS	Adapter p/n	LOCATION	LOCATION
30-6100	30-3433	11A	12A
30-6101	30-3433	11A	12A

Table 2: CAN1L and CAN1H pin locations

Figure 6 below shows the connectors for the Series 2 EMS.

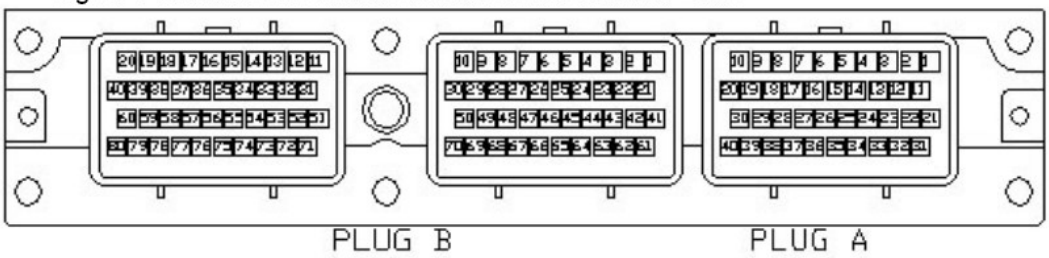


Figure 6: Wire-side view of pinout for 6100 and 6101 EMS

4. Table 2 below lists the corresponding CAN1L and CAN1H pin locations for each Series 2 EMS.

		CAN1L (Green wire)	CAN1H (White wire)
EMS	Adapter p/n	LOCATION	LOCATION
30-6030	30-3430	C22	C21
30-6050	30-3432	D14	D10
30-6051	30-3432	D14	D10
30-6052	30-3432	D14	D10
30-6053	30-3432	D14	D10
30-6060	30-3432	C28	C29
30-6310	30-3431	77	87
30-6311	30-3431	57/77	67/87
30-6320	30-3435	33	13

Table 2: CAN1L and CAN1H pin locations

Figures 7, 8, 9, and 10 below show the connectors for each Series 2 EMS.

