Performance Vehicle Telemetry Displays

www.btigauges.com

TFT CAN Bus Dash for AEM V2 / EMS 4
Plug and Play Installation Manual
Doc version 1.1

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.

**** Notice! This device should be configured by competent personnel. Raising the BOOST too much or reducing the Traction Control too much can have severe consequences. You could blow your engine and or lose control of your vehicle****

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.

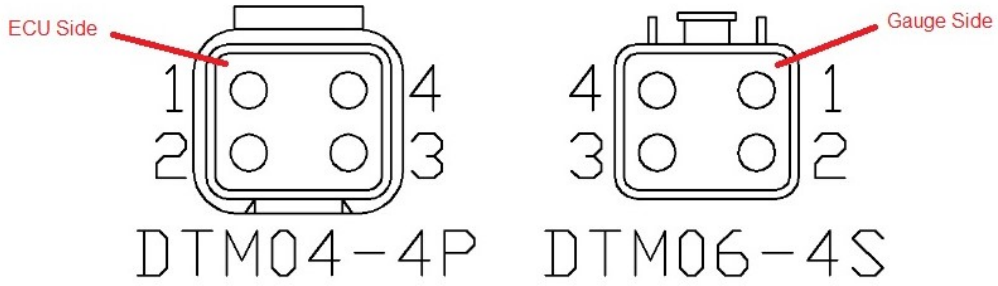


Figure 1: AEMnet connectors, wire entry view

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.

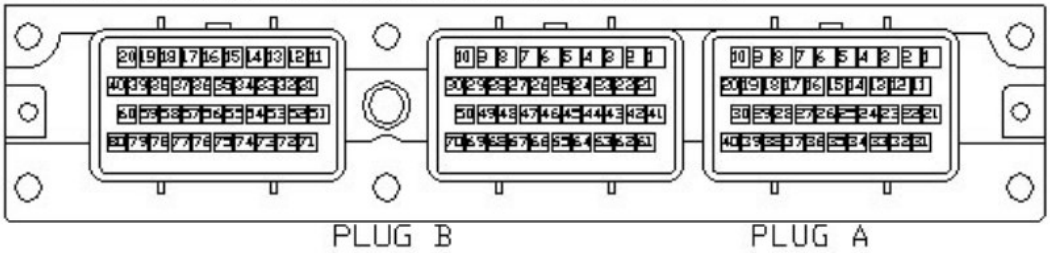
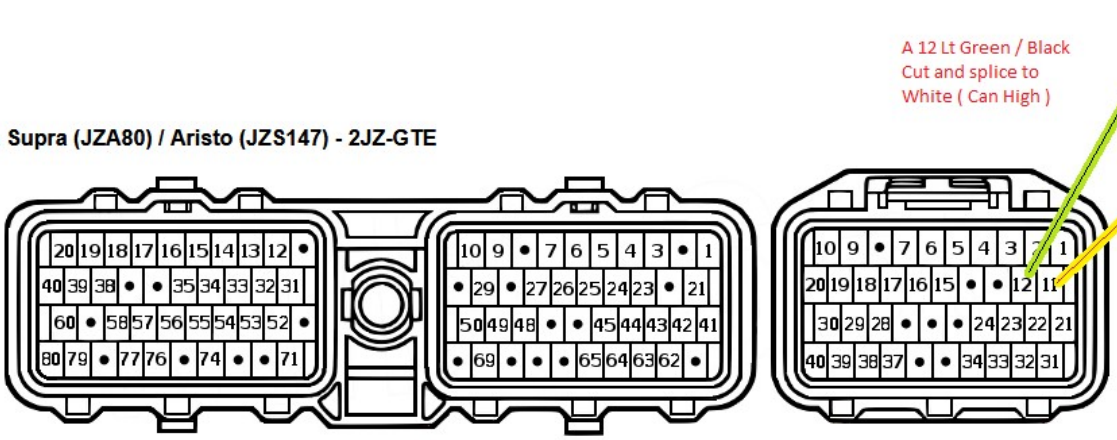


Figure 6: Wire-side view of pinout for 6100 and 6101 EMS

Toyota Supra (JZA80) / Aristo (JZS147) - 2JZ-GTE



Notice: Not all 2JZ wiring harnesses have pins a 11 and a 12 populated. In the event this should occur, pins or pre-terminated pins with wires are available from Toyota.

The PIN part number is TE Connectivity 175197-2
or if you insist on OEM Toyota parts: Toyota 82998-24060

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.

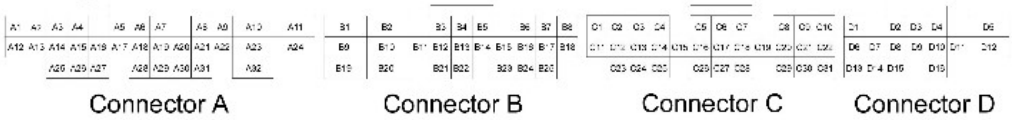


Figure 7: Wire-side view of pinout for 6030

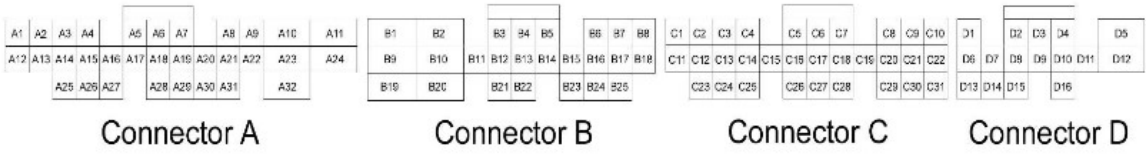


Figure 8: Wire-side view of pinout for 6050, 6051, 6052, 6053, and 6060 EMS

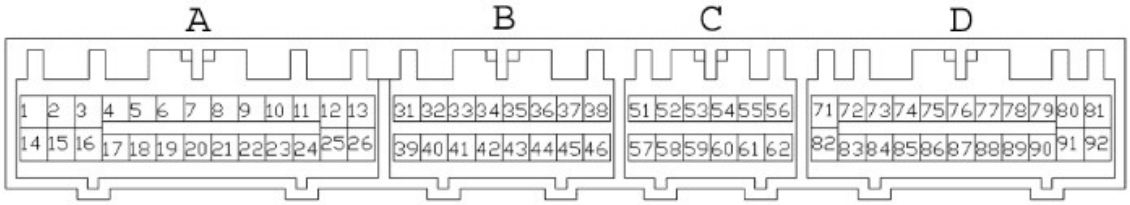


Figure 9: Wire-side view of pinout for 6310 and 6311 EMS

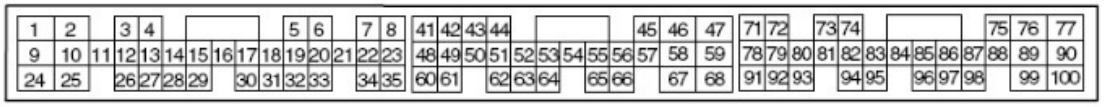
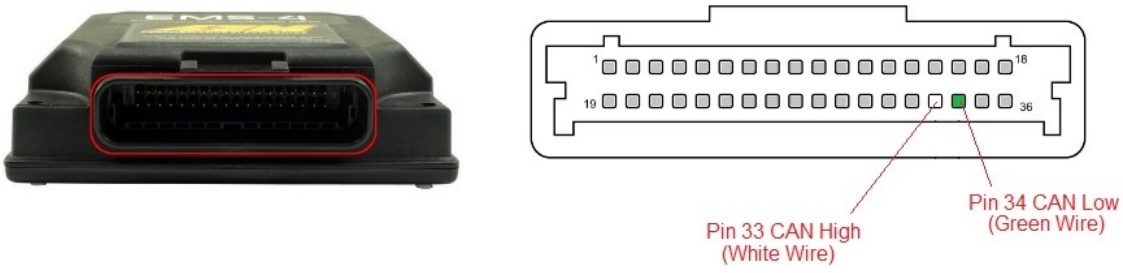


