Performance Vehicle Telemetry Displays

www.btigauges.com

BTI 3.5 and 4.3 TFT multi-integration display
Installation Manual
Doc version 1.4

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****

Index

General installation / wiring:

MKIV Supra specific installation (Series 1 only) :

1. **Remove the 3 screws holding in the OEM clock**

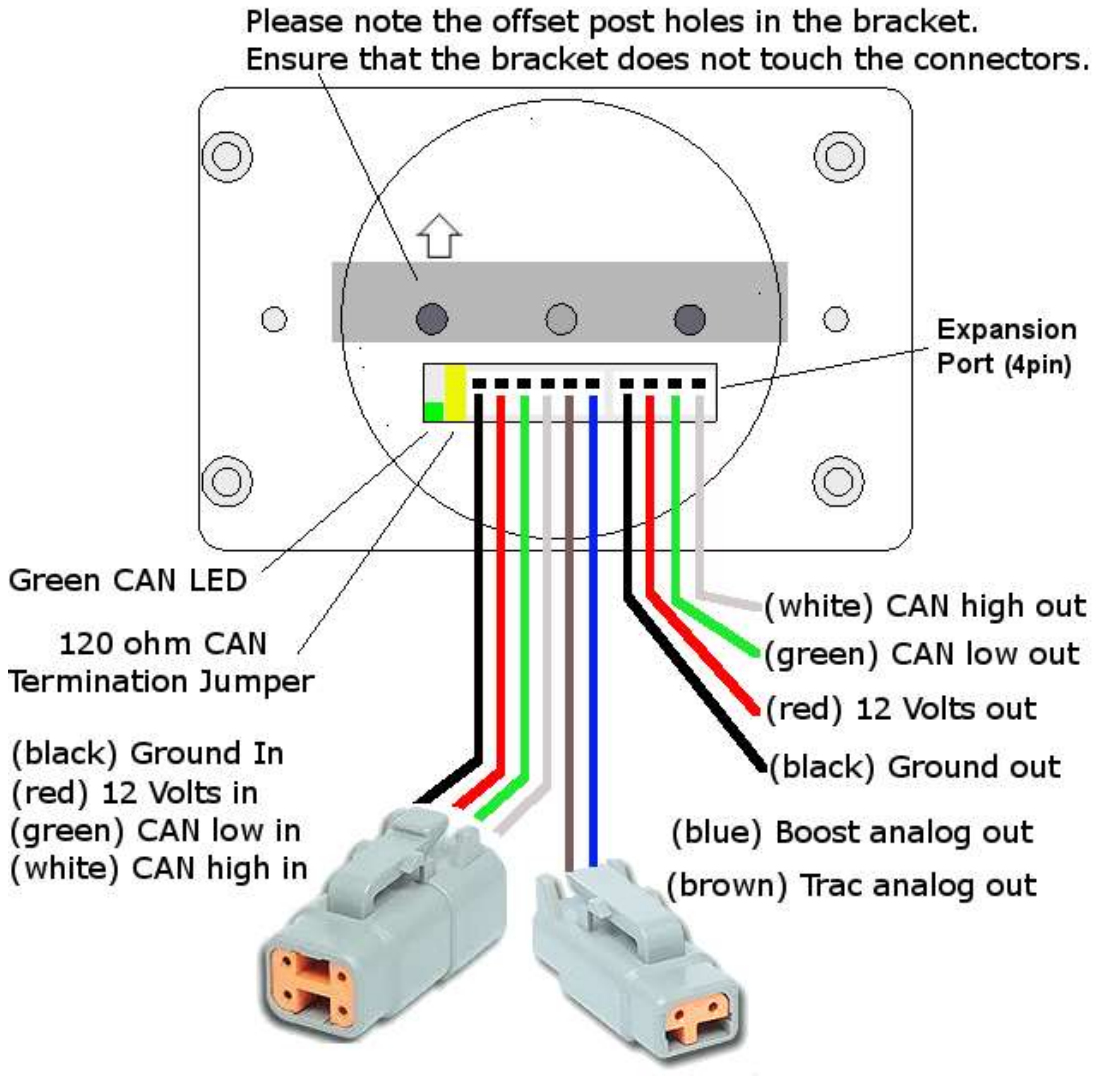
2. **Remove the OEM Clock**

3. **Install the BTI bracket included with the 4.3 display**

4. **Attach the BTI bracket with the OEM screws. If you do not have these screws, 3 stainless steel screws are included with these display.**

5. **Mount the 4.3 display into the OEM clock hole and use the supplied brass thumb screws to secure the display to the bracket.**

In the event your dash has a carbon fiber overlay, you will need spacer discs listed above (right) in order to keep the proper distance and tension on the clock mount bracket. These may be ordered at: www.btigauges.com These come in a pack of 3: 1mm, 2mm, and 3mm discs.



The wiring is similar for all models. All integrations are shipped with the AEMnet standard DTM connector cable with exception to customers whom selected the Haltech 4 pin DTM connector which is conveniently wired 180 degrees from the

AEMnet DTM connector standard. We then ship conversion pig-tails for various ECU connection options. Please see specific ECU integrations for wiring specifics.

AEM Infinity

Plug and Play harness installation:

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

Locate the 4 pin AEM NET wiring connector on the Infinity harness. Connect the Plug and play harness into the Infinity 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.
** Notice** It has come to our attention that some of the first AEM Infinity factory harnesses had the CAN high and CAN low wires reversed **(Most Infinity 8 Supra harnesses)**. Pin 1 should be White (CAN high) and Pin 2 should be Green (CAN low).

Plug and pin harness installation:

Plug and pin wiring harness for Infinity ECUs:

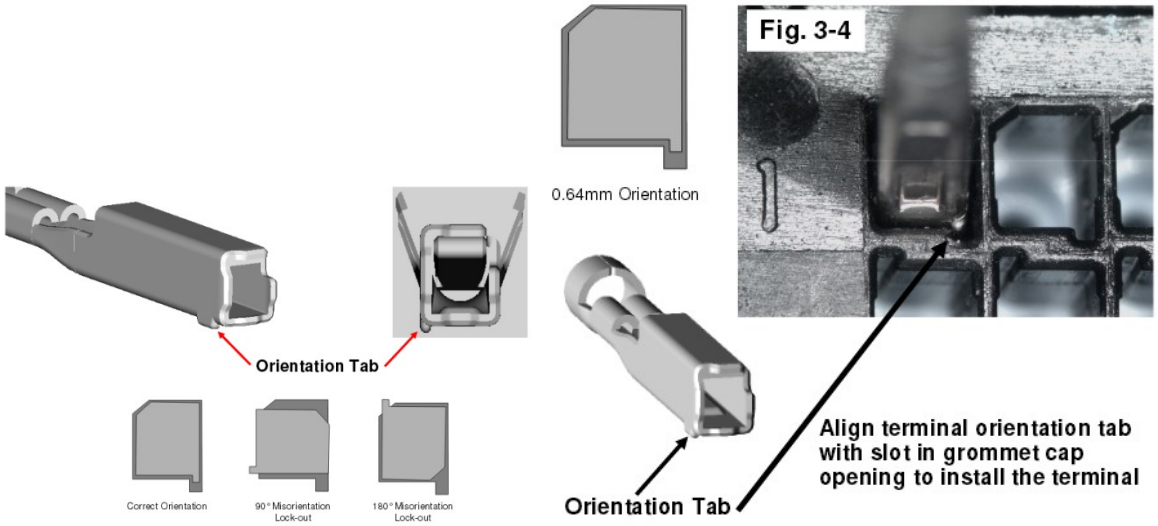
The termination to the Infinity ECU is relatively simple as it only consists of two wires: CAN A High and CAN A Low. Included on the plug and pin harness are two pins that will simply plug into the Infinity (Molex MX 123) connectors.

Notice: It is imperative that the pins are properly inserted into the correct positions on the connector! Removal and repining of these connectors is very difficult and requires special tools. Improper connection to the wrong pins could result to damage to the gauge or the ECU.

Double check your work here!

If you have questions regarding the Molex MX 123 connector, refer to this document for assistance: http://www.molex.com/mx_upload/family//MX123UserManual.pdf

Note that the pins have an orientation tab that only allows the pin to be inserted in one orientation. See the figure below to see the orientation and how the pin will be locked out if the orientation is not correct.

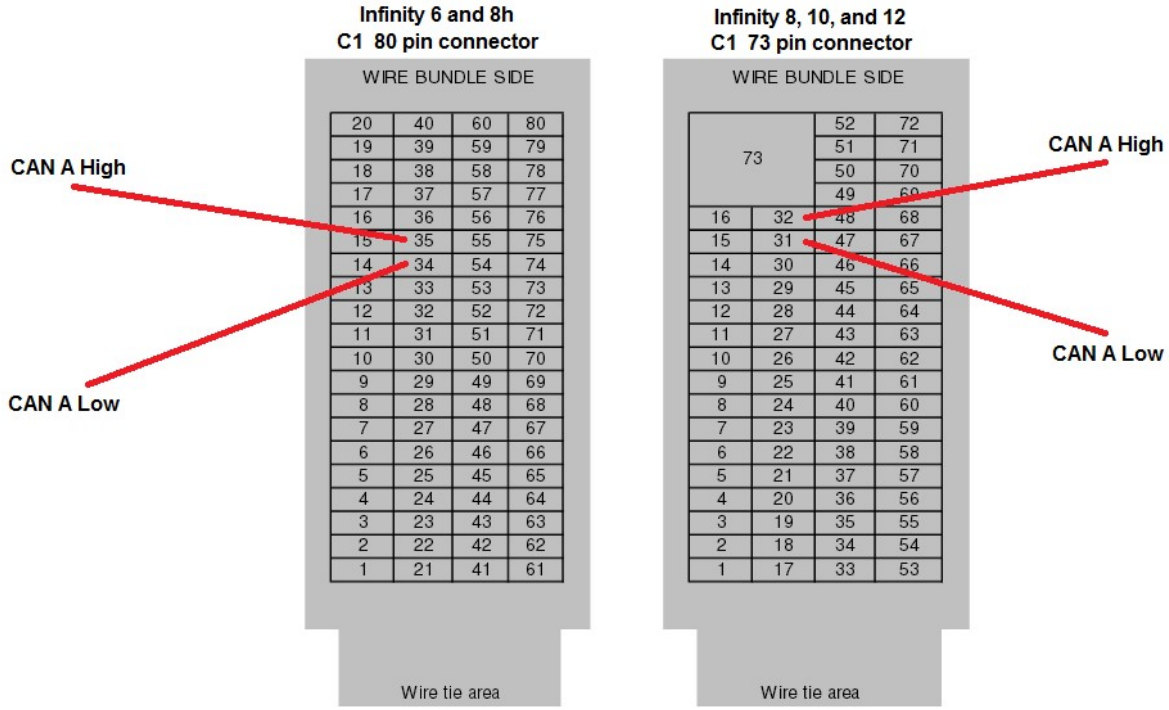


As per the AEM Infinity 8, 10, and 12 documentation:

C1-31	CANL_A_Out	Dedicated High Speed CAN Transceiver	Recommend twisted pair (one twist per 2") with terminating resistor. Contact AEM for additional information.
C1-32	CANH_A_Out	Dedicated High Speed CAN Transceiver	Recommend twisted pair (one twist per 2") with terminating resistor. Contact AEM for additional information.

As per the AEM Infinity 6 and 8h documentation:

C1-34	CANL_A_Out	Dedicated High Speed CAN Transceiver	Recommend twisted pair (one twist per 2") with terminating resistor. Contact AEM for additional information.
C1-35	CANH_A_Out	Dedicated High Speed CAN Transceiver	Recommend twisted pair (one twist per 2") with terminating resistor. Contact AEM for additional information.



The plug and pin harness has two signal wires (Green and White). Pin the White wire to CAN A High and the Green wire to CAN A Low on the corresponding connector. Connect the Red wire to a switched on / ignition power source and connect the Black wire to ground.

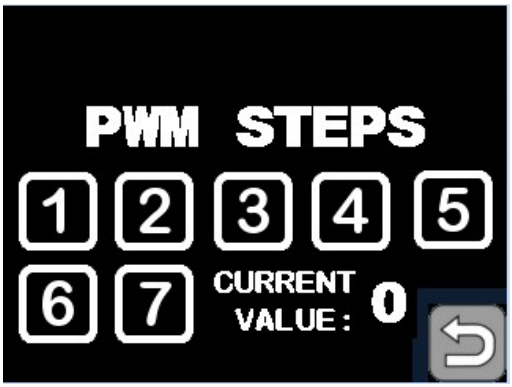
2 Pin Analog Out Connector (Brown and Blue Wires)

The termination of these two wires is dependent on the inputs that are assigned in the Infinity Tuner software. These inputs are assigned in the software under **Wizards > Advanced Setup > "ModeSwitch Input Setup" or "Traction Control Slip Target Trim Input Setup".** 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: The gender of the 2 pin plug may be reversed on newer models in order to prevent the improper connection to the "Flash Enable" connector.

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.



AEM Infinity TRAC and BOOST PWM Steps:

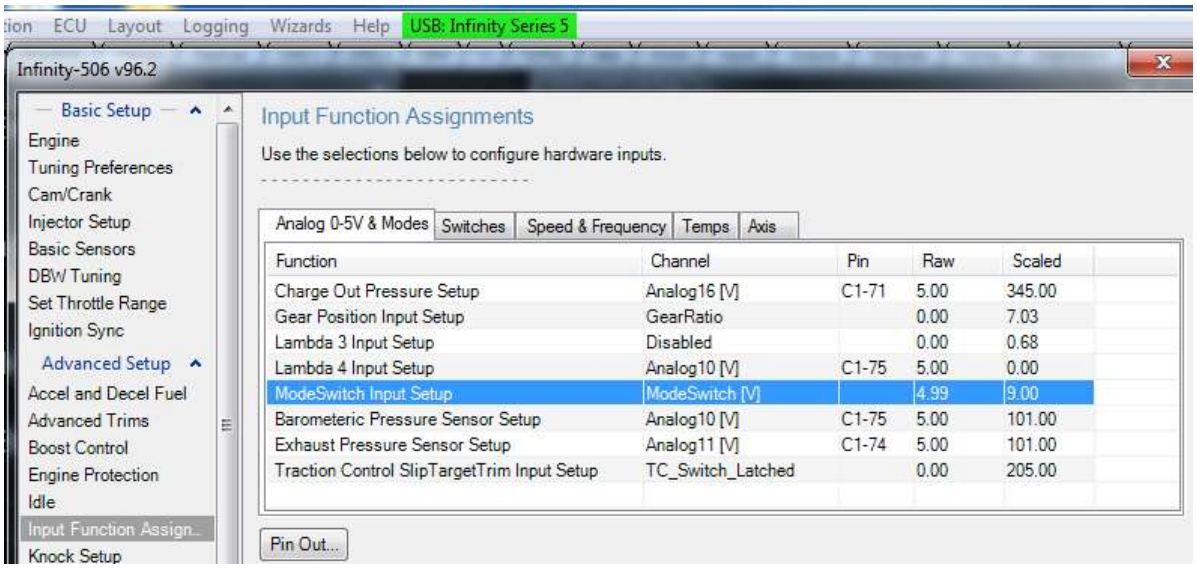
Use these two buttons to configure how many steps are to be programmed in the Infinity Tuner software for Boost and Slip. Typically the scale is from 0-5 volts and the max amount of steps allowed is 7 which give you 8 settings (0-7). Example: a value of 7 here would make each step would have a value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