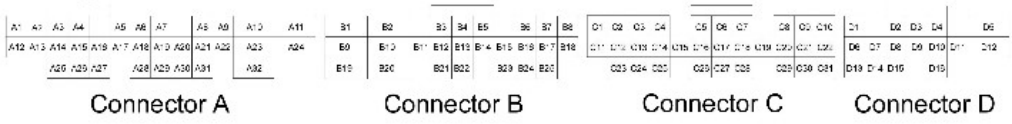


Figure 7: Wire-side view of pinout for 6030

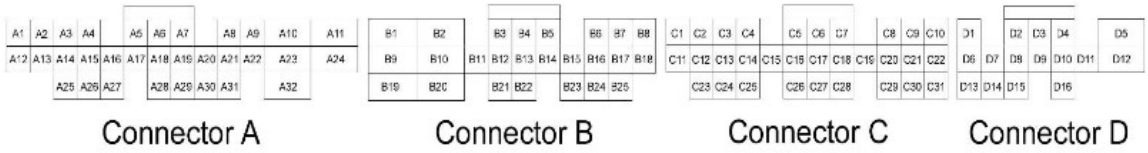


Figure 8: Wire-side view of pinout for 6050, 6051, 6052, 6053, and 6060 EMS

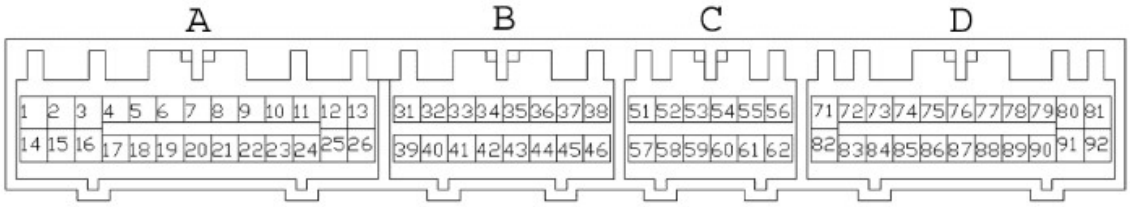


Figure 9: Wire-side view of pinout for 6310 and 6311 EMS

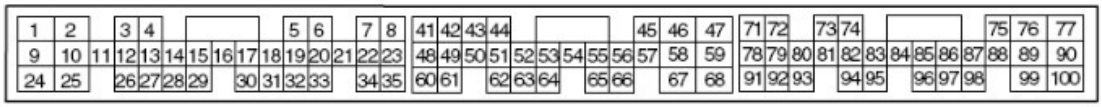
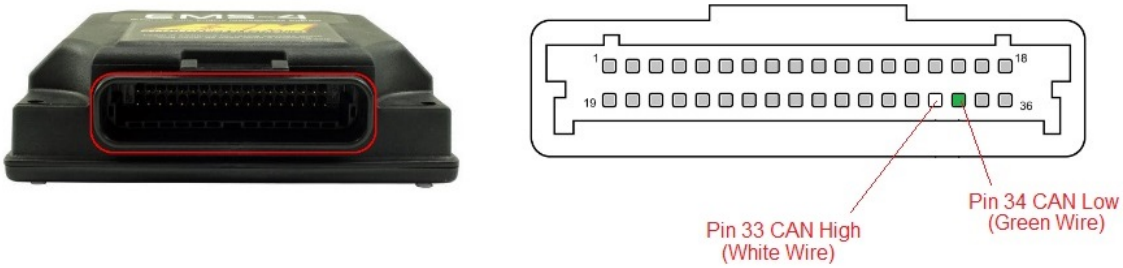
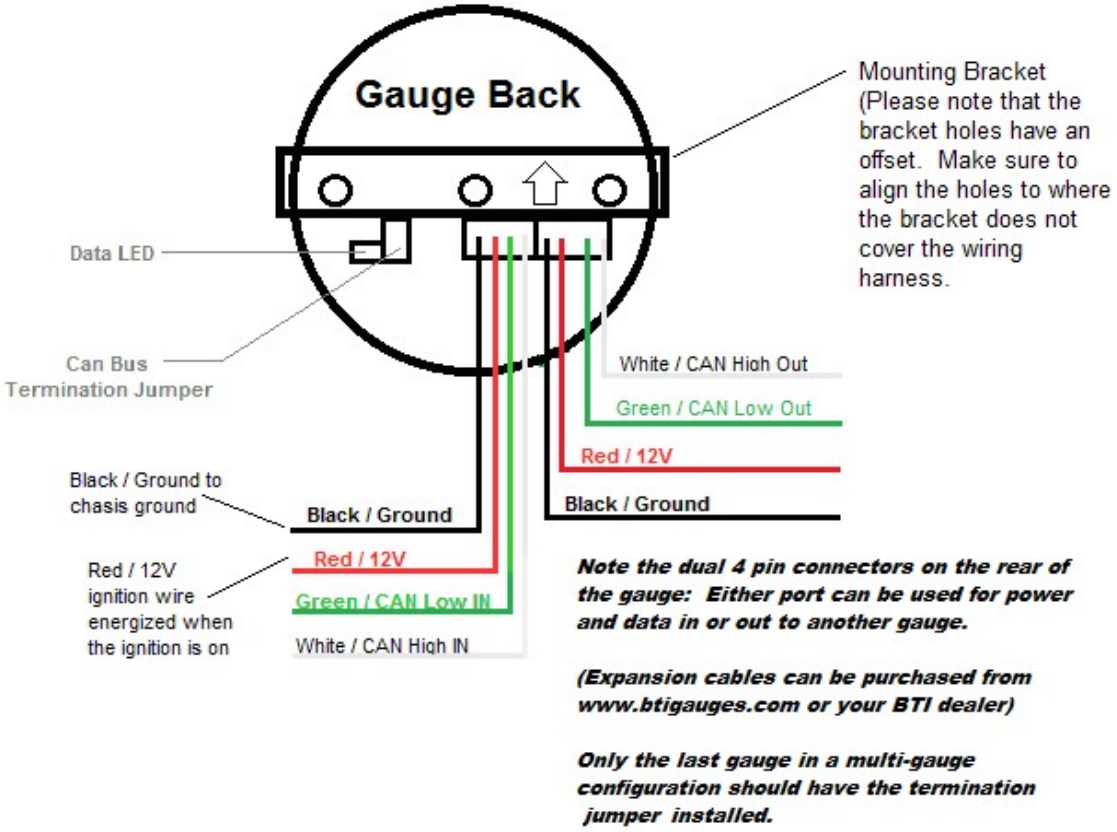


Figure 10: Wire-side view of Pinout for 6320 EMS

EMS-4 CAN Bus wiring:





Data LED: This indicator will flash when ever the gauge is energized and CAN communications are present. Use this to confirm communications.