Figure 10: Wire-side view of Pinout for 6320 EMS

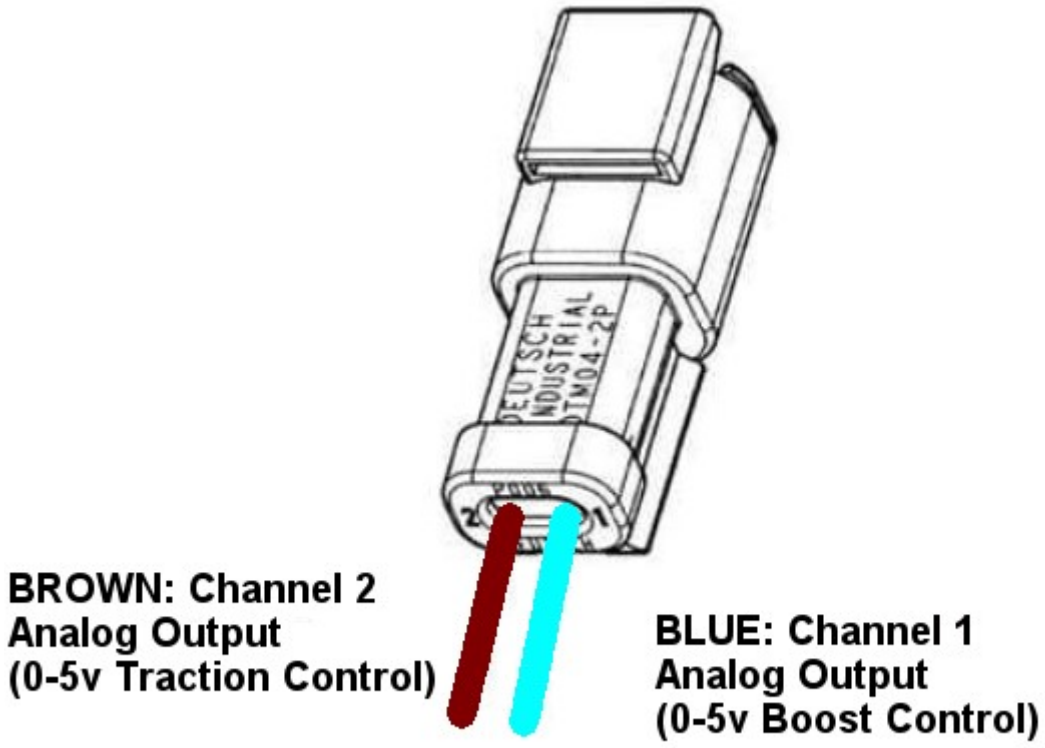
EMS-4 CAN Bus wiring:



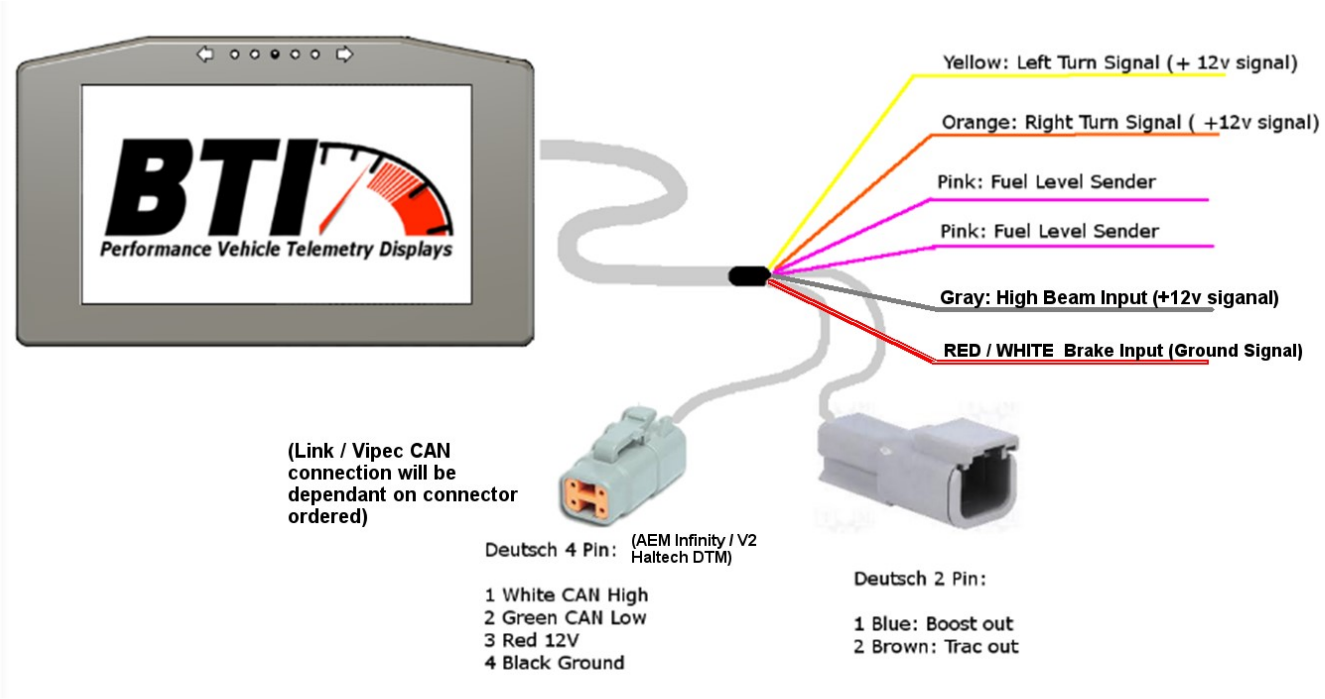
2 Pin Analog Out Connector (Brown and Blue Wires)

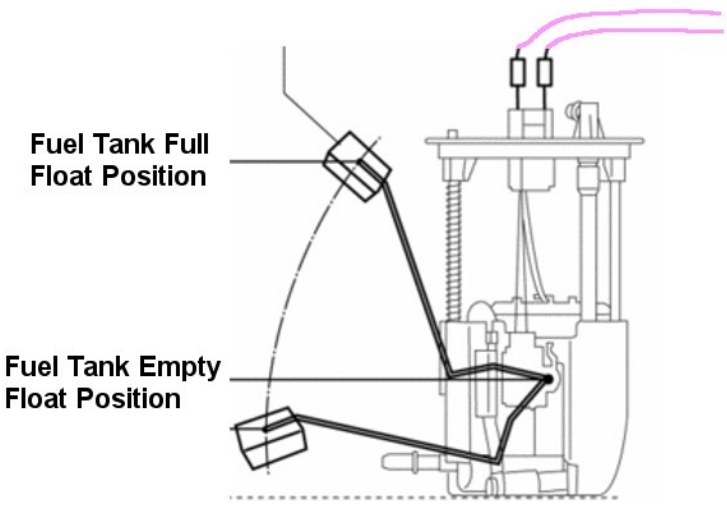
The termination of these two wires is dependent on the inputs that are assigned in your ECU tuner software. The analog outputs are low current 0-5 volt outputs that may be read into your ECU's analog inputs and used to control boost level and slip control. Please note that it is imperative that precautions are taken to prevent over-boosting your engine or an improper slip configuration.

The Input used will be defined here. Connect the blue and brown wires to the corresponding inputs that are selected for your application. There are more details regarding this under "BOOST and PWM STEPS" below.