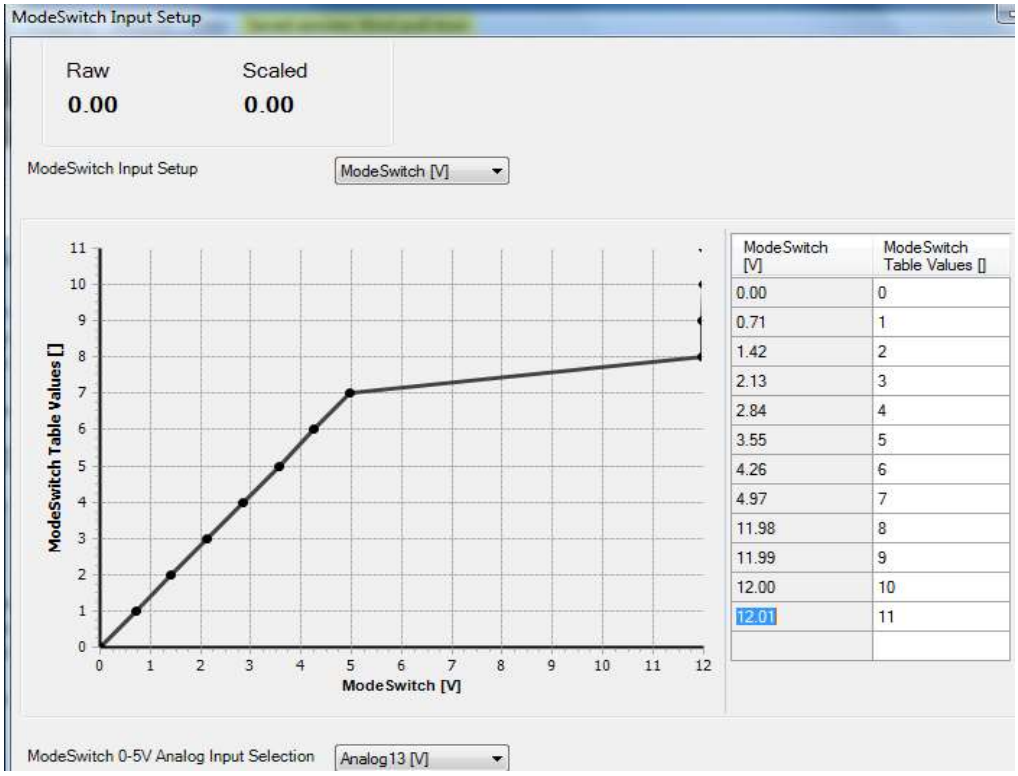
**** Note that these two settings should be configured by competent personnel. Raising the BOOST too much or reducing the SLIP too much can have severe consequences. ****

Both the Boost and Traction Control settings must be configured in the AEM Infinity Tuner software under: **Wizards** > **Advanced Setup > "ModeSwitch Input Setup" or "Traction Control Slip Target Trim Input Setup".**

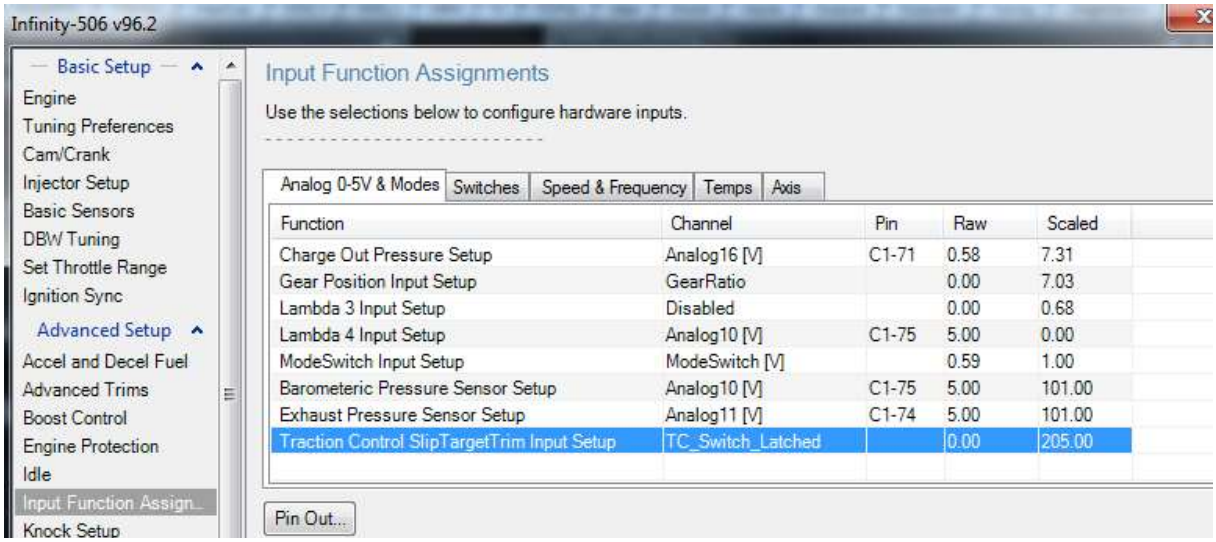
It is imperative to configure these inputs correctly. This is what that setup looks like in the Infinity Tuner software: (if you are uncomfortable here, please take your vehicle to a competent shop)

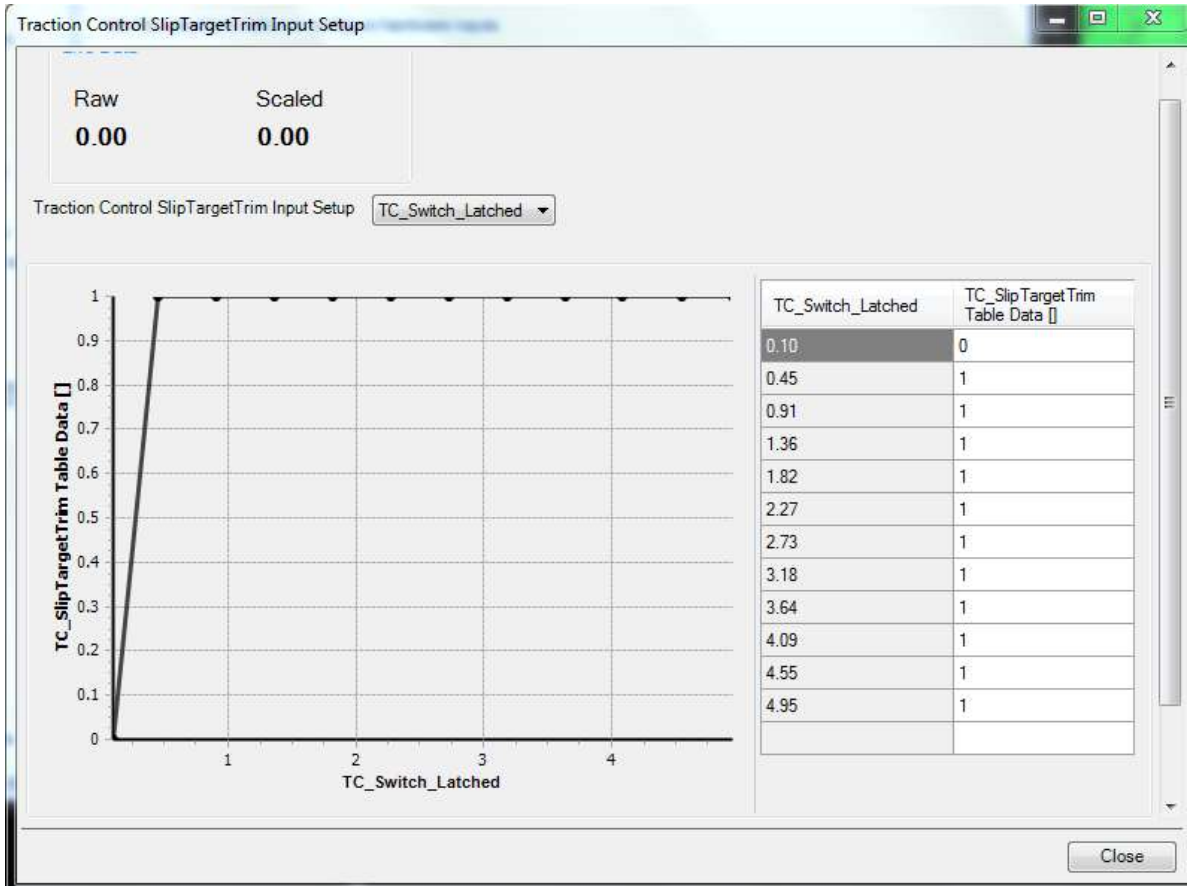
Example Boost Setup:





Example Trac Setup:





** Note that all GPS, G-force and Yaw readings are derived from the AEM Vehicle Dynamics Module (PN 30-2203). The absence of this module will result in a "0" value on corresponding readings.

AEM V2

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.

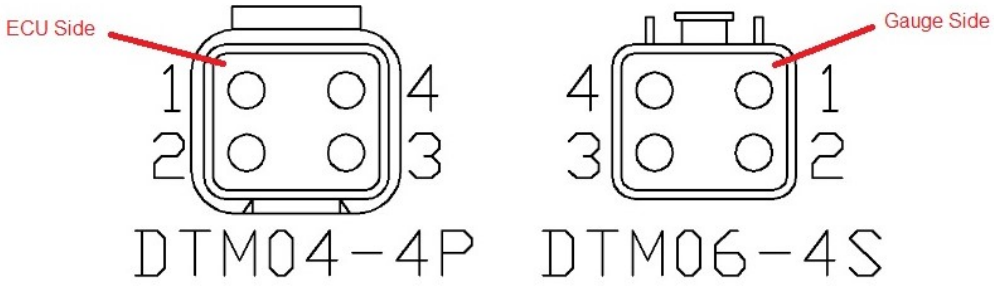


Figure 1: AEMnet connectors, wire entry view

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.

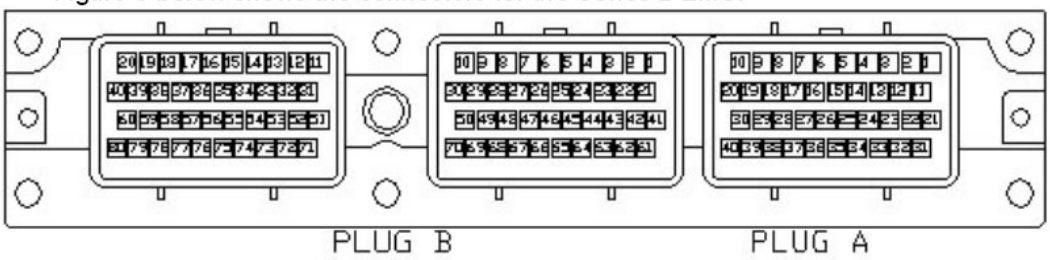
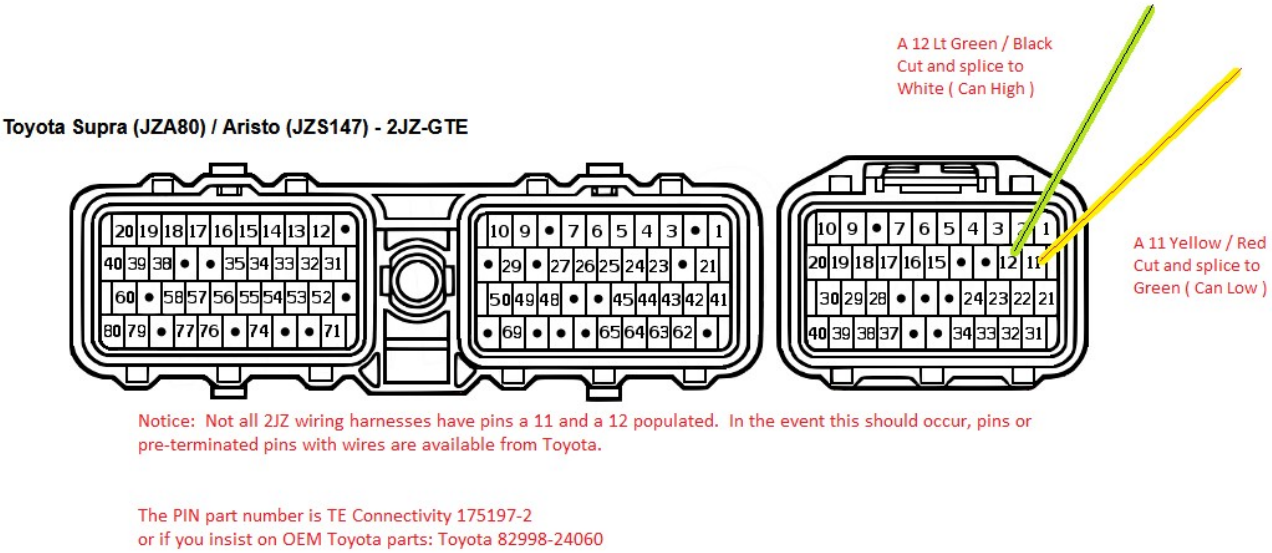


Figure 6: Wire-side view of pinout for 6100 and 6101 EMS



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.

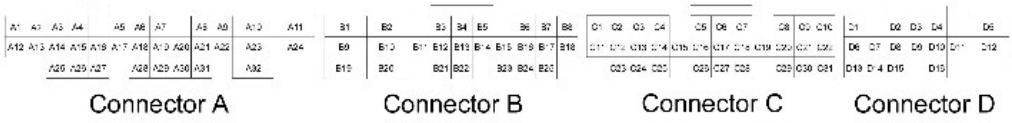


Figure 7: Wire-side view of pinout for 6030

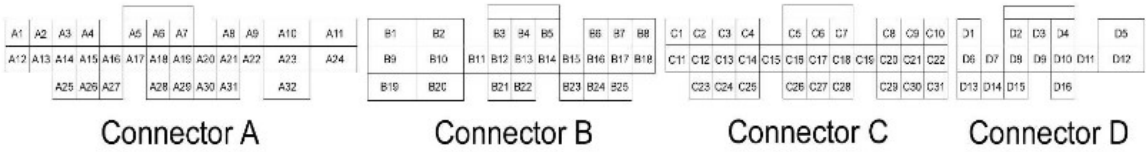


Figure 8: Wire-side view of pinout for 6050, 6051, 6052, 6053, and 6060 EMS

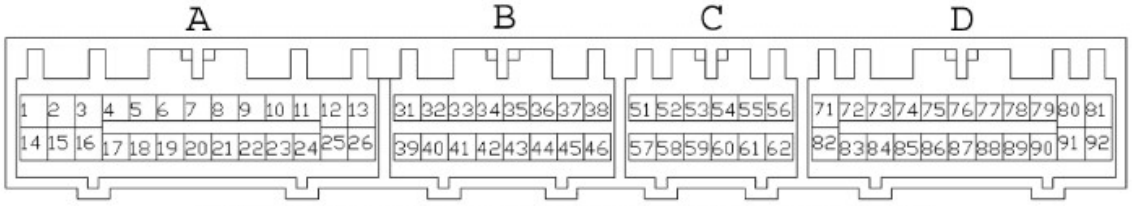


Figure 9: Wire-side view of pinout for 6310 and 6311 EMS

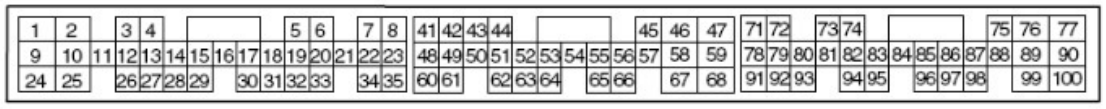
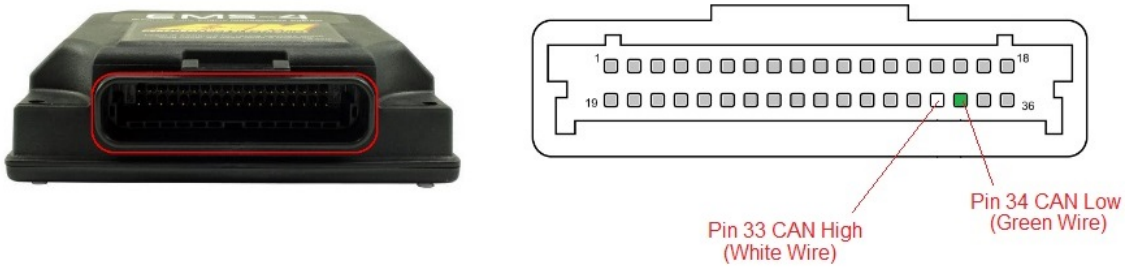