CAN Bus Termination Jumper: Remove this jumper if the gauge is not the last device on the CAN Bus. If there are multiple gauges, the last gauge should be the only gauge with the jumper installed.
Leave the jumper installed if the gauge is a stand alone installation and there is nothing else on the CAN Bus.

Use the Yellow and Blue wires in order to attach multiple gauges to the CAN Bus.

Configuring AEM V2:

According to AEM's documentation, the AEM V2 must be configured to output the telemetry on the CAN Bus (AEMnet):

The AEMnet data stream is compatible with version AEM25 01v23 firmware and later. To activate the AEMnet data stream, open AEMTuner and go to Wizards > Setup Wizard and select the AEMnet Data Stream. See figure 11 below.

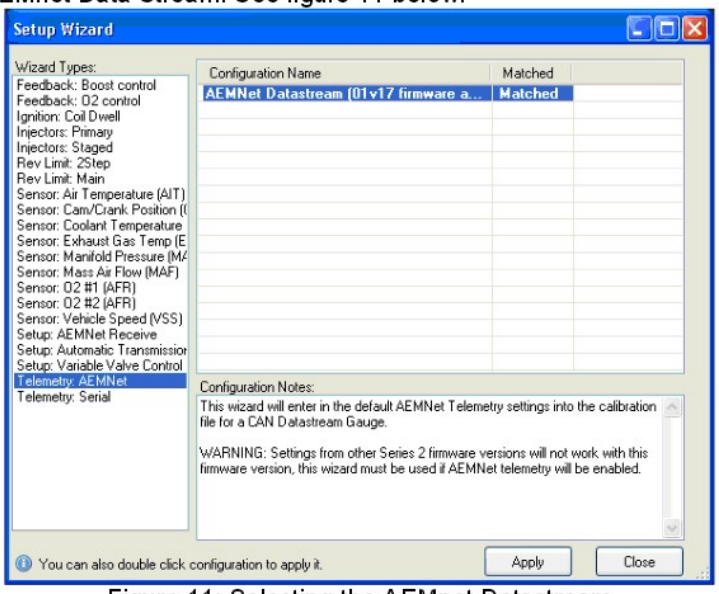
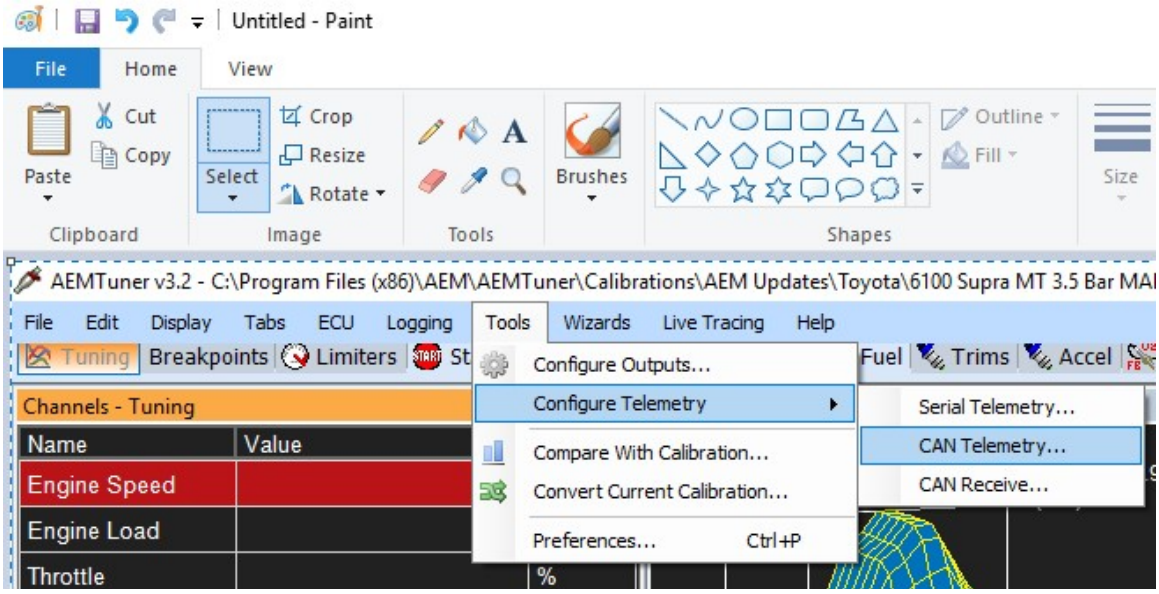