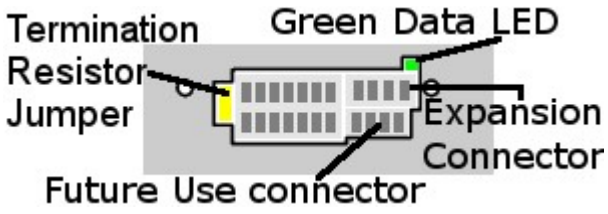


****Notice that there are several methods to configuring Boost Control in AEM V2. Consult your tuner in order to configure this input.**





Terminate the Pink wires to the Fuel Tank sending unit. The Sending unit must be isolated from ground or power within the car (just like taking a resistancemeasurementwith a multi-meter) There is no polarity on the pink wires. Consult the vehicle manual to determine the proper wiring. When in doubt, always take your vehicle to a trained professional.



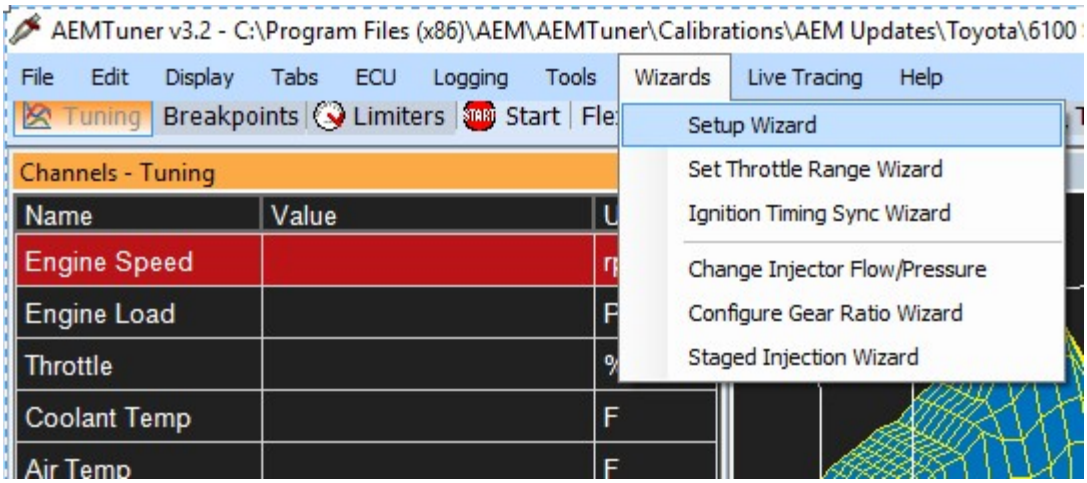
Data LED: (back of the dash) This indicator will flash when ever the gauge is energized and CAN communications are present. Use this to confirm communications.

AEM Tuner software configuration:

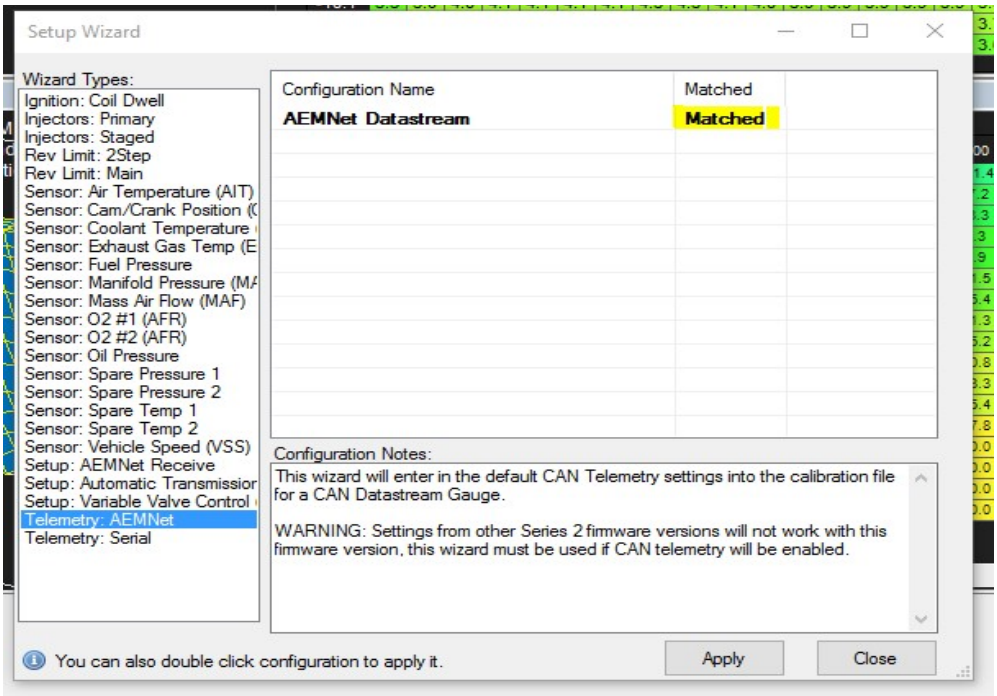
In order to have a properly functioning gauge, it is mandatory that the CAN protocol is configured in the AEM Tuner software.

Steps to create the protocol and generate the multipliers:

1. Open the AEM Tuner software and proceed to the Wizard / Setup Wizard:

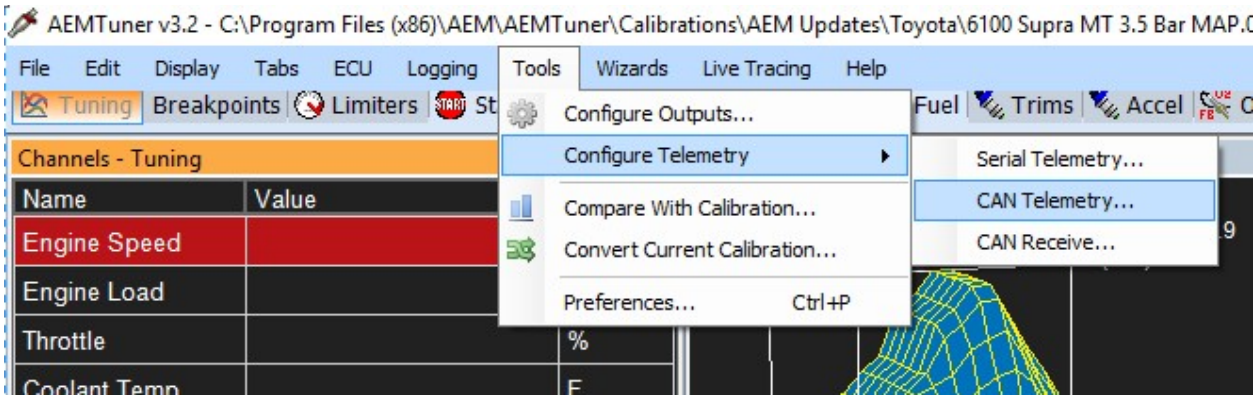


1. Now select “Telemetry: AEMNet” and click on the space under “Matched”. This should insert the word “Matched” if the datastream is not linked.



Now that the datastream is matched, this will build the basis for the standard transmit and save some time in configuration.