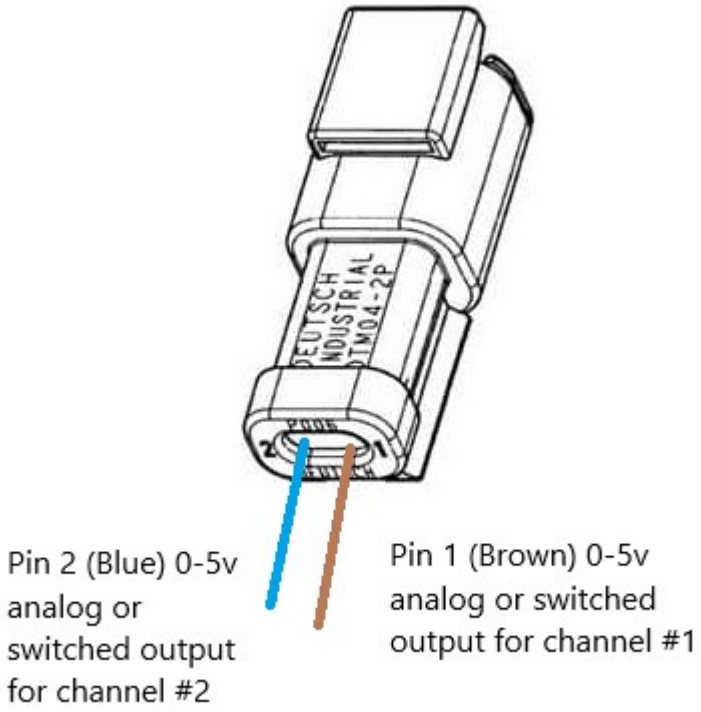
Figure 10: Wire-side view of Pinout for 6320 EMS

EMS-4 CAN Bus wiring:



2 Pin Analog Out Connector (Brown and Blue Wires)

The termination of these two wires is dependent on the inputs that are assigned in the AEM Tuner software. If you are using one of these gauge outputs for boost control, tie the output to the V2 **"ModeSwitch Input".** Either output may be connected to a different input on V2 (5 volt low current) or used with a 5 volt relay for Nitrous Arm / Purge or a line lock if desired. We offer both 1 channel and 2 channel optically isolated 5 volt relay for these scenarios listed on page 19 of this manual.

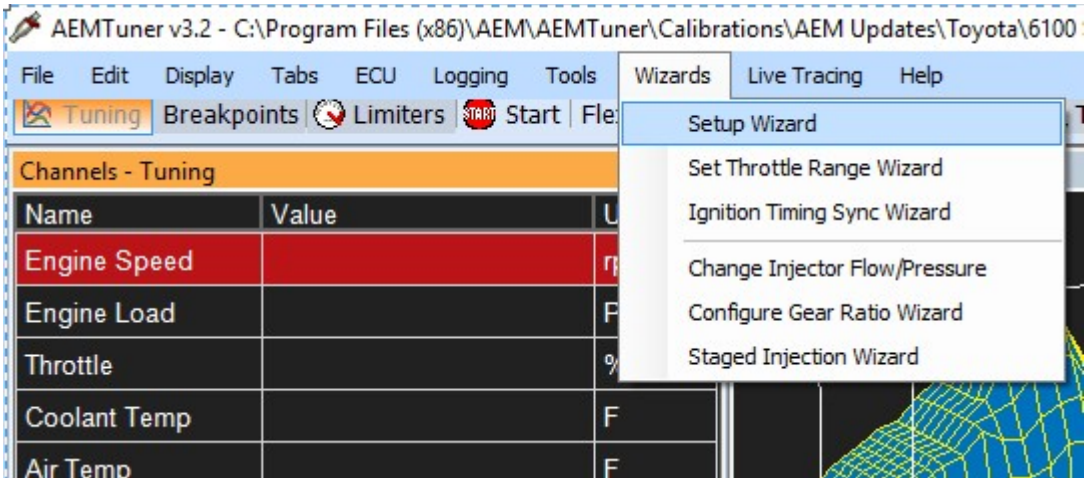


AEM Tuner software configuration:

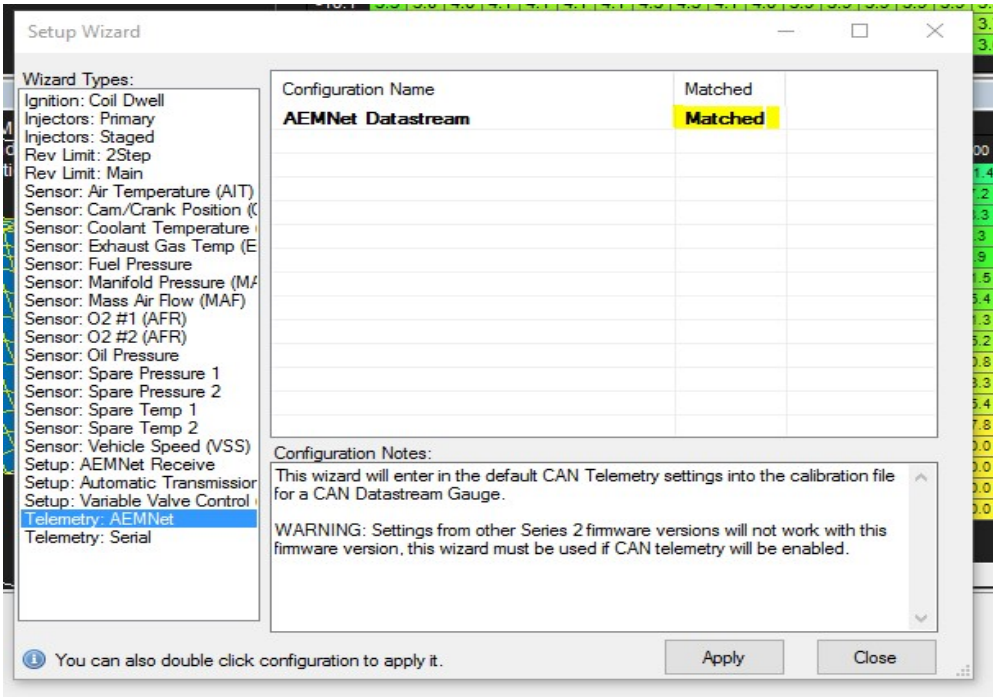
In order to have a properly functioning gauge, it is mandatory that the CAN protocol is configured in the AEM Tuner software.

Steps to create the protocol and generate the multipliers:

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

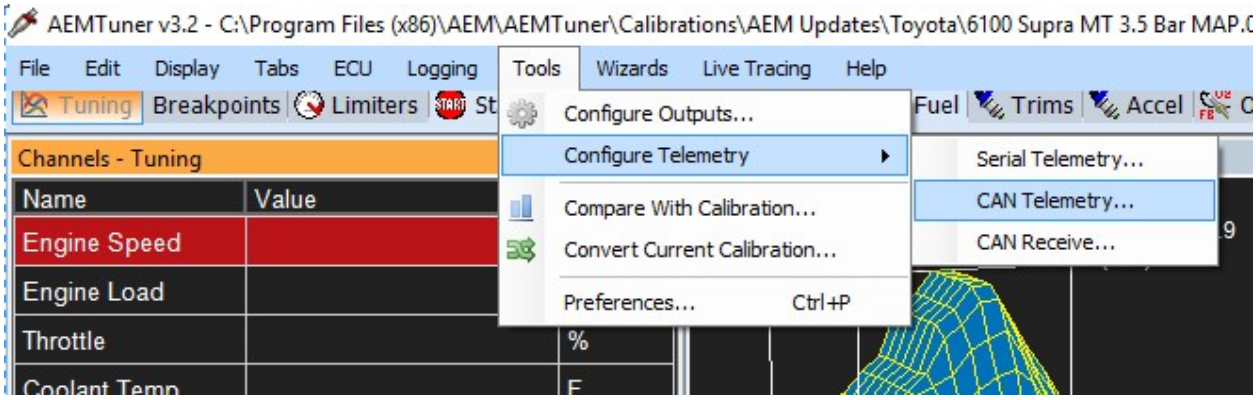


1. Now select “Telemetry: AEMNet” and click on the space under “Matched”. This should insert the word “Matched” if the datastream is not linked.



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:



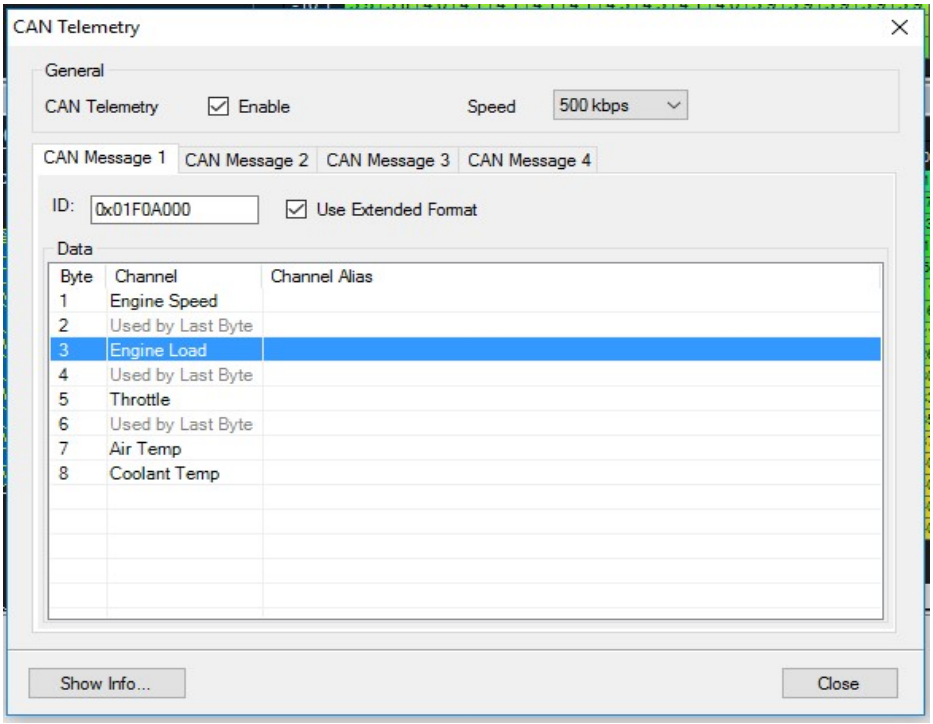
Standard CAN transmission:

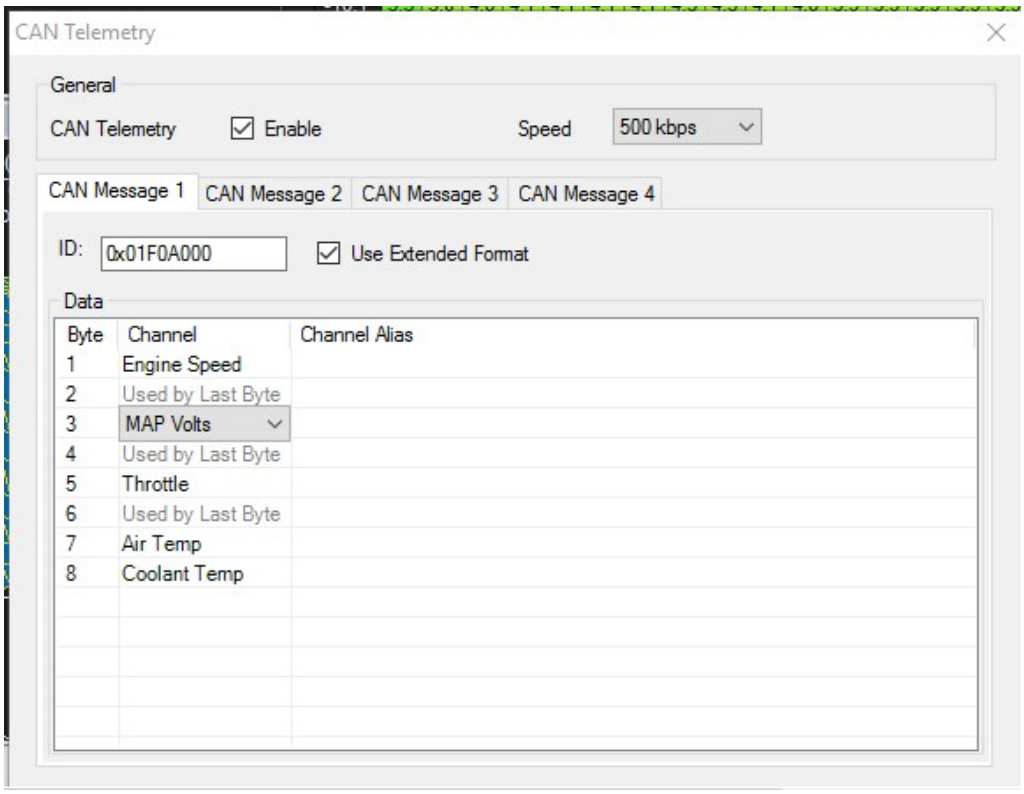
(Manual transmission cars with or without flex fuel) :

Can Message 1 should look like this:

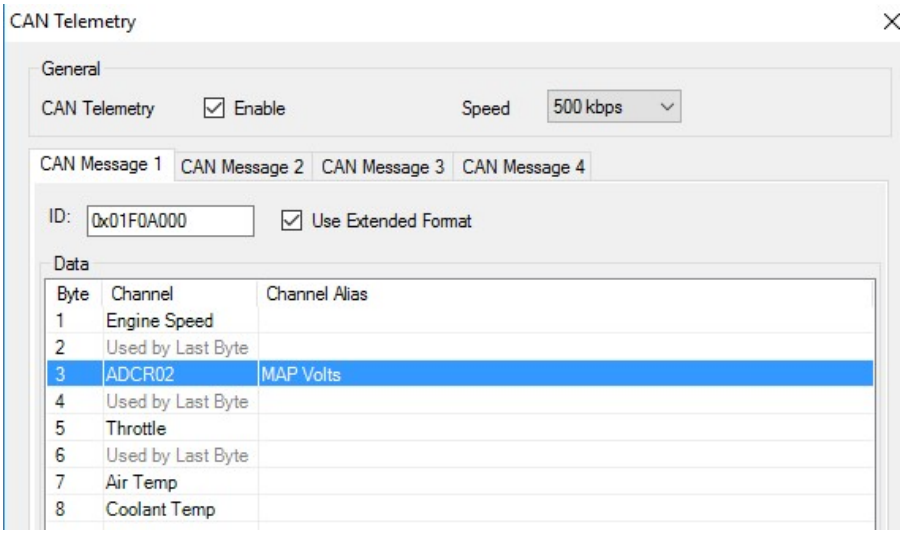
Change Byte 3 from “Engine Load” to “MAP Voltage” AEM V2 is not capable of outputting the MAP pressure on the CAN bus, so we will need to put in a scalar and offset in the gauge in order to get our MAP Pressure.