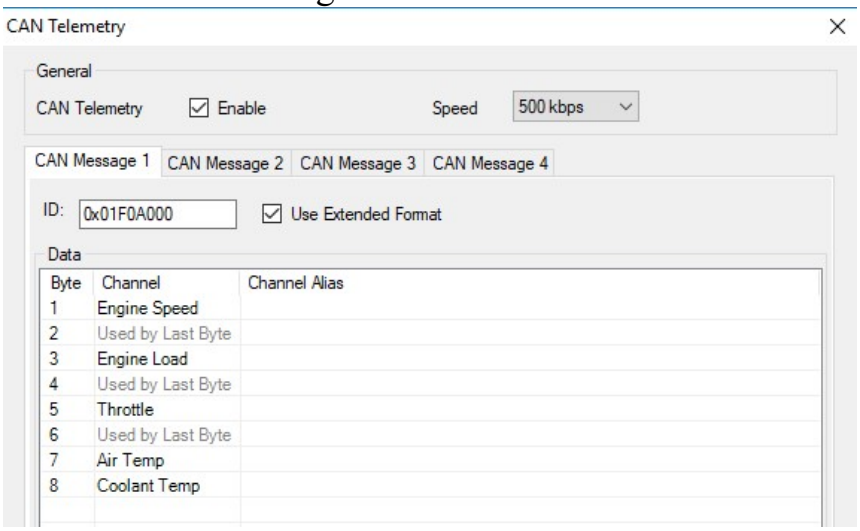
Figure 11: Selecting the AEMnet Datastream

Notice! Ensure to click on the "Matched" column and ensure that the term "Matched" appears.

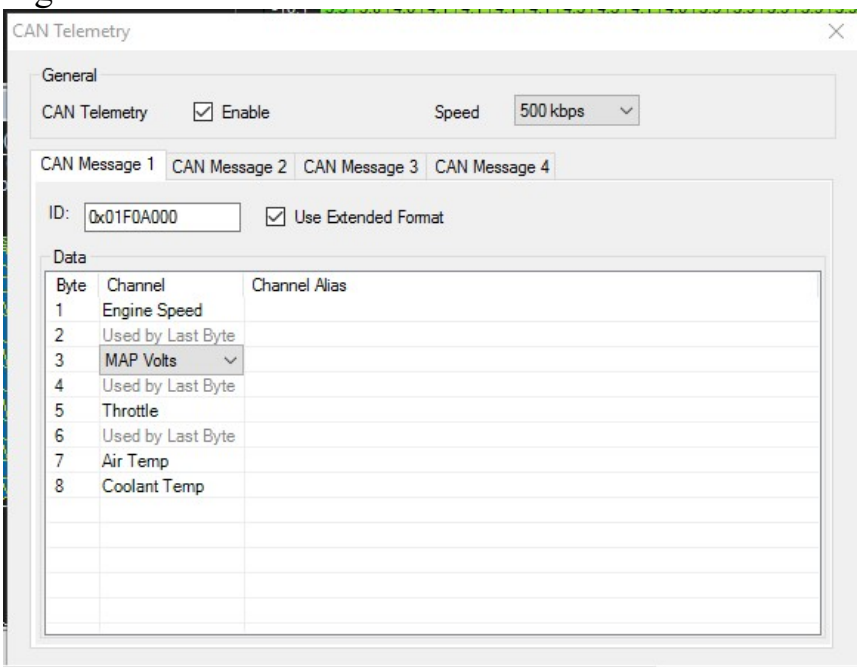
Now we will need to modify the CAN data stream in order to broadcast Ethanol content, Fuel Pressure, and Oil pressure: Open Configure Telemetry / CAN telemetry:



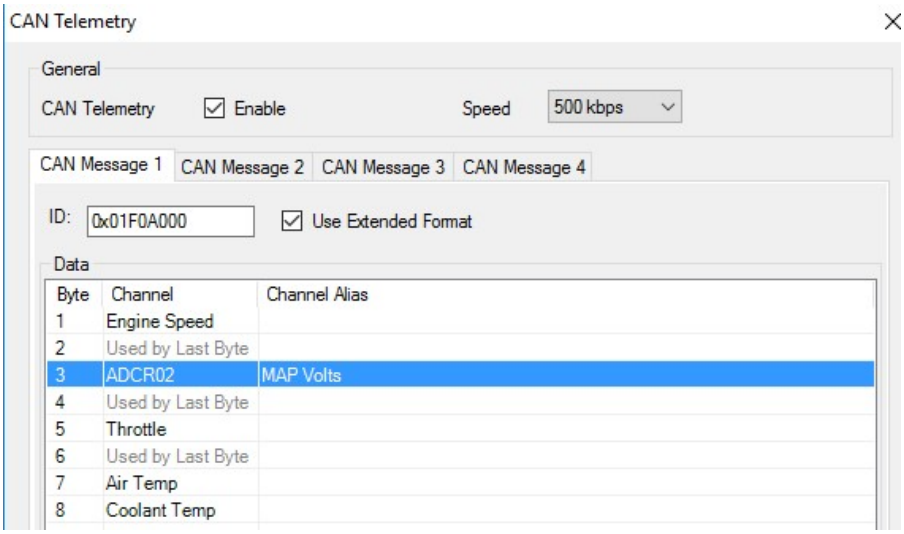
Can Message 1 should look like this:



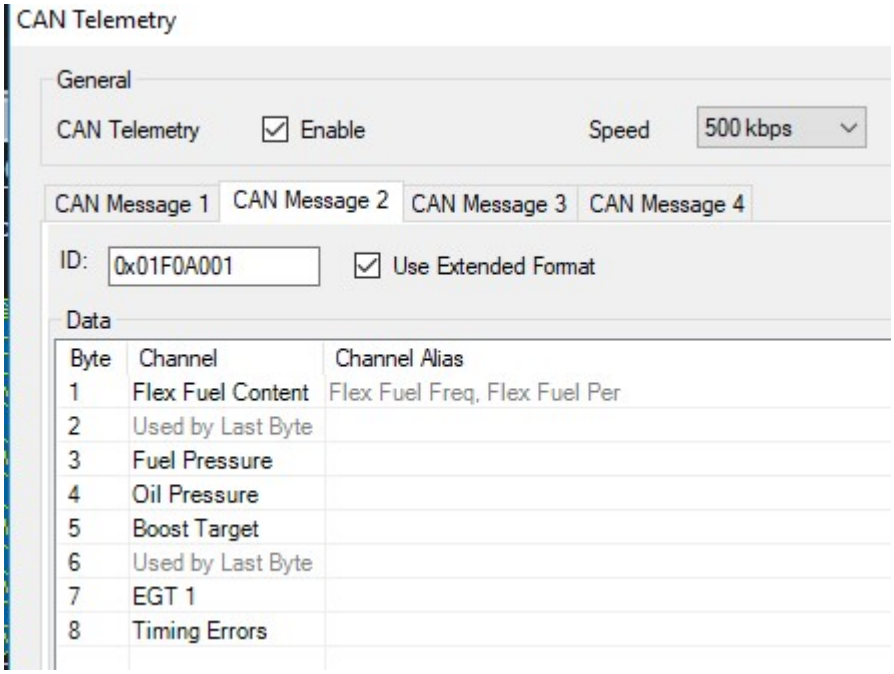
Change Byte 3 from “Engine Load” to “MAP Voltage” AEM V2 is not capable of outputting the MAP pressure on the CAN bus, so we will need to put in a scalar and offset in the gauge in order to get our MAP Pressure.
CAN Message 1 should now look like this:



Notice that “MAP Volts” may change to one of the ADCR channels once you have made your selection. This behavior is normal:

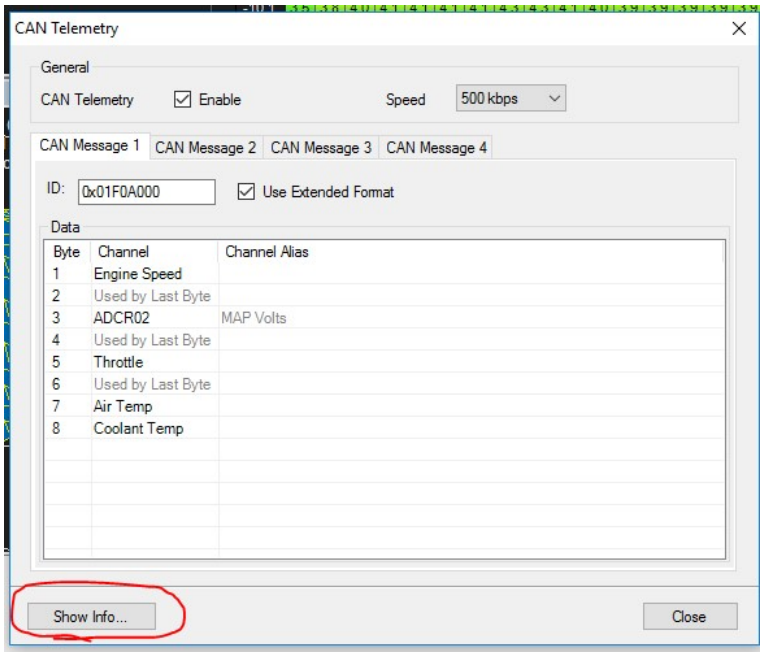


Now we will need to change CAN Message 2 to the following:

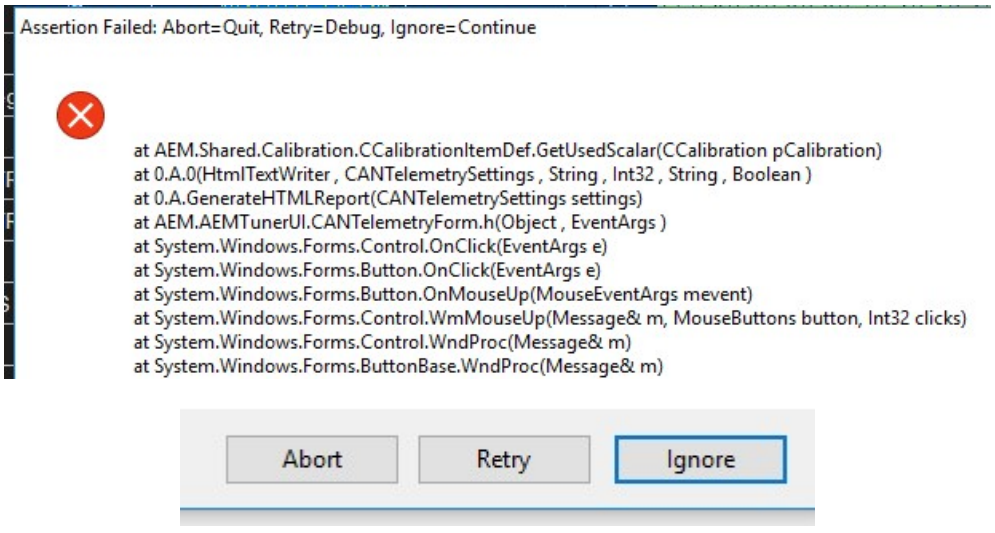


Finally, we will need to verify the multipliers for the Fuel Pressure and Oil Pressure so that those values may be put into the gauge:

Click on “Show Info” in order to generate the CAN Configuration Sheet with the Scalars and Offsets. We will need this info in order to ensure that the displays are accurate.



Notice that sometimes it is possible to get an error when generating this sheet. You may have to click “Ignore” up to 3 times in order to get past this.



Print this sheet out and hang onto it for later…

Operation:

Upon powering up a properly terminated gauge, the Gauge will display the interface and version number,

The gauge will then display a splash screen if one is programmed.

Following the splash screen, the gauge will display the first screen. (This screen usually has a parameter assigned from testing the gauge after manufacturing)
The remaining 11 screens will display the following message:

"No parameter selected for screen # 1-12"

Use the Left or Right buttons to scroll through the 12 screens.

Use the center button to enter the screen configuration.

Once in the screen configuration, use the Left or Right buttons to scroll to the desired parameter or compound parameters that you wish to assign to the selected screen number. After the desired parameter or parameters have been selected, use the Center button to complete the screen assignment.

When the gauge is powered off, the last screen that was used for more than 60 seconds will be the next screen displayed when power is reapplied to the gauge.

Configuring the MAP and Fuel pressure sensors:

Common Sensor multipliers and offsets:

Manufacturer	Model #	Multiplier	Offset
AEM 3.5 Bar	**30-2130-50**	**12.5**	**-6.25**
AEM 5 Bar	**30-2130-75**	**18.750**	**-9.375**
Omni 3 Bar	**MAP-STI-3BR**	**9.122**	**.164**
Omni 4 Bar	**MAP-STI-4BR**	**12.086**	**.169**
GM 3 Bar	**12223861**	**8.94**	**.1604**

The MAP sensor must be configured in BTI gauge for proper operation.