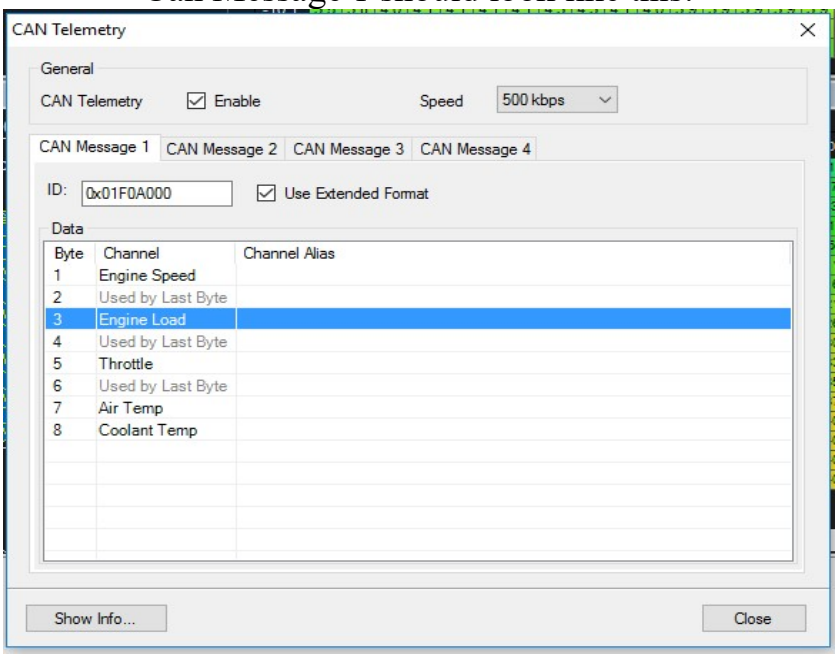
2. Now we must create the CAN Message Data. Note that there will be different CAN transmissions for cars using the AEM V2 to control an automatic transmission vs cars running Flex Fuel. We do this in order to get the most amount of Data out of V2 given it's limited communication size.
   In order to do this, navigate to Tools / Configure Telemetry / CAN Telemetry:



Standard CAN transmission:

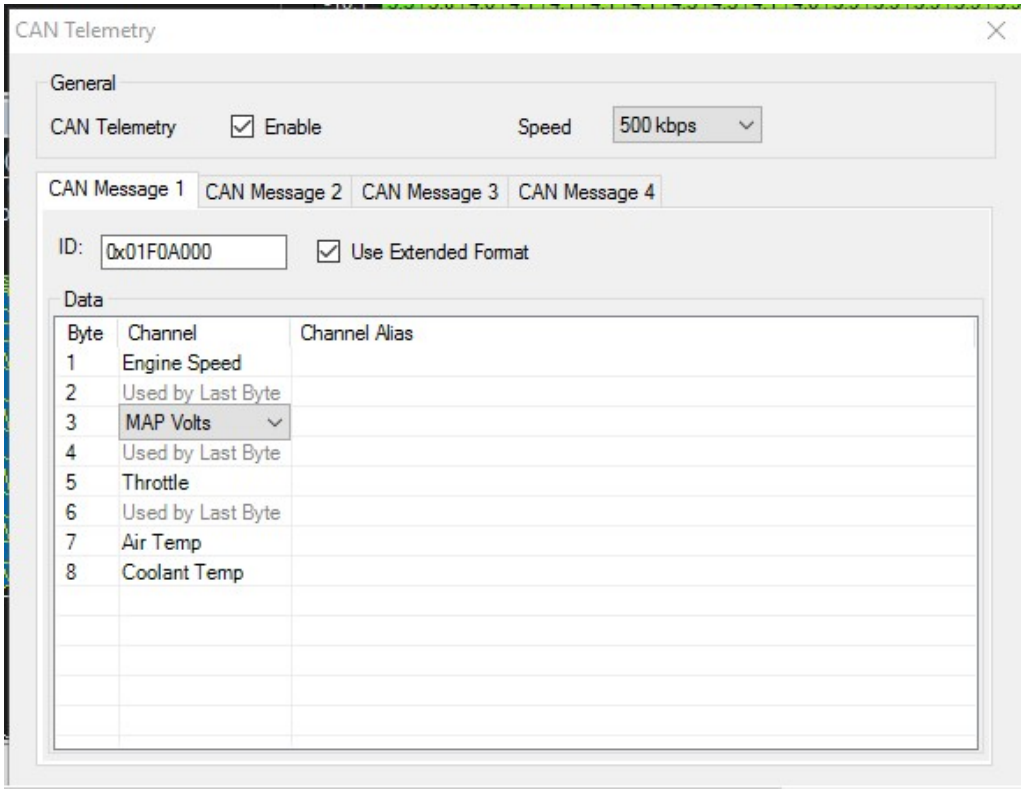
(Manual transmission cars with or without flex fuel) :

Can Message 1 should look like this:

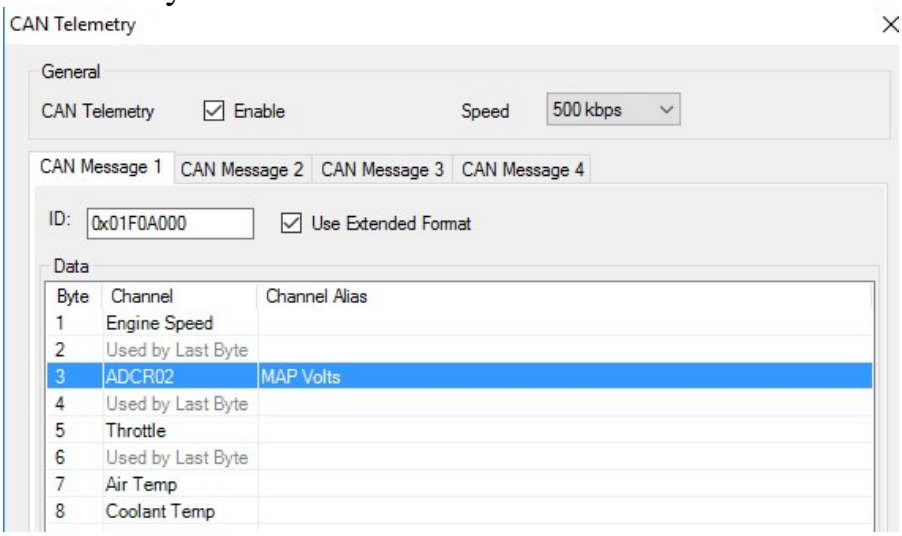


Change Byte 3 from "Engine Load" to "MAP Voltage" AEM V2 is not capable of outputting the MAP pressure on the CAN bus, so we will need to put in a scalar and offset in the gauge in order to get our MAP Pressure.

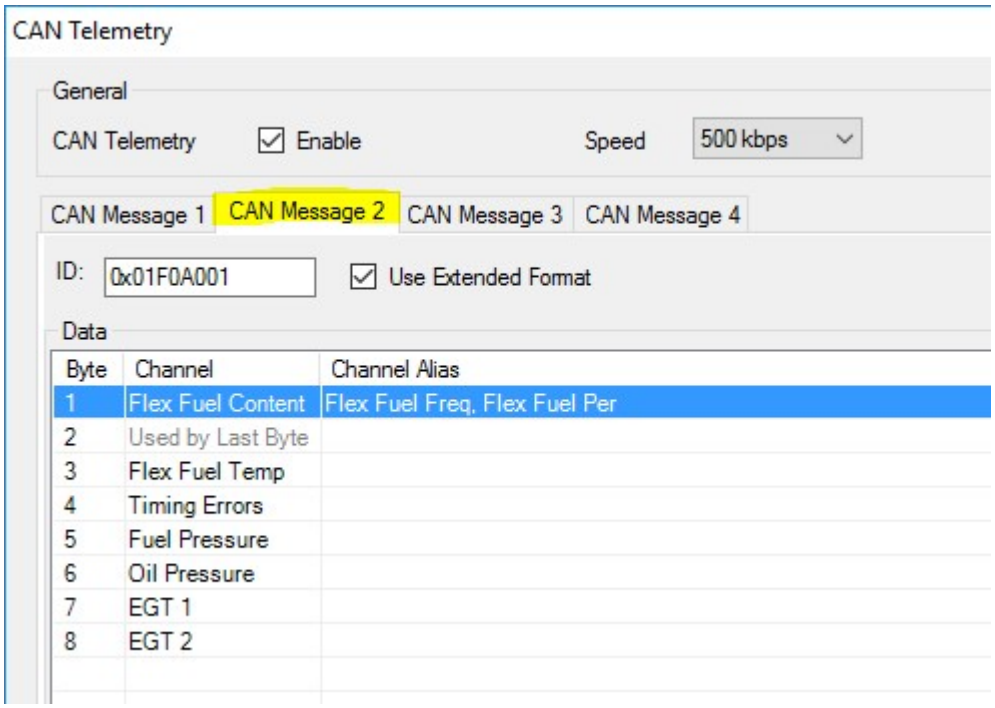
CAN Message 1 should now look like this:



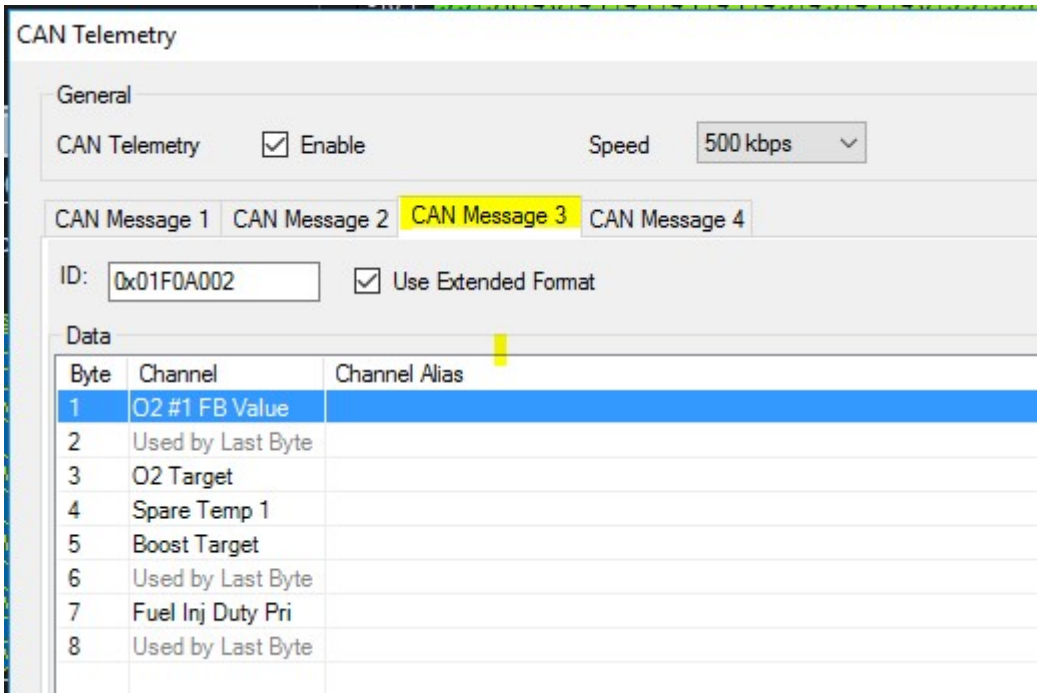
Notice that "MAP Volts" may change to one of the ADCR channels once you have made your selection. This behavior normal:



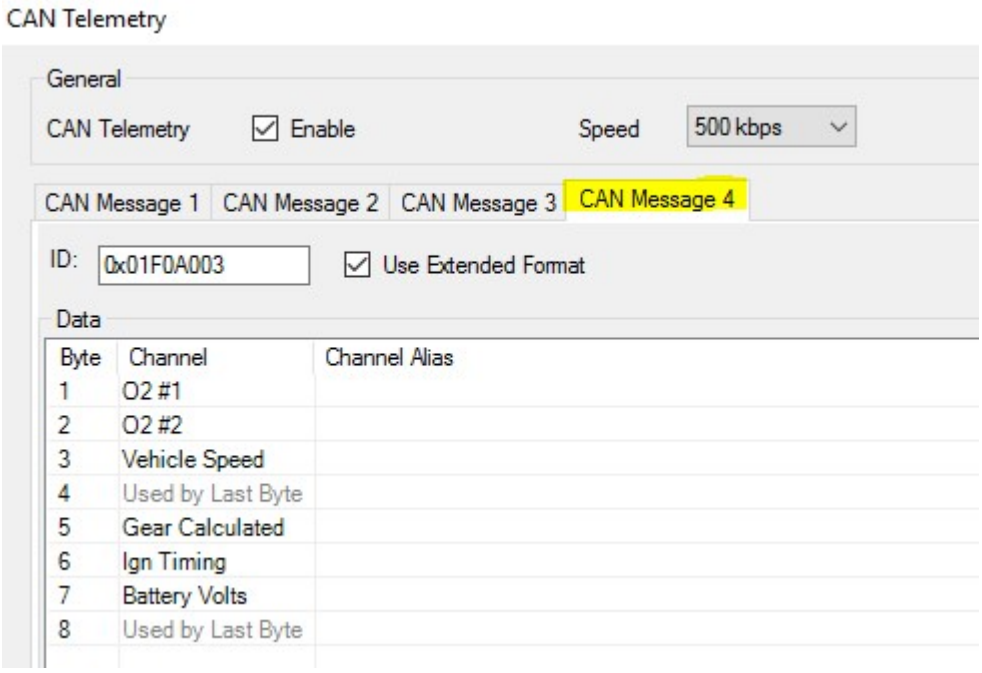
1. Now we must create CAN Message 2. Match CAN message 2 to the following:



2. Now create CAN Message 3 to match the following:



3. Now given the wizard's auto configuration, CAN Message 4 should already look like the following:



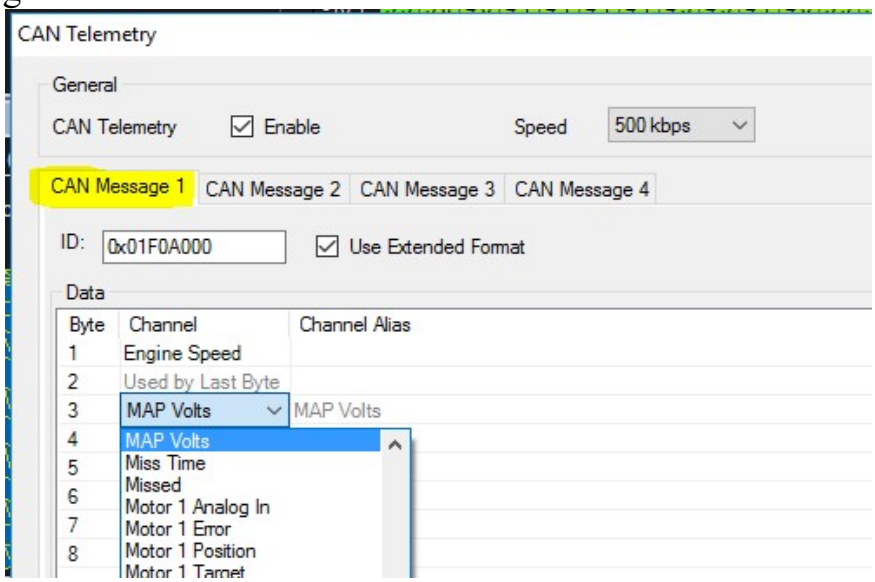
4. Skip the Automatic Transmission CAN protocol configuration and proceed to step # 7 on generating the CAN multiplier sheet on the bottom half of page 14 in this document.

Once the CAN Telemetry Settings Sheet is generated, the Fuel Pressure Scalar, Oil Pressure Scalar, Boost Target Scalar, O2 Scalar, and O2 Offset must be verified on page 17 in this manual.