CAN Message 1 should now look like this:

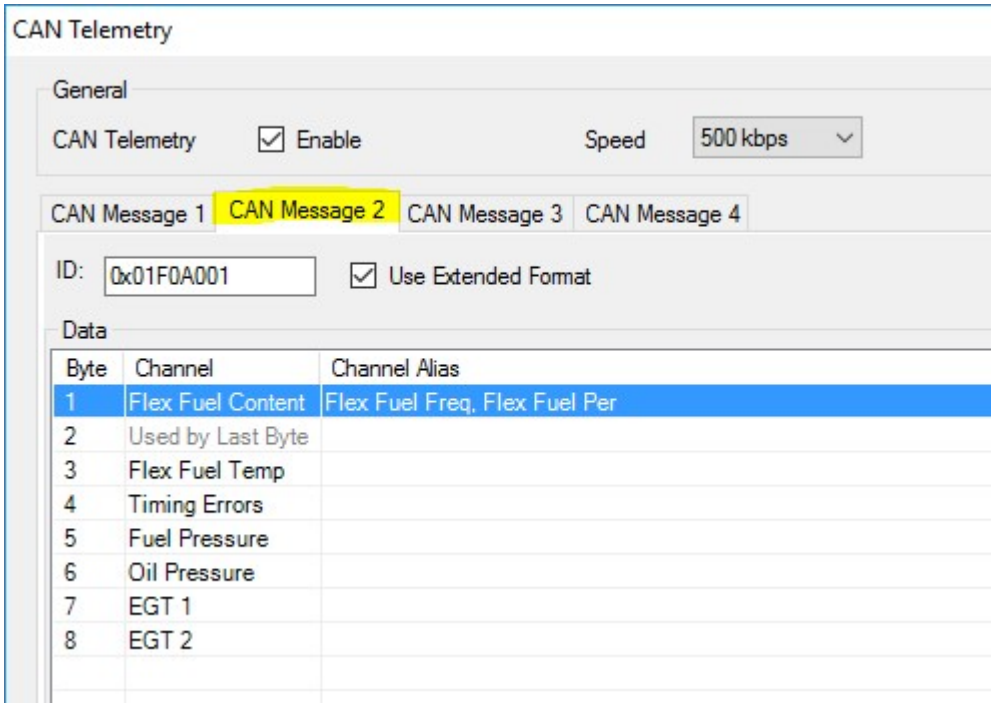




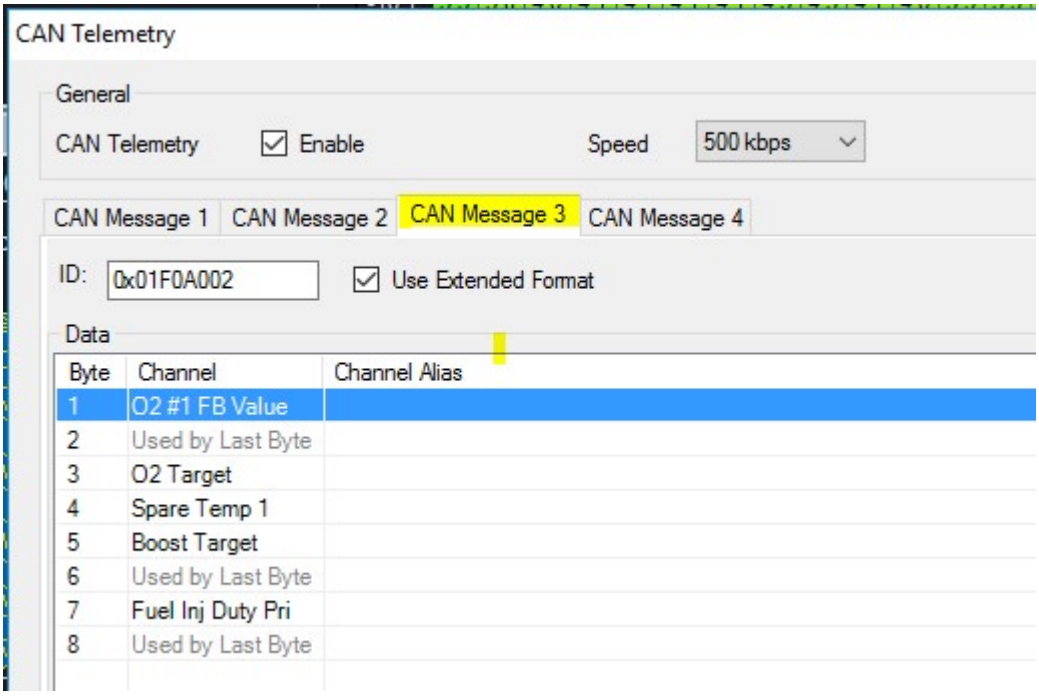
Notice that “MAP Volts” may change to one of the ADCR channels once you have made your selection. This behavior is normal:



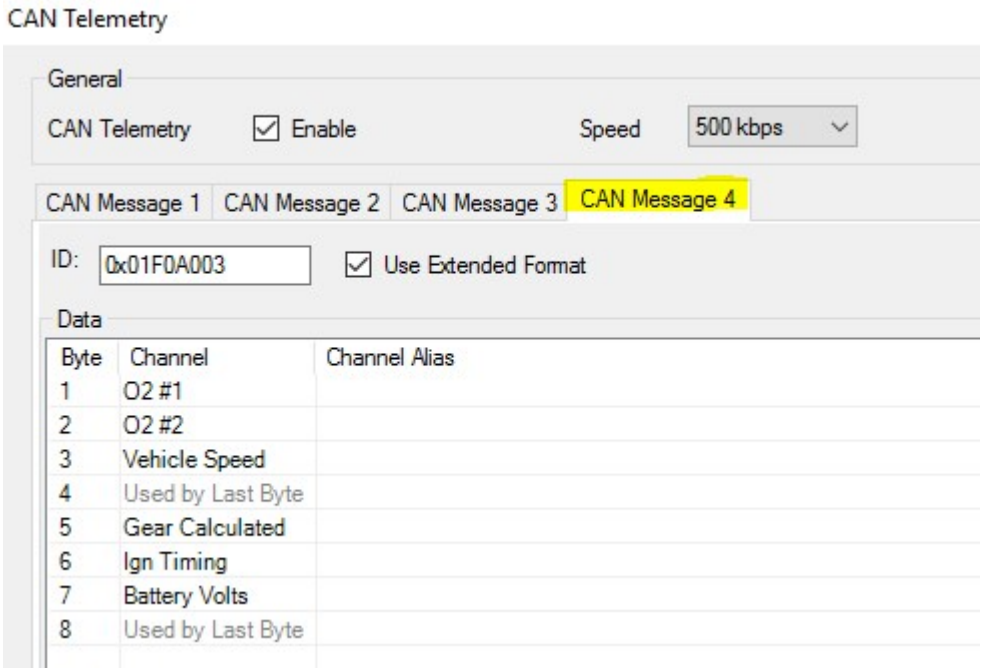
1. Now we must create CAN Message 2. Match CAN message 2 to the following:



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:



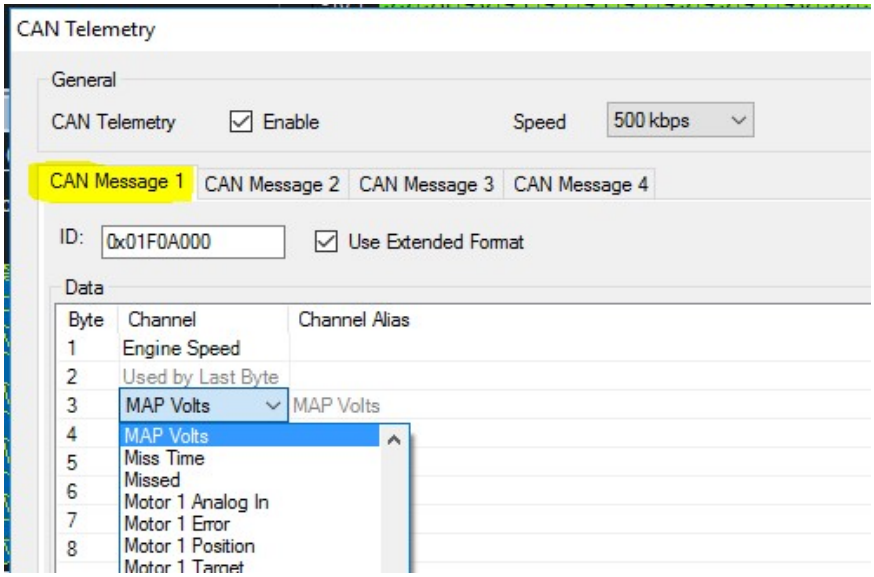
4. Skip the Automatic Transmission CAN protocol configuration and proceed to step # 7 on generating the CAN multiplier sheet on the bottom half of page 14 in this document.

Auto CAN transmission:
(Automatic transmission cars) :

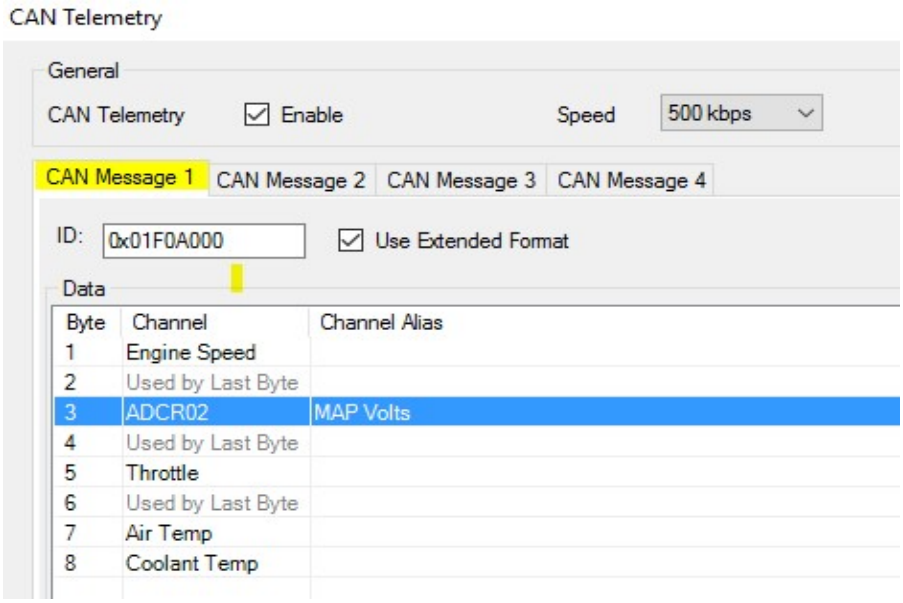
Can Message 1 should look like this:

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.

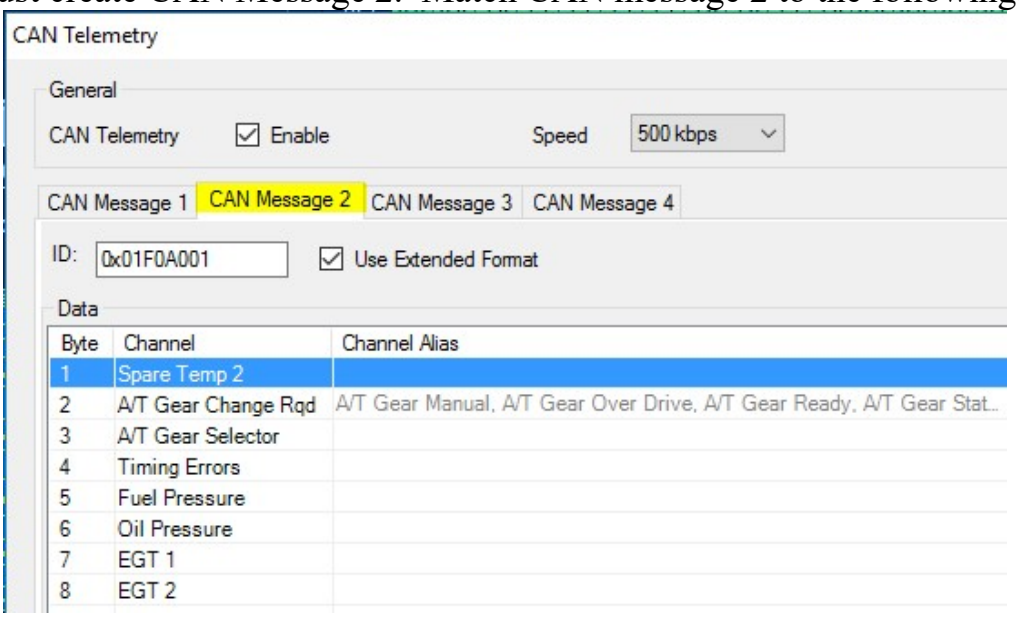
CAN Message 1 should now look like this:



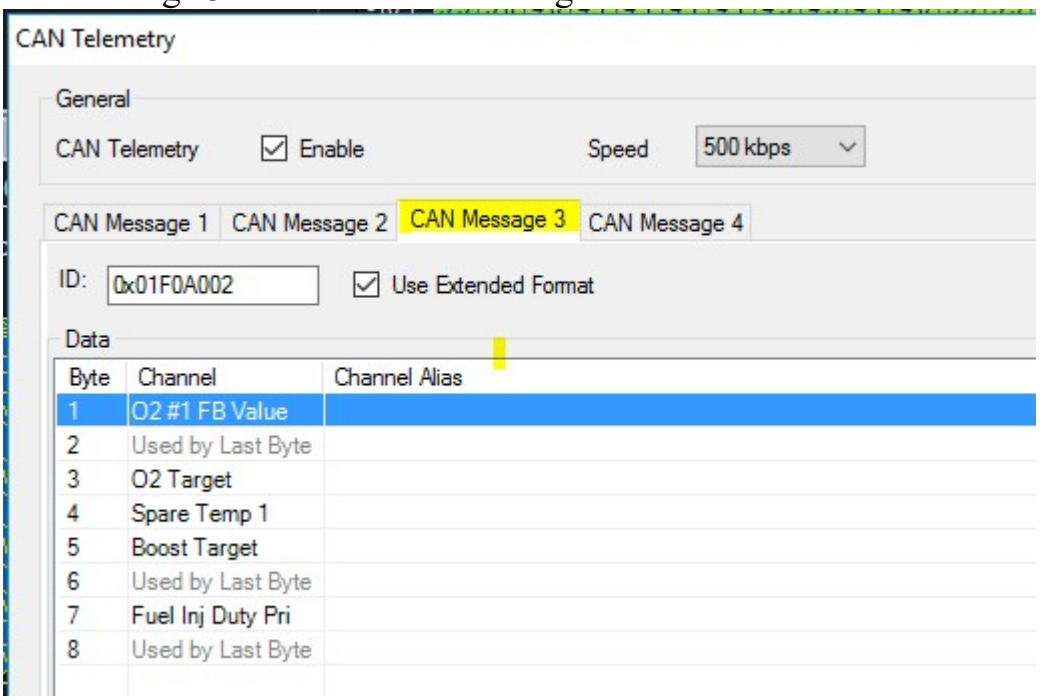
Notice that “MAP Volts” may change to one of the ADCR channels once you have made your selection. This behavior is normal:



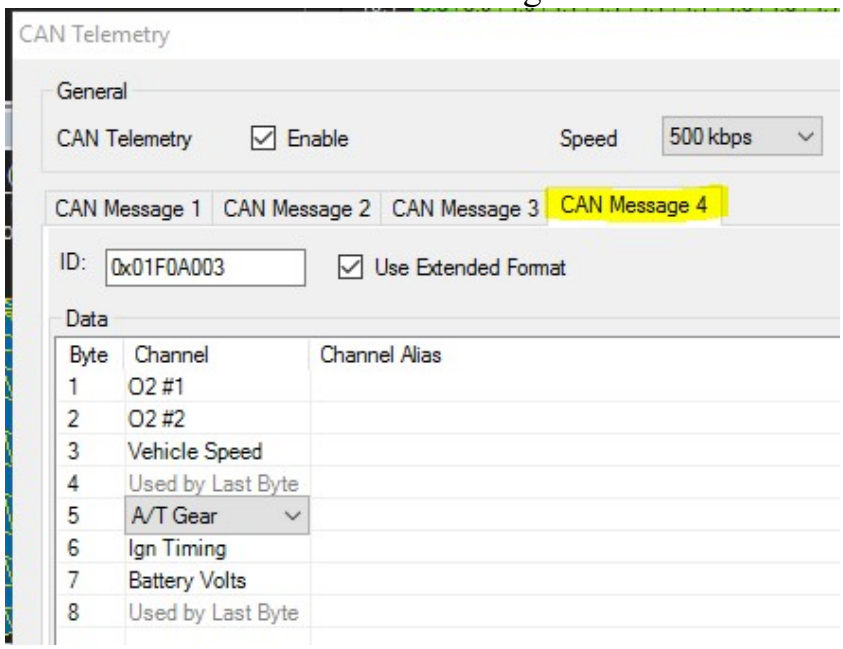
4A. Now we must create CAN Message 2. Match CAN message 2 to the following:



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

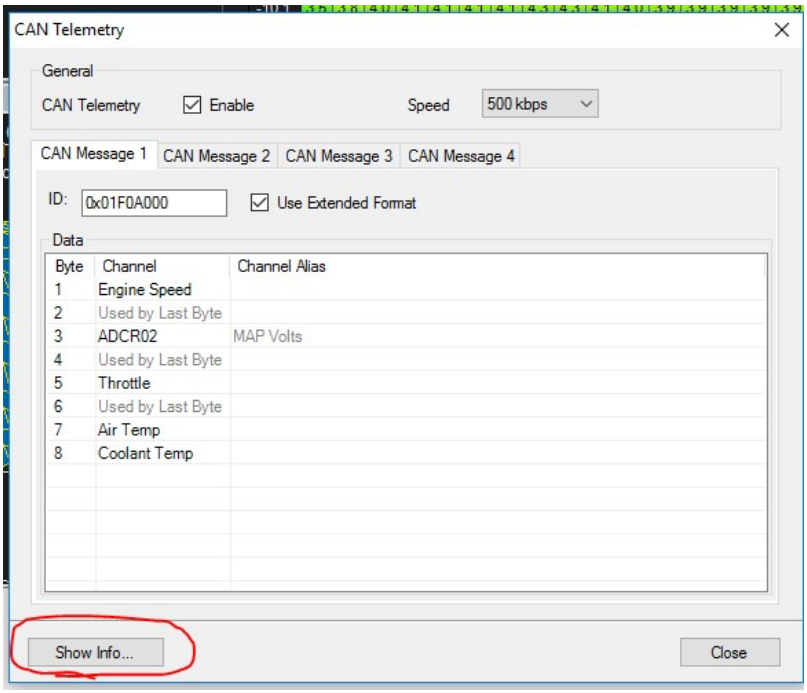


6A. Now given the wizard's auto configuration, CAN Message 4 should already look like the following, with exception of the "Gear Calculated". Change this to "A/T Gear".