In order to configure the MAP sensor, hold the Right button down after applying power to the gauge. Promptly release the Right button once the MAP sensor scale screen appears. You must enter the MAP sensor multiplier on this screen. Use the LEFT button to decrement the value and use the RIGHT button to increment the value (holding the buttons for longer than 10 seconds will speed up this process)

Hint: AEM 3.5 bar sensor has a multiplier of 12.5 which means that this particular sensor outputs 12.5 PSI / volt.

Press the CENTER button labeled “Accept” once you have entered the multiplier.

Next you will be prompted to enter in multipliers for the Fuel Pressure, Oil Pressure, Boost Target, and O2 Sensor. You may also need to modify the O2 Sensor offset as well.

This step will require the page generated when pressing “Show Info” in the “Can Telemetry” mentioned earlier in this document.

We will need some information from CAN Message 2 and 4.
That sheet should look like this:

CAN Message 2

ID: 0x01F0A001

Byte	Name	Units	Scalar	Offset	Min	Max	Signed?	Bitmask
1	Flex Fuel Content [msb]	%	1	-49	-31	1253083	No	
	(Flex Fuel Freq [msb])	Hz	1	1	19.1	1253132.9	No	
	(Flex Fuel Per [msb])	ms	0.000798000022768974	0	0.0000	52.2969	No	
2	Flex Fuel Content [lsb]							
3	Fuel Pressure	psi	1	0	0	255	No	
4	Oil Pressure	psi	1	0	0	255	No	
5	Boost Target [msb]	%	0.863281291003659	0	0.0	25599.6	No	
6	Boost Target [lsb]							
7	EGT 1	°C	5	0	0	1275	No	
8	Timing Errors		1	0	0	255	No	

CAN Message 4

ID: 0x01F0A003

Byte	Name	Units	Scalar	Offset	Min	Max	Signed?	Bitmask
1	O2 #1	Lambda	0.00390625018553692	0.500000023748726	0.5	1.496	No	
2	O2 #2	Lambda	0.00390625018553692	0.500000023748726	0.5	1.496	No	
3	Vehicle Speed [msb]	mph	0.00390625	0	0	256	No	

There will be default values loaded into the gauge, but certain parameters change the scalars and offsets requiring these adjustments for gauge accuracy.

Again use the LEFT and RIGHT buttons to increment and decrement the value.
Press the CENTER button labeled “Accept” to store the value. You will now be prompted to enter the fuel pressure settings.

Pressing the center button will allow you to accept these settings and move on to adjusting the update rate.

You will then be prompted to adjust the display update rate. This value can be set from 0 – 200 milliseconds. Use the left and right buttons to adjust accordingly.
Use the center button to accept the Update Rate value.
You will then be prompted to enable or disable the peak hold screens. This applies only to single parameter screens and does not affect the Boost screen which always display peak boost episode values when ever selected.

In order to reset the peak value on the selected single parameter screen, press and hold the center button for 3 seconds until the “Reset” prompt appears.
Note that the peaks on the single parameter screens will continue to record peak values no matter what parameter you are monitoring.

Shift Light Configuration:
Press and hold the left button after energizing the gauge until the shift light configuration screen appears. The menu will prompt you to enter an RPM number for each gear (1-5). Use the left and right button to increment or decrement the RPM value. Use the center button to save the value for each gear. The shift light will flash once the setup is complete.

Warranty:

All BTI Gauges carry a 1 year warranty effective at the time of purchase.

- This warranty extends only to products distributed and/or sold by BTI Gauges. It is effective only if the products are purchased and operated in the USA. (Within the USA including US 48 States, Alaska and Hawaii.)
- This warranty covers only normal use of the computer. BTI Gauges shall not be liable under this warranty if any damage or defect results from (i) misuse, abuse, neglect, improper shipping or installation; (ii) disasters such as fire, flood, lightning or improper electric current; or (iii) service or alteration by anyone other than an authorized BTI Gauge representative.
- You must retain your bill of sale or other proof of purchase to receive warranty service.
- No warranty extension will be granted for any replacement part(s) furnished to the purchaser in fulfillment of this warranty.