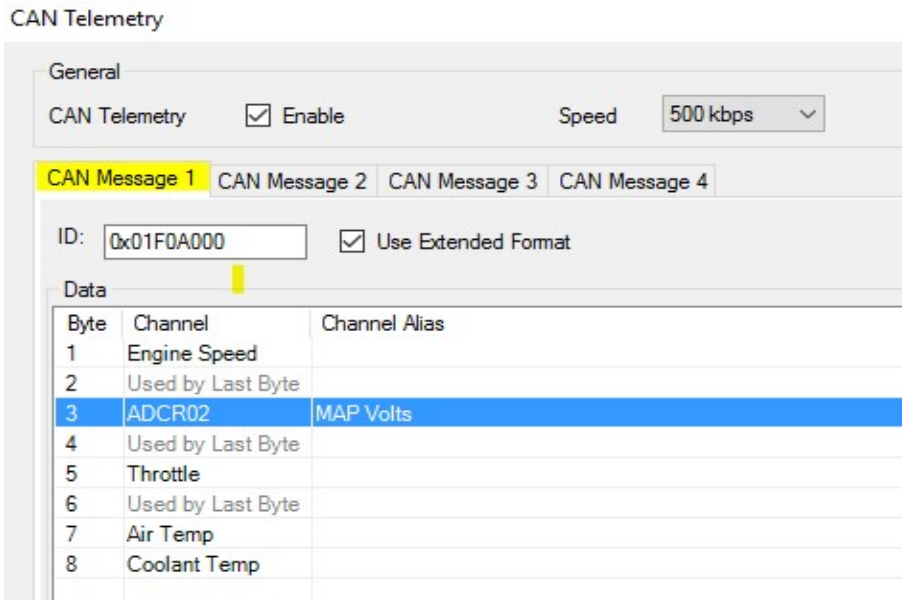
Auto CAN transmission:
(Automatic transmission cars) :

Can Message 1 should look like this:

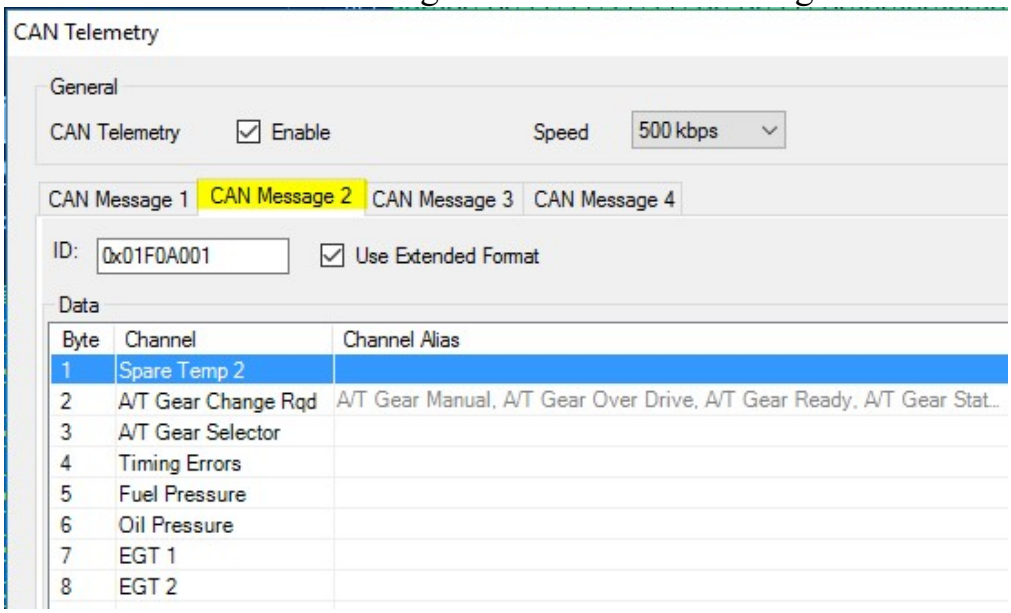
Change Byte 3 from “Engine Load” to “MAP Voltage” AEM V2 is not capable of outputting the MAP pressure on the CAN bus, so we will need to put in a scalar and offset in the gauge in order to get our MAP Pressure.
CAN Message 1 should now look like this:



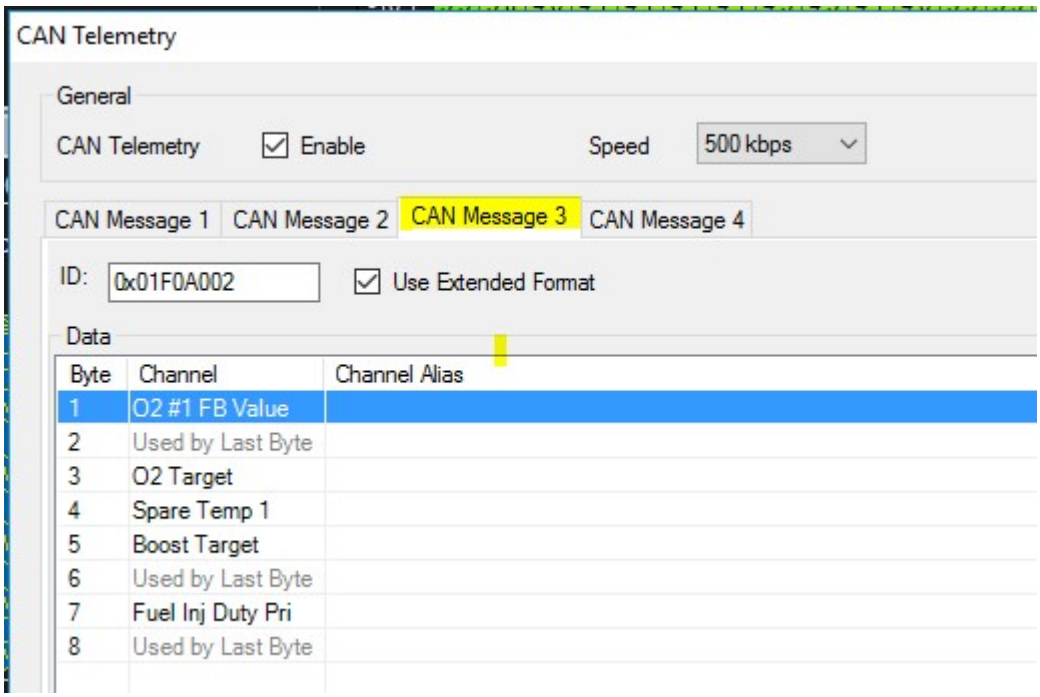
Notice that “MAP Volts” may change to one of the ADCR channels once you have made your selection. This behavior is normal:



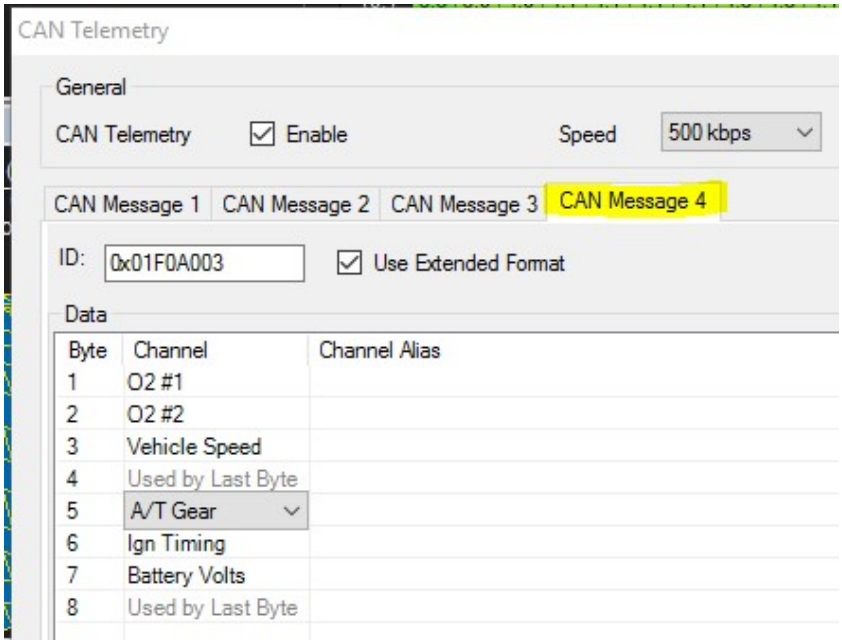
4A. Now we must create CAN Message 2. Match CAN message 2 to the following:



5A. Now create CAN Message 3 to match the following:

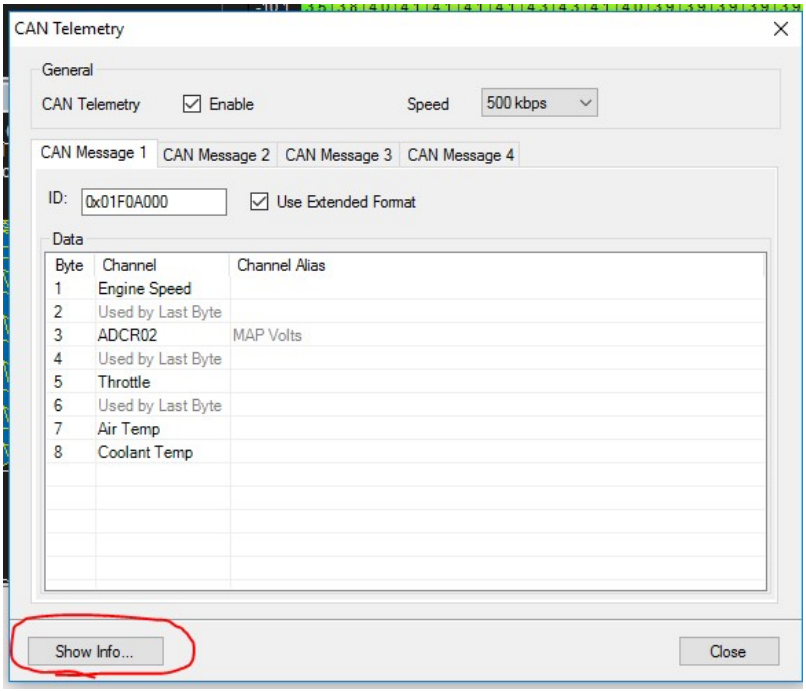


6A. Now given the wizard's auto configuration, CAN Message 4 should already look like the following, with exception of the "Gear Calculated". Change this to "A/T Gear".

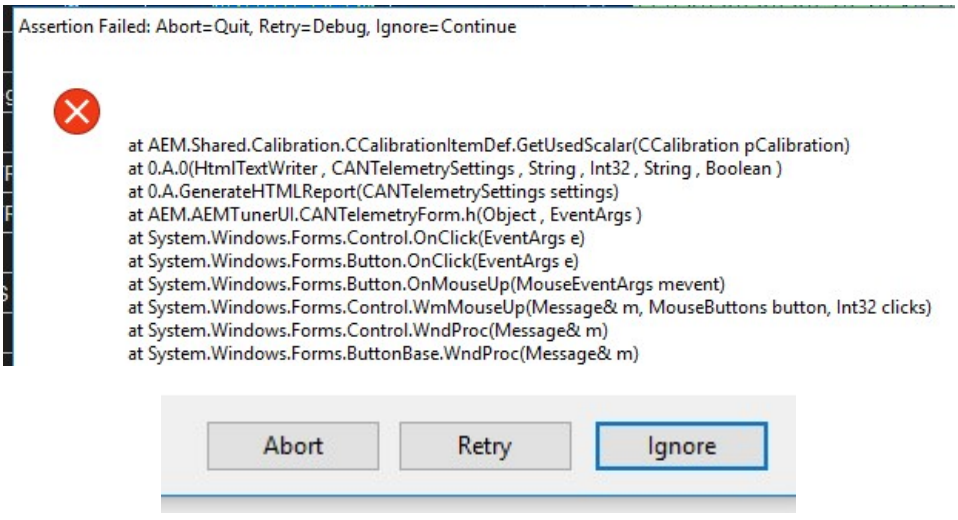


7. Generate the Multiplier Sheet:

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. Click “Show Info…” to generate the sheet.



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.



Telemetry Info

CAN Telemetry Settings

CAN Telemetry:	Enabled
Speed:	500 kbps

CAN Message Data

CAN Message 1

ID: 0x01F0A000

Byte	Name	Units	Scalar	Offset	Min	Max	Signed?	Bitmask
1	Engine Speed [msb]	rpm	0.390625	0	0.0	25599.6	No	
2	Engine Speed [lsb]							
3	ADCR02 [msb]	Volts	7.78198227635585E-05	0	0.0000	5.0999	No	
	(MAP Volts [msb])	Volts	7.78198227635585E-05	0	0.0000	5.0999	No	
4	ADCR02 [lsb]							
5	Throttle [msb]	%	0.00152587890625	0	0.000	99.998	No	
6	Throttle [lsb]							
7	Air Temp	°C	1	0	-128	127	Yes	
8	Coolant Temp	°C	1	0	-128	127	Yes	

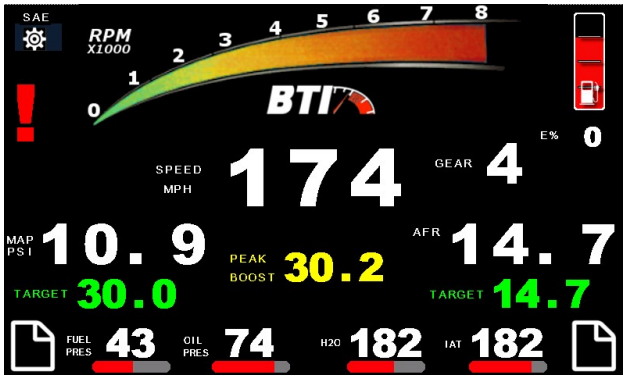
'() indicates alias channels.'

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	0.00079800022768974	0	0.0000	52.2969	No	
2	Flex Fuel Content [lsb]							

Once the CAN Telemetry Settings Sheet is generated, the Fuel Pressure Scalar, Oil Pressure Scalar, Boost Target Scalar, O2 Scalar, and O2 Offset must be verified on page 17 in this manual.



Operation:

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

There are two page menu selection buttons at the bottom corner of all operational screens.

Use this button to ass the page menu:

Select the corresponding screen that you wish to view.

Parameter Data Color: The Parameters will be shown in White, Green, Yellow, and Blue.

White: Live Data

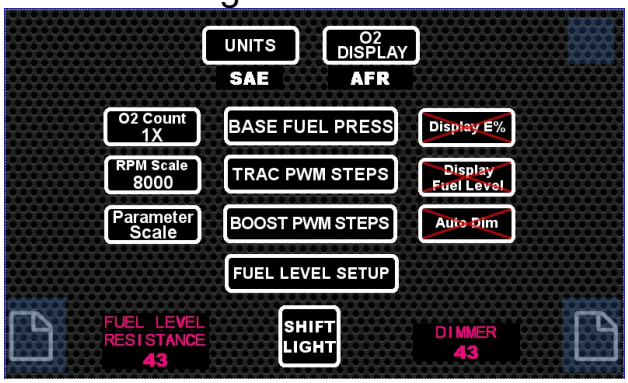
Green: Target

Yellow: Peak data (can be reset by touching value in most instances with exception to boost which records its peak by boost episode)

Blue Data: This only appears on the Peak Boost Freeze Frame screen. This is freeze-frame data from the last boost episode. Example: your Manifold Air Pressure goes up to 20 psi, the blue freeze-frame data will be recorded while the Manifold Air Pressure was at its peak.

Dash Setup Options:

Touch the cog wheel on the touch screen in order to configure the gauge.



This will bring you into a screen where the Units may be selected, the settings can be accessed, and the shift light may be setup. The Units button will allow the user to toggle between SAE and SI units. This applies to temperature, pressure, speed and distance. The O2 Display button will change how the Oxygen sensor data is displayed. The options are AFR and Lambda.

V2 CAN Multiplier:

This setup is critical in how the gauge functions and determines what data is brought in and how accurate it is.