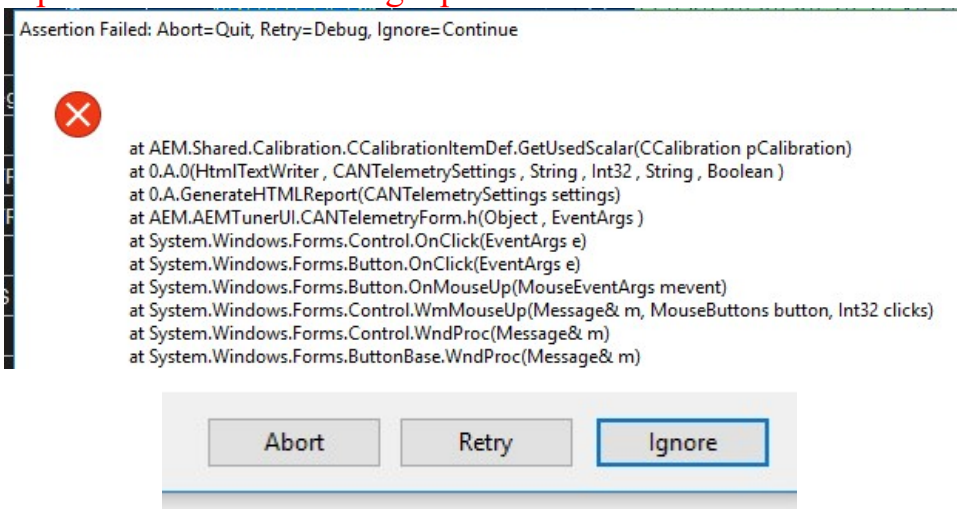


7. Generate the Multiplier Sheet:

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

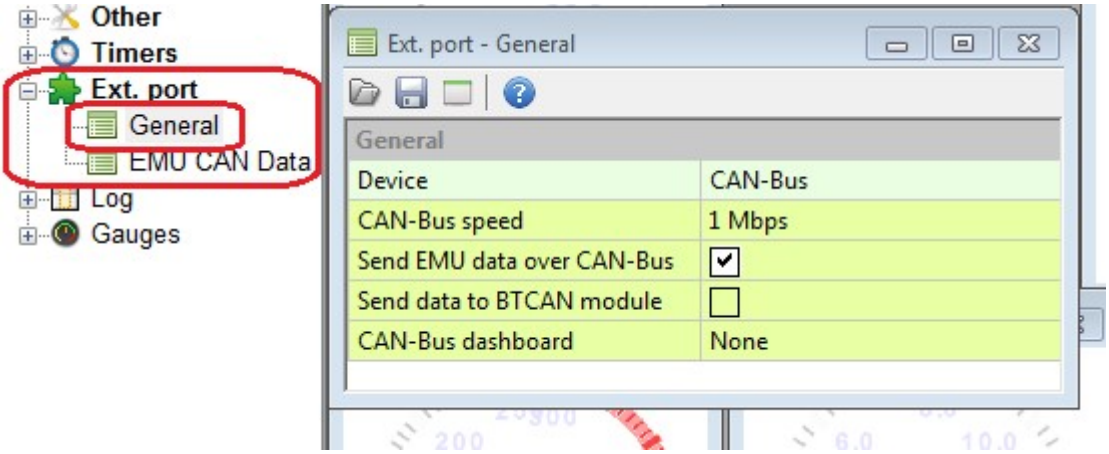
ECU Master integrtation

ECU Master Classic Confiugration:

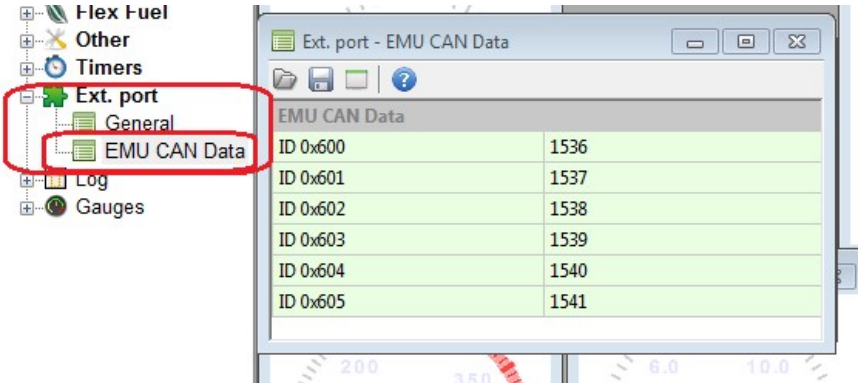
Software Configuration:

The ECU Master software must be configured in order for the BTI CAN gauge to function. The configuration only requires a few steps:

1. Open the client software and expand the “Ext. port” directory. Click on “General” and make sure that “Device” is set to “CAN-Bus”, “CAN-Bus speed” is set to “1 Mbps”, and “Send EMU data over CAN-Bus” is checked.



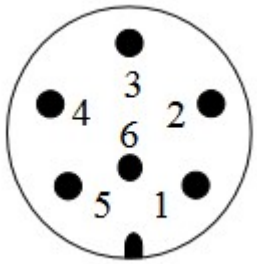
2. Open the “EMU CAN Data in the “Ext. port” directory and ensure that the “EMU CAN Data” has the following address listed:



ECU Master Classic Termination:

The ECU Master Classic ECU does require that you have the CAN Expansion module in order to have access to the CAN bus communication feature.

Connect Pin 1 on the Module to the GREEN wire on the harness.
Connect Pin 5 on the Module to the WHITE wire on the harness
The red wire on the BTI gauge harness should be tied to ignition +12 Volts while the black wire should be tied to ground.

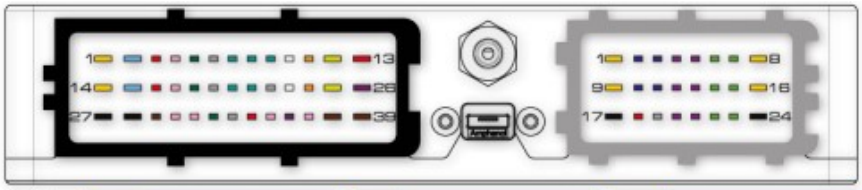


1 – CAN L

5 – CAN H

ECU Master Black Termination

Wire the White wire (CAN high) to pin 12 on the 39 pin connector.
Wire the Green wire (CAN low) to pin 25 on the 39 pin connector. The Black wire will need to be tied to chassis ground and the Red wire will need to be tied to an ignition source that has power only when the ignition is energized.

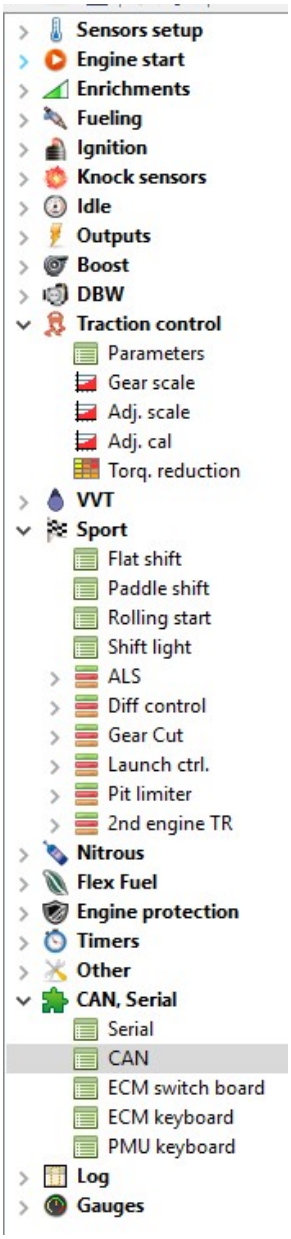


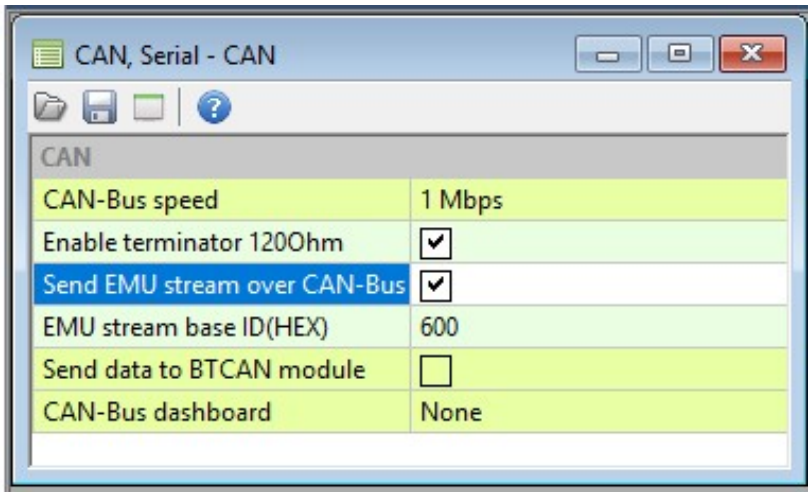
Black 39pin conector

1	Ignition coil #5	14	Ignition coil #4	27	Power Ground
2	EGT in #1	15	EGT in #2	28	Ecu Ground
3	Knock Sensor in #1	16	Knock Sensor in #2	29	Sensor Ground
4	Analog In #2	17	Analog In #3	30	Analog In #4
5	CLT In	18	TPS In	31	Analog In #1
6	WBO Vs	19	WBO Ip	32	IAT In
7	Camsync In #2	20	VSS In	33	WBO VGND
8	Primary trigger	21	Camsync In #1	34	+5V supply
9	Flex Fuel In	22	WBO Rcal	35	Analog In #5
10	Switch #1 In	23	Switch #2 In	36	Switch #3 In
11	RS232 TXD	24	RS232 RXD	37	Analog In #6
12	CAN H	25	CAN L	38	Sensor Ground
13	Constant +12V	26	+5V supply	39	Sensor Ground

ECU Master Black Software Configuration

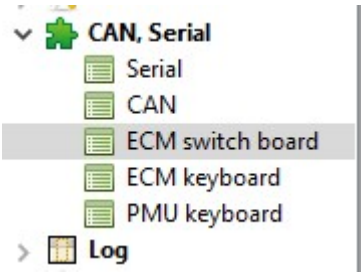
Navigate to the CAN configuration and double click to begin the CAN configuration. Once you are in the CAN configuration, select the following:

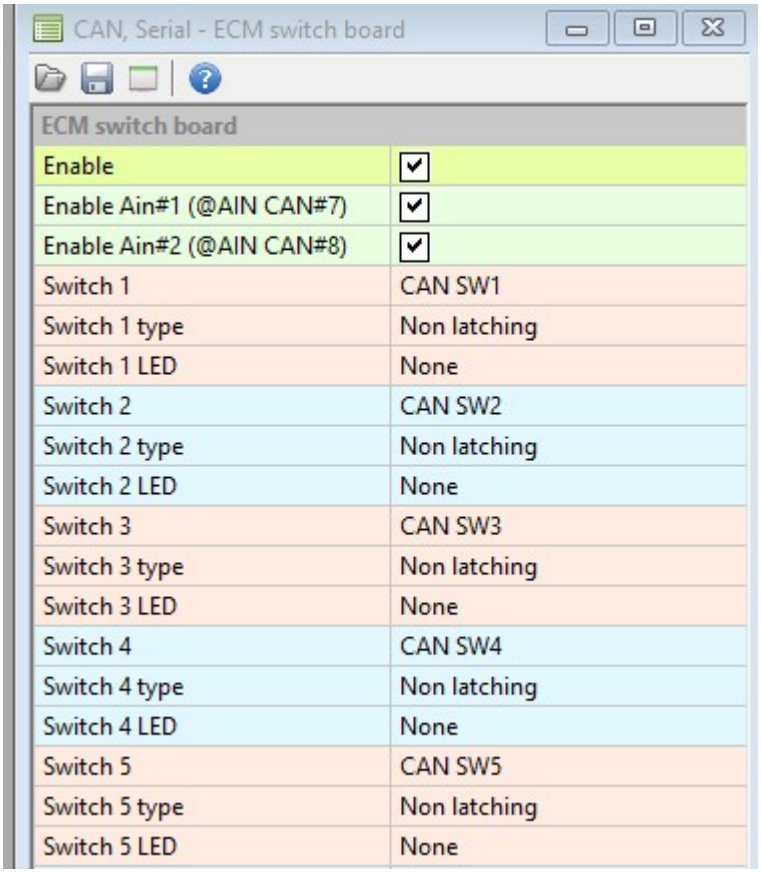




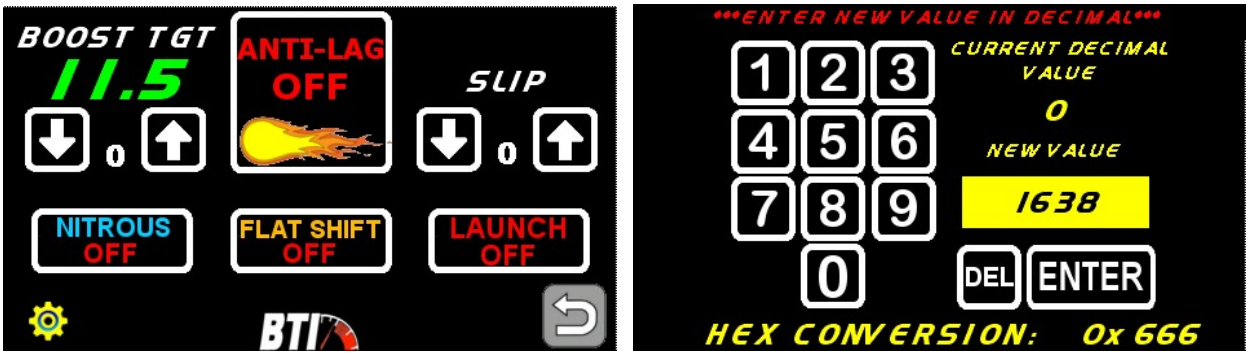
In order to receive instructions from the display to the ECU, we must emulate the “ECU Switch board”

Double clicking on the ECM switch board will yield the following options:





NOTE: The default CAN address for the ECU switch board is 0x666 in HEX or 1638 in decimal. The CAN transmit address is entered by pressing the yellow cog wheel on the CAN transmission screen.