First, select what type of setup this is:
Select “MANUAL/FLEX” or “AUTO” and press “NEXT” to continue.
Now we will need to refer to the CAN Telemetry info sheet that we generated earlier. Use this to adjust the Fuel Pressure Scalar, Oil Pressure Scalar, Boost Target Scalar, O2 Scalar, and O2 offset. Proceed through the menu and press next if the current value is correct. If the value needs to be adjusted, make the adjustments and press “NEXT” until the configuration is complete.

If the value in the gauge does not match the value on the sheet, adjust the value for said scalar or offset

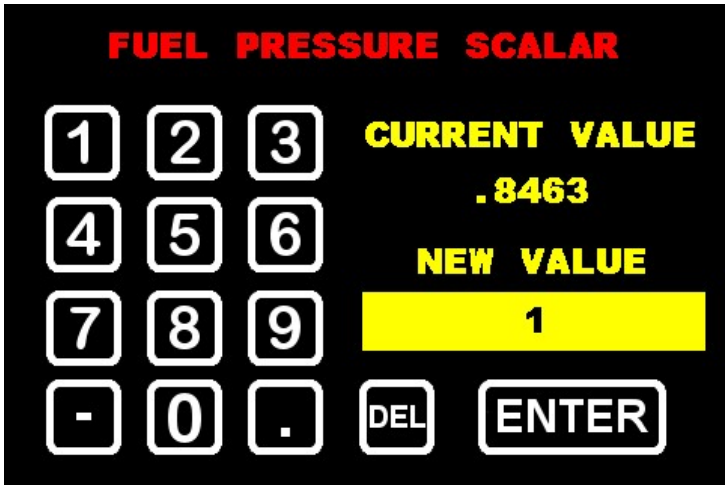
Example:

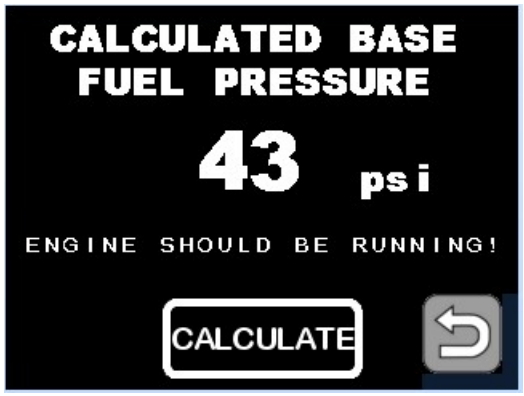
Telemetry Info

CAN Message 2

ID: 0x01F0A001

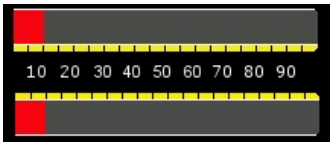
Byte	Name	Units	Scalar	Offset	Min	Max	Signed?	Bitmask
1	Flex Fuel Content [msb]	%	1	-49	-31	1253083	No	
	(Flex Fuel Freq [msb])	Hz	1	1	19.1	1253132.9	No	
	(Flex Fuel Per [msb])	ms	0.000798000022768974	0	0.0000	52.2969	No	
2	Flex Fuel Content [lsb]							
3	Fuel Pressure	psi	1	0	0	255	No	
4	Oil Pressure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





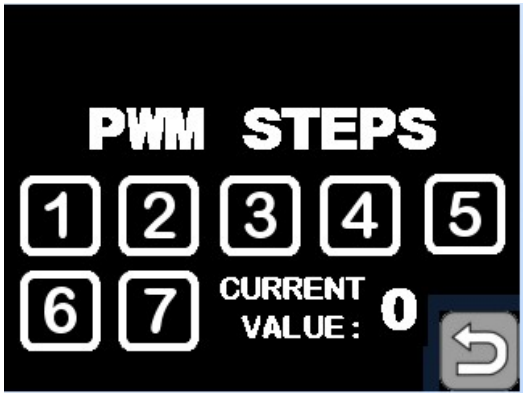
Base Fuel Pressure configuration:

In order to calculate the base fuel pressure, the engine should be idling. Press the CALCULATE button and the base pressure will be calculated and displayed. This is used on the fuel screen in order to graph the fuel pressure vs. boost pressure for simple regulator function verification.



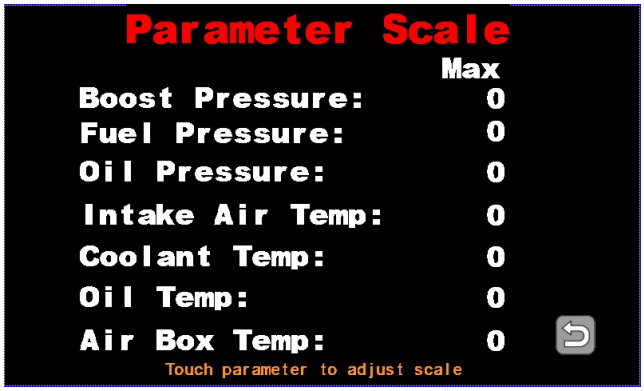
Fuel Level Setup: This is where the fuel level resistance may be programmed in order to take a reading from the fuel level sender. Consult the service manual for the fuel level resistance values.

Example: MKIV Toyota Supra Full = 4 ohms / Empty = 107 ohms.



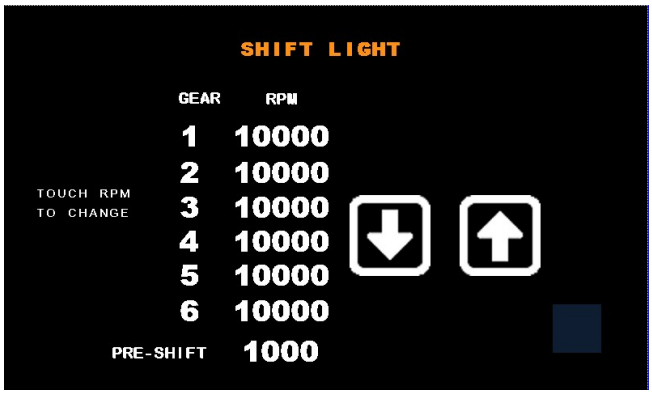
TRAC and BOOST PWM Steps:
Use these two buttons to configure how many steps are to be programmed in the Infinity Tuner software for Boost and Slip. Typically the scale is from 0-5 volts and the max amount of steps allowed is 7 which give you 8 settings (0-7). Example: a value of 7 here would make each step would have a value of .71 volts. A value of 1 here would give the step a value of 5 volts. It is **imperative** to view each step in the infinity tuner

software when configuring this as there could be a potential difference with regard to ground.



Parameter scale: Use this screen to set the maximum range for boost pressure and various temperature slide bars and graphs.
Example: You will be running a 30 psi boost
target. The max boost pressure could be 35 psi
to give the slide bars and graphs the best resolution. The same goes for temperatures. These values should be entered with respect to which units are selected: SI or SAE. If SI units are selected, Boost Pressure should be entered in kPa and temps should be entered in Celsius. If SAE units are selected, Boost Pressure should be entered in psi and temps in Fahrenheit.

O2 Count 1X (2x) Use this to display 1 or 2 wideband sensor readings.
RPM Scale This button switches the RPM scale from 8K RPM to 10K rpm.
Display E% This button adds or removes ethanol content on the screen.
Fuel Level This button adds or removes the fuel level gauge on the screen.
Auto Dim This button enables and disables the auto dim feature.
Warnings Use this to disable the warnings generated by the ECU. * (not all ECUs generate warnings over CAN)



Shift Light Configuration:
Touch the gear that you wish to change the shift light
RPM on. That gear number will appear above the up and down arrows for verification. Use the up and down arrows to adjust the shift light RPM set-point of said gear. Press the back arrow button at the bottom right hand corner to save the settings. PRE-SHIFT will fade the outside orange LEDs in the value less than the assigned RPM per gear. The shift light should flash once the settings are saved.

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.
- Warranty claims must be sent to sales@btigauges.com.