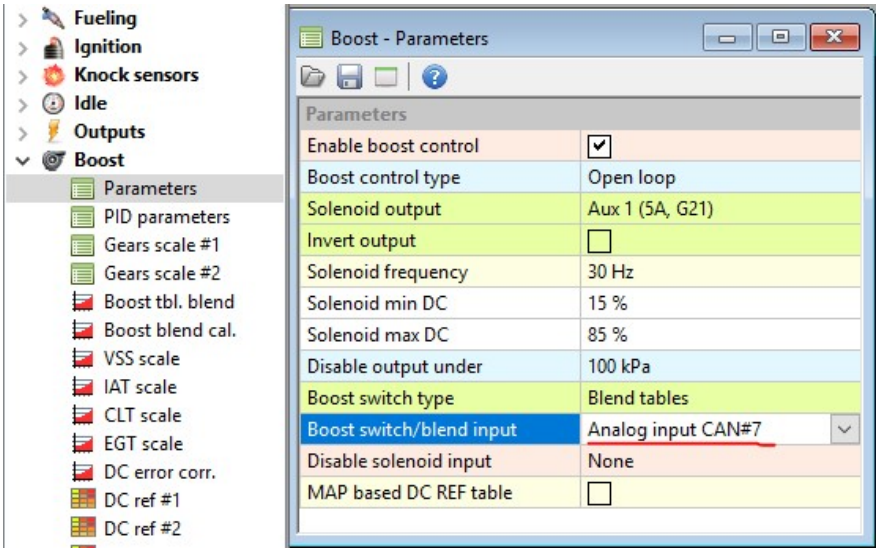


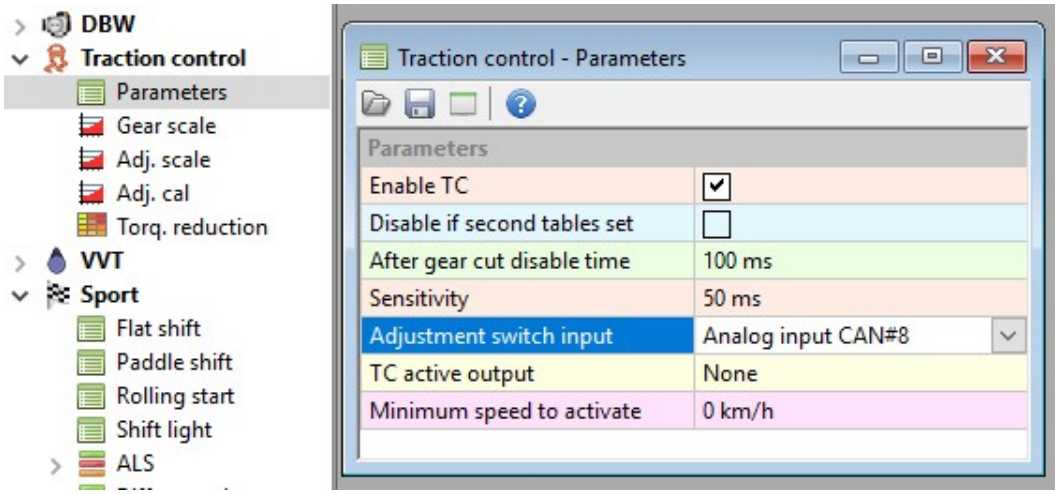
The CAN Transmit data stream is as follows:

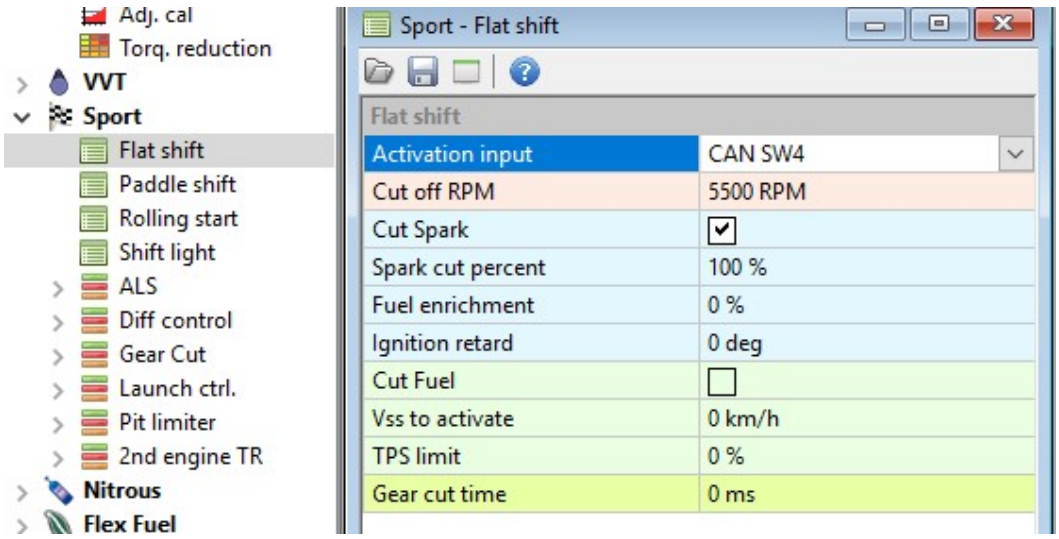
Analog Input CAN # 7 : Boost steps in millivolts.
Analog Input CAN # 8: Traction control slip steps in millivolts.
CAN Switch 1: Rolling Antilag
CAN Switch 2: Launch Control
CAN Switch 3: Nitrous
CAN Switch 4: Flat Shift
CAN Switch 5: Traction Enable / Disable

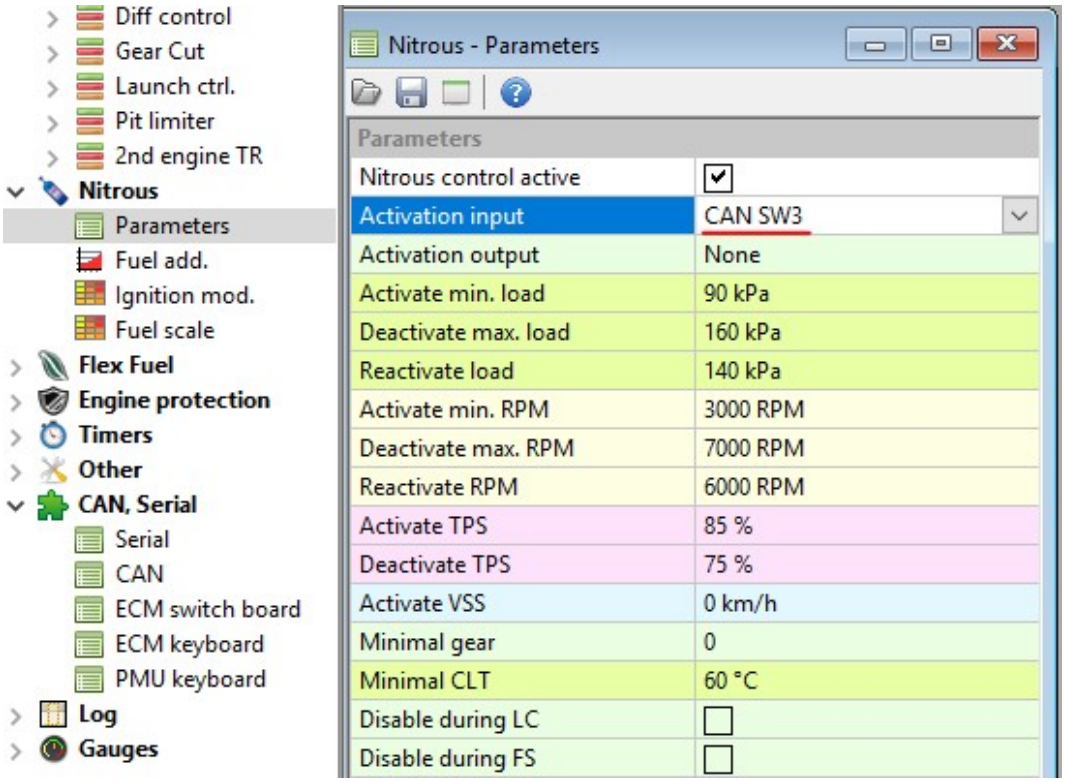
Example Configurations in the EMU software. Note that tuning strategies may differ and require additional configuration to complete the setup. BT Innovations, LLC will not be held responsible for tuning configurations or damage caused by misusing said tuning configurations

Note that the CAN value comes in as a voltage and the peak voltage is 5 volts. The Boost PWM steps and Trac PWM steps will determine how many positions will be used and the voltage value for each position will be the total of 5 volts divided by the number of steps.



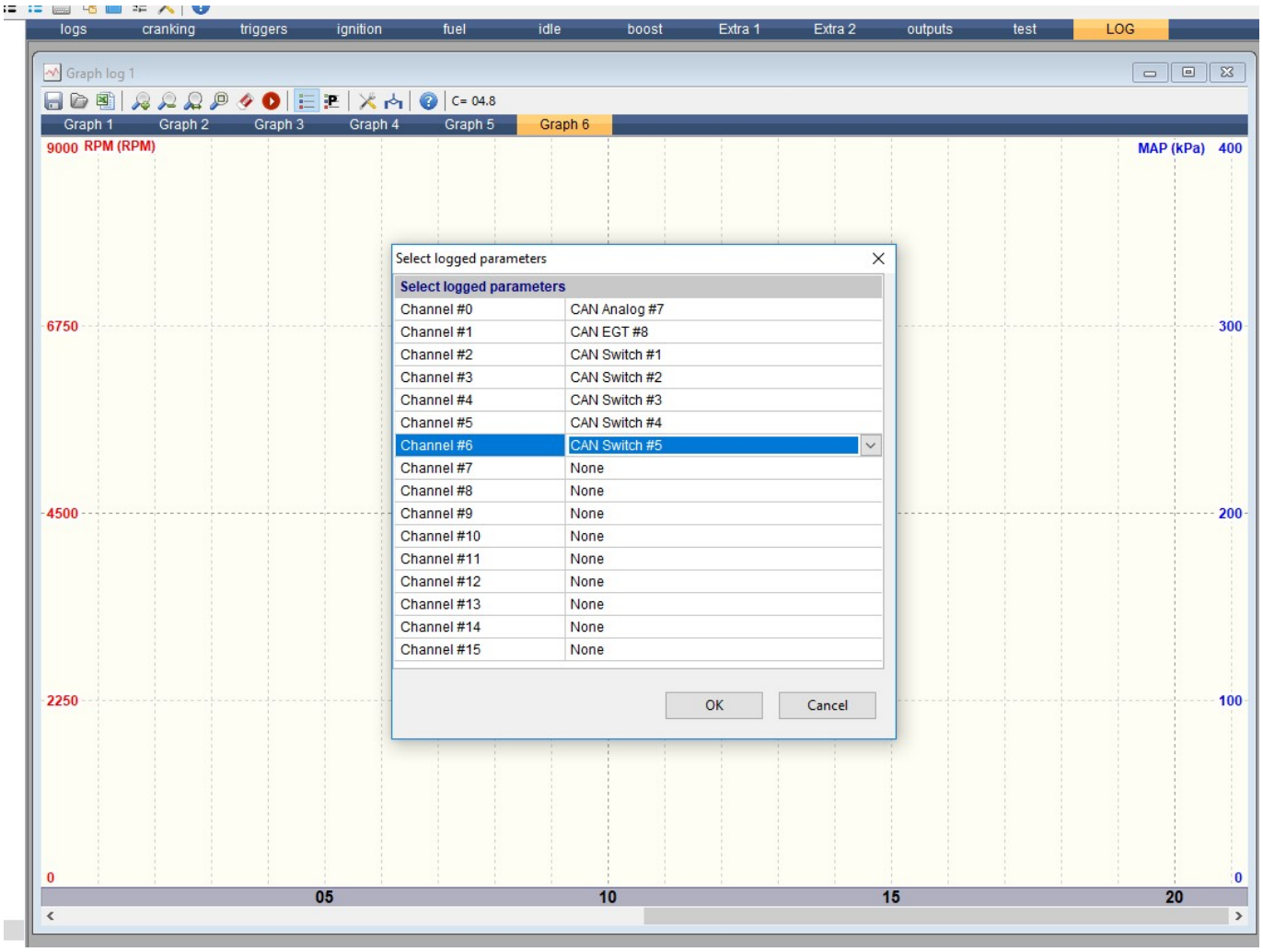

DBW
Traction control
Parameters
Gear scale
Adj. scale
Adj. cal
Torq. reduction
VVT
Sport
Flat shift
Paddle shift
Rolling start
Shift light
ALS
Traction control - Parameters
Parameters
Enable TC
Disable if second tables set
After gear cut disable time
100 ms
Sensitivity
50 ms
Adjustment switch input
Analog input CAN#8
TC active output
None
Minimum speed to activate
0 km/h


Adj. cal
Torq. reduction
VVT
Sport
Flat shift
Paddle shift
Rolling start
Shift light
ALS
Diff control
Gear Cut
Launch ctrl.
Pit limiter
2nd engine TR
Nitrous
Flex Fuel
Sport - Flat shift
Flat shift
Activation input
CAN SW4
Cut off RPM
5500 RPM
Cut Spark
Spark cut percent
100 %
Fuel enrichment
0 %
Ignition retard
0 deg
Cut Fuel
Vss to activate
0 km/h
TPS limit
0 %
Gear cut time
0 ms


Diff control
Gear Cut
Launch ctrl.
Pit limiter
2nd engine TR
Nitrous
Parameters
Fuel add.
Ignition mod.
Fuel scale
Flex Fuel
Engine protection
Timers
Other
CAN, Serial
Serial
CAN
ECM switch board
ECM keyboard
PMU keyboard
Log
Gauges
Nitrous - Parameters
Parameters
Nitrous control active
Activation input
CAN SW3
Activation output
None
Activate min. load
90 kPa
Deactivate max. load
160 kPa
Reactivate load
140 kPa
Activate min. RPM
3000 RPM
Deactivate max. RPM
7000 RPM
Reactivate RPM
6000 RPM
Activate TPS
85 %
Deactivate TPS
75 %
Activate VSS
0 km/h
Minimal gear
0
Minimal CLT
60 °C
Disable during LC
Disable during FS

Troubleshooting tips for CAN transmissions:

In order to verify theECU is receiving the CAN transmissions from the touch screen, use the logging screen to setup logs for Analog CAN #7, Analog CAN #8, CAN Switches 1-5

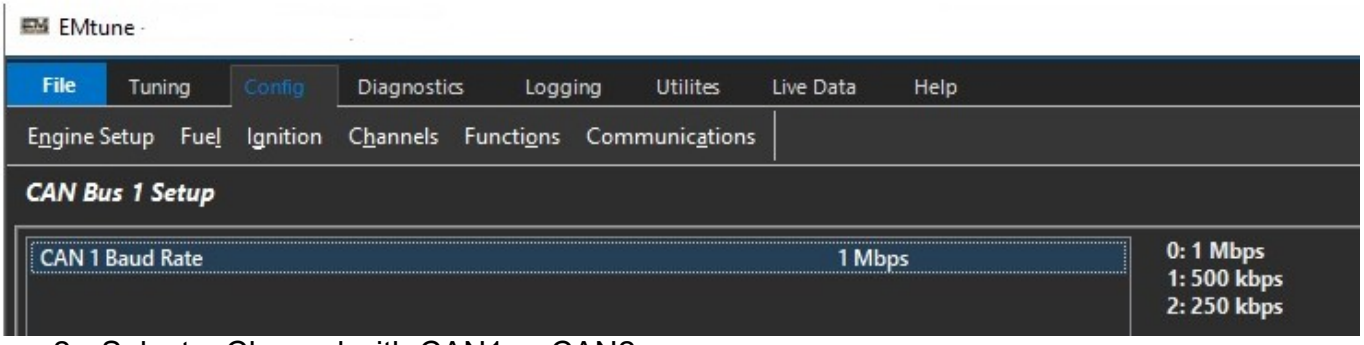


EMTRON configuration:

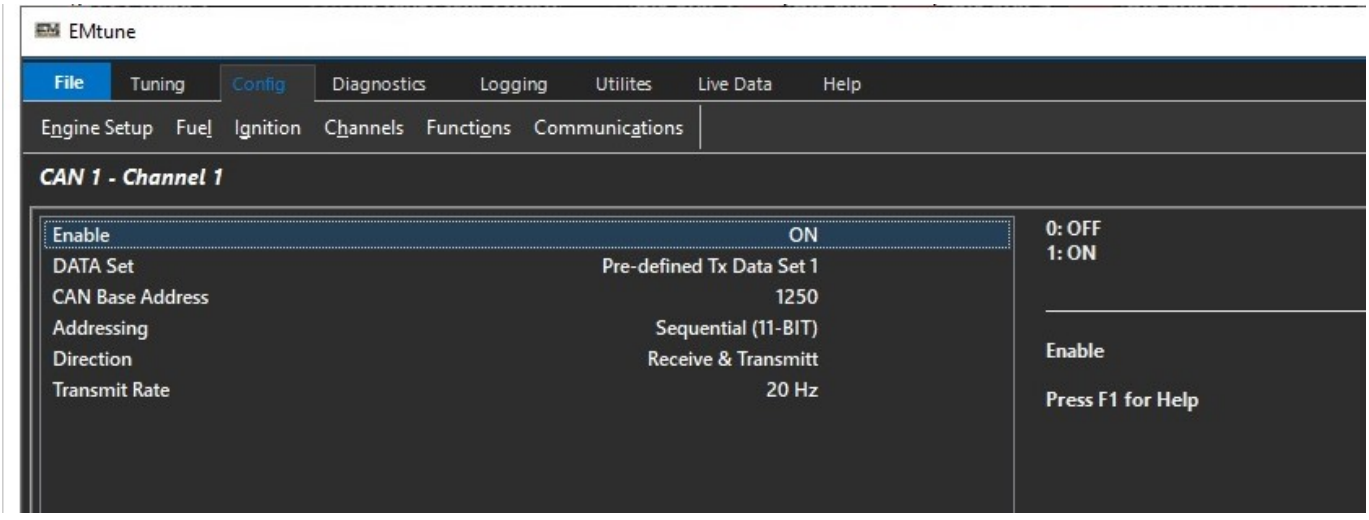
Software Configuration:

In order to enable the CAN bus data transmission, the following must be configured in the EMtune software.

1. Select either CAN1 or CAN2 . This is dependent upon which CAN bus channel is selected for termination to the desired BTI product. The default Baud Rate is set for 1Mbs on the BTI gauge, but may be adjusted to 500Kbs, or 250Kbs if desired. *If 1Mbs is not the desired baud rate, this will need to be adjusted on the Settings screen in the BTI Gauge as well.*



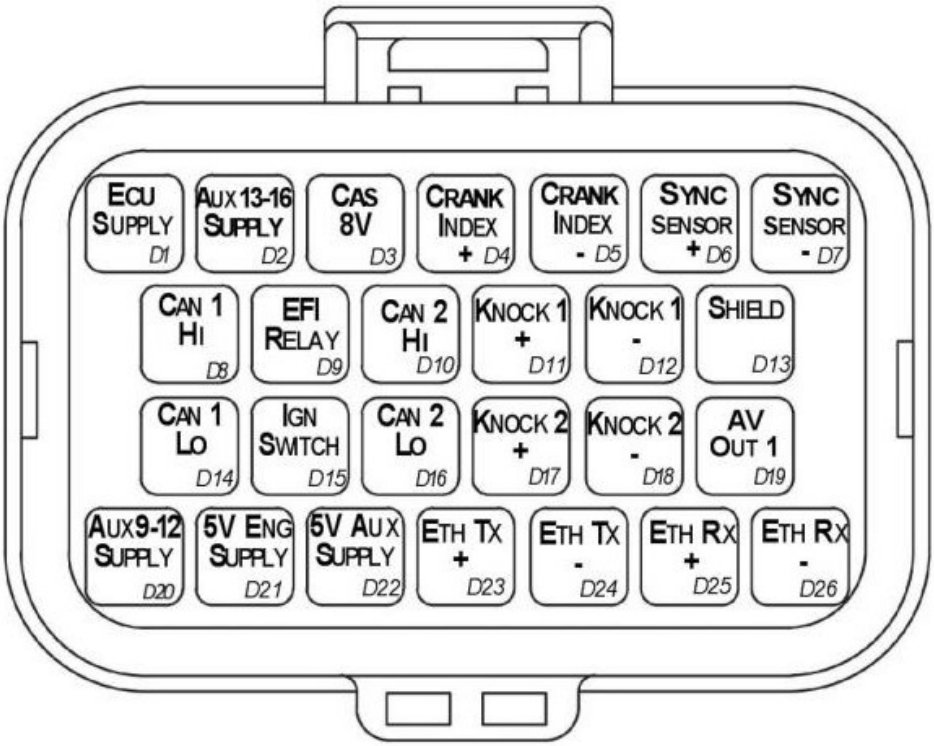
2. Select a Channel with CAN1 or CAN2
3. Set Enable to ON
4. Set CAN Address = 1250
5. Select required DATA Set; Predefined
6. Set Addressing to sequential
7. Set the Transmit rate to 20 Hz



Plug and Pin termination:

Note that both CAN busses are available on connector “D” on all Emtron ECUs
Use the following:

CAN 1	CAN 2
CAN 1 High – D8	CAN 2 High – D10
CAN 1 Low – D14	CAN 2 Low – D16



CONNECTOR D

Wire the 4 pin Deutsch DTM pigtail included with your BTI gauge as follows:

Power and CAN Flying Loom Connector: DTM 4 pin (M).

Pin	Function	Wire Colour
1	Ground	BLACK
2	CAN Lo	GREEN
3	CAN Hi	YELLOW
4	12V Supply	RED

Table 3.0. ETC4 Power and CAN Deustch Connector Pinout

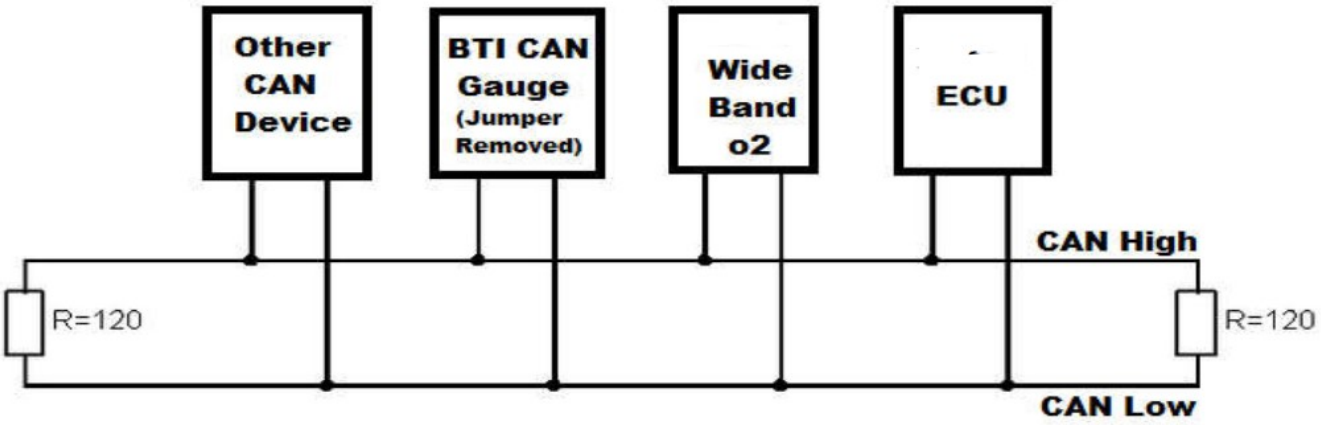
Gauge side wiring:

(black) Ground In
(red) 12 Volts in
(green) CAN low in
(white) CAN high in

The terminations to the EMtron CAN bus are relatively simple as it only consists of two wires: CAN High and CAN Low.

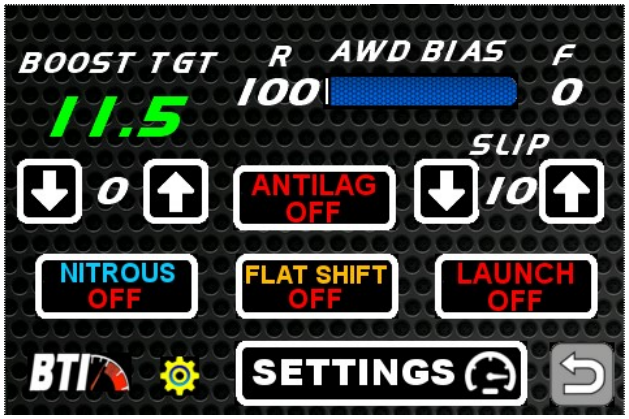
Note that the Termination Jumper located in the back of the BTI gauge should be removed if the gauge is not the last device in the CAN bus or there is already a termination resistor in your CAN bus. *(Every CAN bus should have one 120 ohm termination resistor at each end of the bus, one at the ECU end and the other at the last device in the bus.)*

This is what the CAN bus should look like with multiple CAN devices on the BUS:



This is what the CAN bus should look like with multiple CAN devices on the bus with the BTI gauge as the last or only device on said bus:

CAN Transmit:



Pressing the yellow cog wheel on this screen will allow the user to set the CAN transmission address. The address is set in decimal, but a conversion to Hex is listed at the bottom of the screen:

The data stream is as follows:

CAN 0 Address set with the yellow cog wheel * on the CAN transmission screen.
CAN 1 address is the CAN 0 address +1.

----------"CAN 0"----------

Byte 0&1 (16 bits) (Boost Control*)	Byte 2&3 (16 bits) (Anti-Lag 0/5 v)	Byte 4&5 (16 bits) (Launch 0/5 v)	Byte 6&7 (16 bits) (Nitrous 0/5 v)

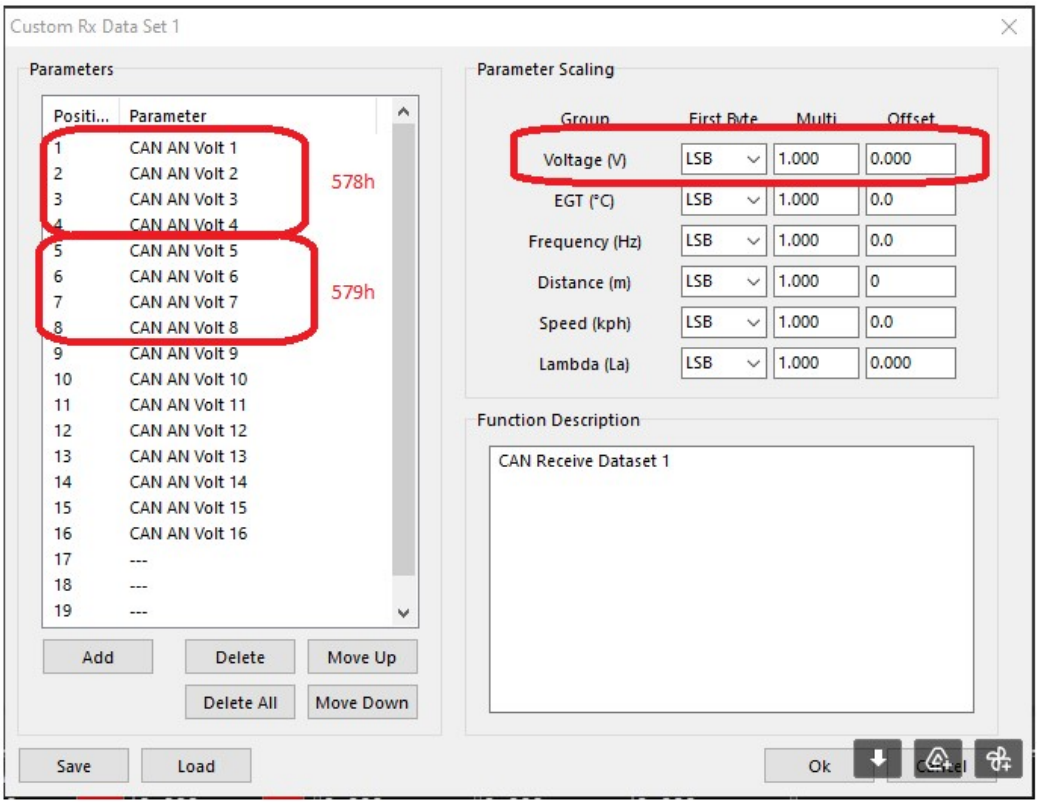
*Boost Control 0 – 5.000 volts
divided by PWM Steps (10 Boost PWM steps will output .500 volts per step)

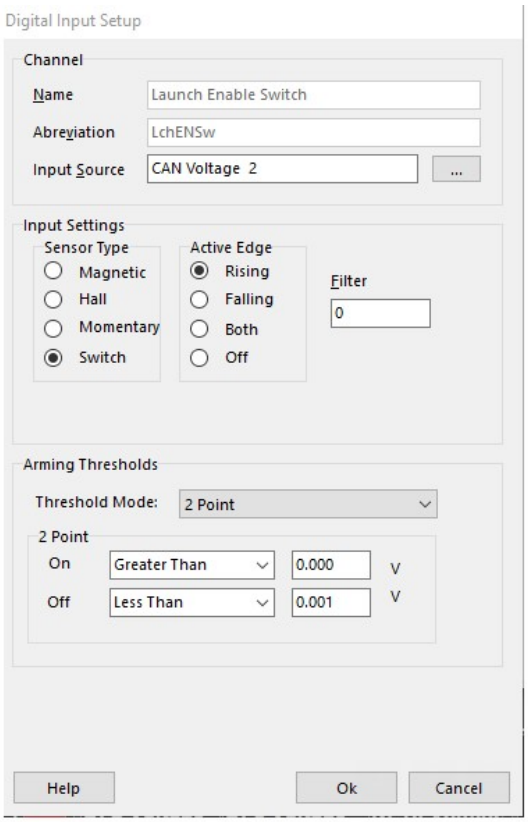
----------"CAN 1"----------

Byte 0 (16 bits) (Traction control**)	Byte 1 (16 bits) (Flat Shift 0/5 v)	Byte 2 (16 bits) (AWD Bias slider***)	Byte 3 (16 bits) (Currently not used)

**Traction Control 0 – 5.000 volts
divided by PWM Steps (10 Trac PWM steps will output .500 volts per step)
***AWD Bias Slider displays 0-100% but outputs 0 – 5.000 Volts on the CAN Data stream.

Emtron Tech support has been kind enough to provide these configuration examples in the EMtune software. Emtron support suggests using the CAN address 1400 (578 hex) for data reception from the BTI display.


Custom Rx Data Set 1
Parameters
Positi...
Parameter
1 CAN AN Volt 1
2 CAN AN Volt 2
3 CAN AN Volt 3
4 CAN AN Volt 4
578h
5 CAN AN Volt 5
6 CAN AN Volt 6
7 CAN AN Volt 7
8 CAN AN Volt 8
579h
9 CAN AN Volt 9
10 CAN AN Volt 10
11 CAN AN Volt 11
12 CAN AN Volt 12
13 CAN AN Volt 13
14 CAN AN Volt 14
15 CAN AN Volt 15
16 CAN AN Volt 16
17 ---
18 ---
19 ---
Add
Delete
Move Up
Delete All
Move Down
Parameter Scaling
Group
First Byte
Multi
Offset
Voltage (V) LSB 1.000 0.000
EGT (°C) LSB 1.000 0.0
Frequency (Hz) LSB 1.000 0.0
Distance (m) LSB 1.000 0
Speed (kph) LSB 1.000 0.0
Lambda (La) LSB 1.000 0.000
Function Description
CAN Receive Dataset 1
Save
Load
Ok
Cancel


Digital Input Setup
Channel
Name Launch Enable Switch
Abreviation LchENSw
Input Source CAN Voltage 2
...
Input Settings
Sensor Type
Magnetic
Hall
Momentary
Switch
Active Edge
Rising
Falling
Both
Off
Filter
0
Arming Thresholds
Threshold Mode: 2 Point
2 Point
On Greater Than 0.000 V
Off Less Than 0.001 V
Help
Ok
Cancel

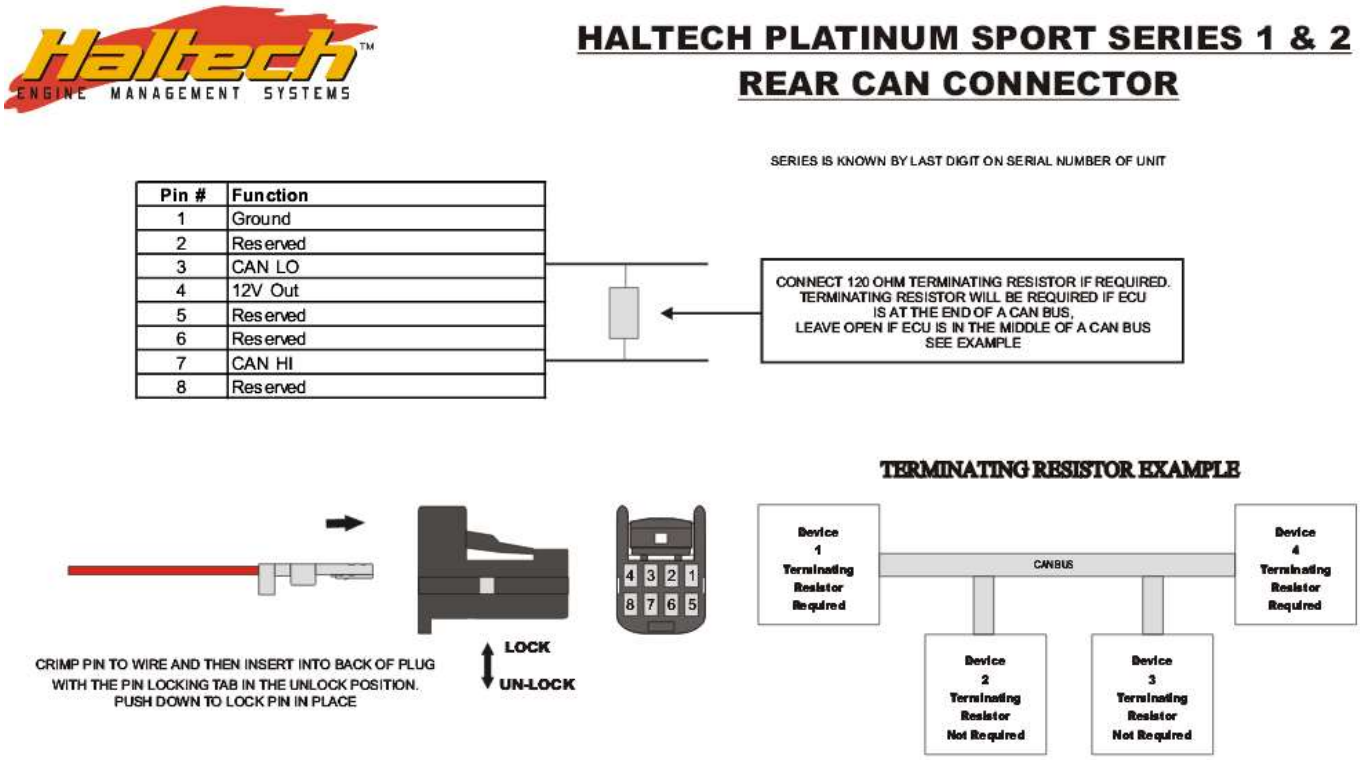
HALTECH Integration:

Plug and Play harness installation:

Plug and play wiring harness for Haltech ECUs with the BTI wiring harness:

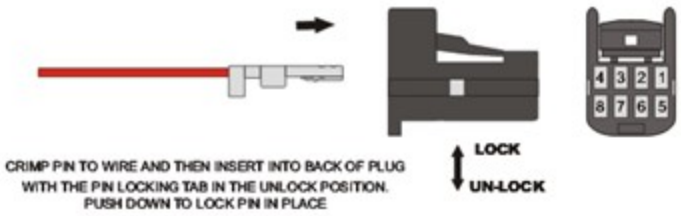
Simply plug the BTI connector straight into the Haltech ECU and the gauge will receive both power and CAN bus communications.

Notice! This diagram is for the Tyco connectors that are plugged directly into the ECU

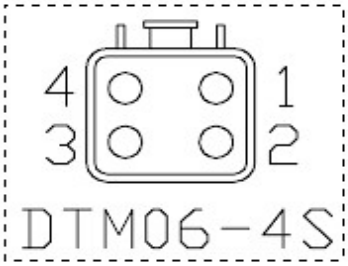


Notice! This diagram is for the Tyco connectors that are plugged into the Haltech CAN hub:

Pin#	Function	Color
1	Ground	Black
4	12V Out	Red
2,3,6	CAN Low	Green
7,8	CAN High	White



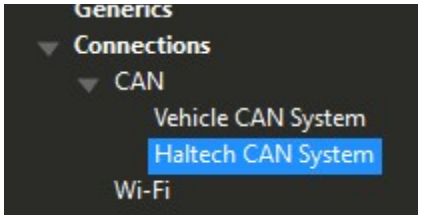
Elite DTM06 Connector:



Deutsch 4pin connector:
1- 12v
2- Ground
3- CAN High
4- CAN Low

Make sure you select which CAN port you are using in ESP

If you are running a Nexus ECU or an Elite ECU on Nexus software, you will need to go into the Nexus software and activate the CAN data transmission to the gauge. Go into the “Connections” menu > “CAN” > “Haltech CAN System” and check “Dash”> “Generic Dash”.



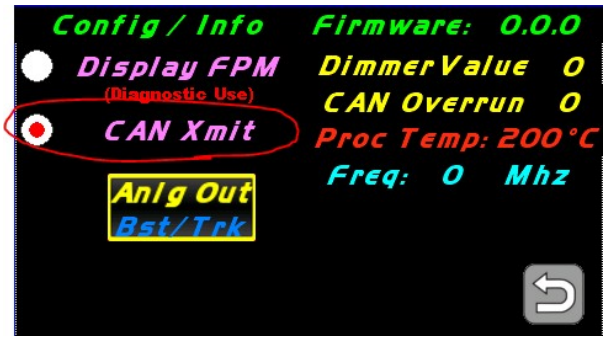
Output options for Haltech:
In the past, we were limited to using the two built-in analog outputs to control functions in the ECU, but as of firmware revision: 1.8.7.0 we can now output to the ECU over the CAN bus with 4 user defined outputs.

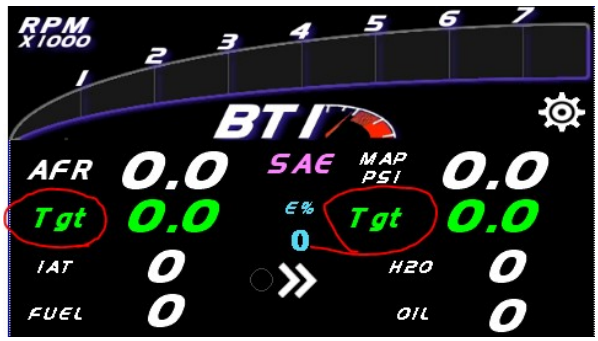
Using the user defined CAN outputs:

1. **Touch the Settings cog wheel and touch the “Config Info” button.**

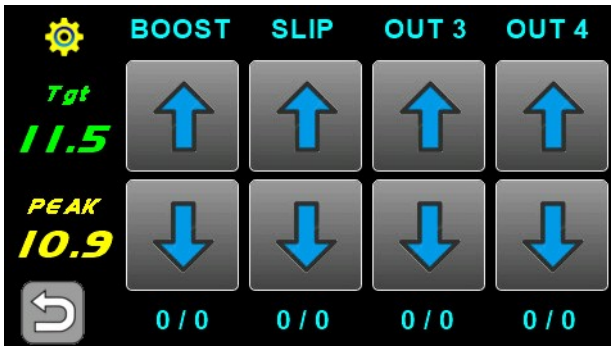
2. **Select the “CAN output” option:**

Now touching a Boost target hotspot will forward you to the user defined CAN output screen instead of the standard analog output screen. You may also just select the CAN output screen in the screen selector as well.

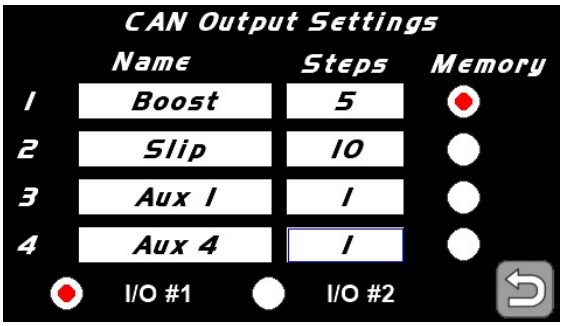




The Haltech CAN output looks as follows:

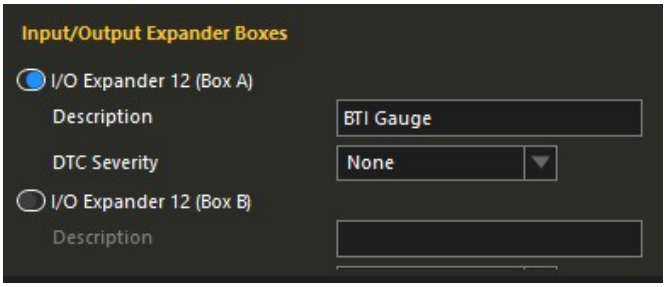


Touching the yellow cog wheel will allow you to Set up the CAN output name, the number of steps, and whether that output is saved to memory for when the vehicle is turned off and re-started. Below each of the 4 outputs shows what step you are on vs how many steps are available. 0 / 0



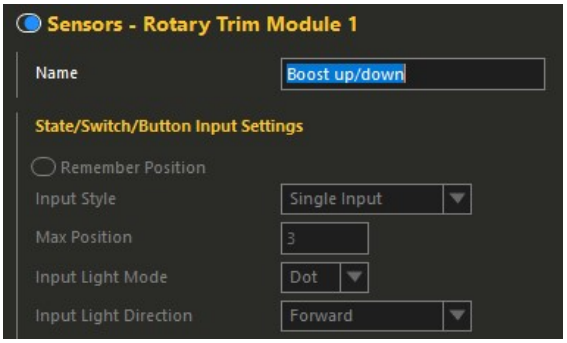
The name may be 6 characters.
The number of steps determines what the value of voltage is transmitted to the ECU. The max value of Volts is 5 volts. In the first example: 5 steps will yield a value of 1 volt per step. The “Memory” bit will determine if that value is stored in the gauge when the vehicle is restarted. In the first example you may wish to keep the boost target when the car is started verses un-checking that bit may revert the boost target to the waste gate when the vehicle is restarted.

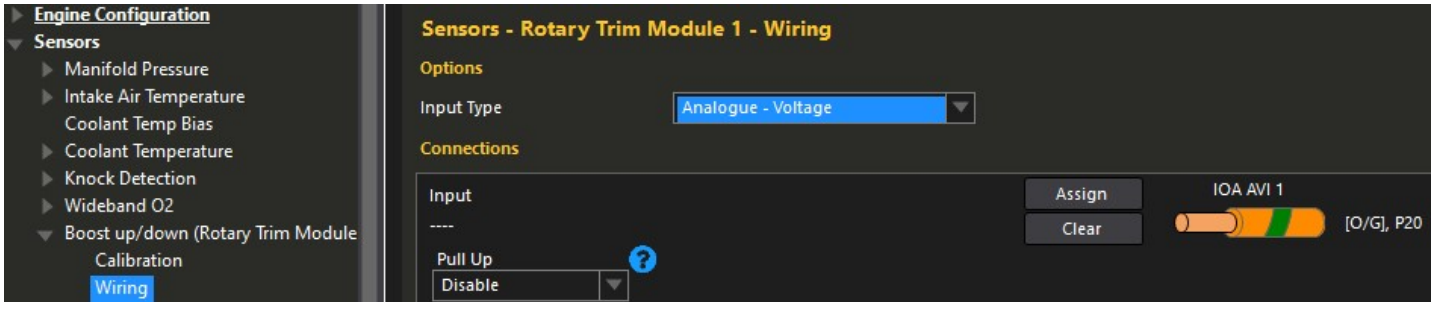
This output is transmitted as a Haltech Input/Output expander box. Haltech has the option for 2 of those boxes. (I/O #1) and (I/O # 2). Select the channel you wish to use and do the same in the Haltech software:
DTC Severity is not used.



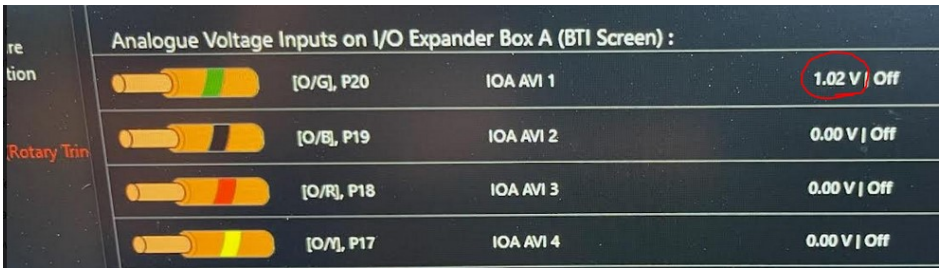
The CAN values will now be transmitted into the Haltech ECU as voltage and may be viewed when configuring the inputs.

In our example we setup a rotary switch and tied the input to the “Wiring” of IO A AVI 1. When “Assigning” the input, the raw voltage of the input voltage may be verified in order to configure the steps when building your boost table in this example.

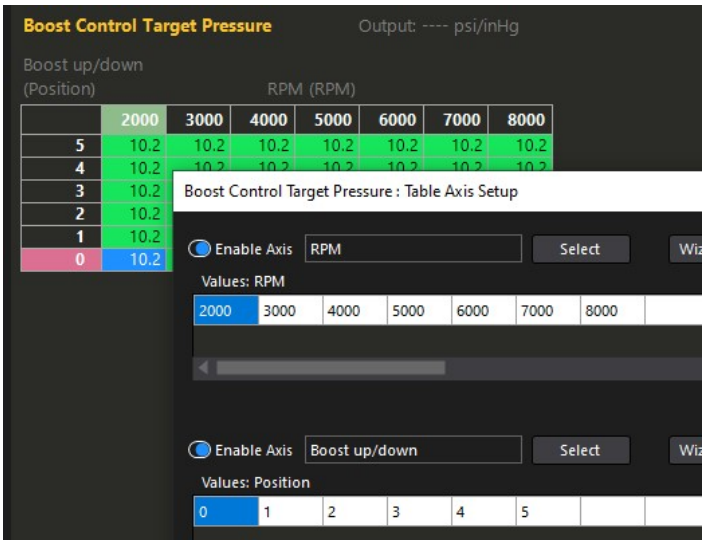


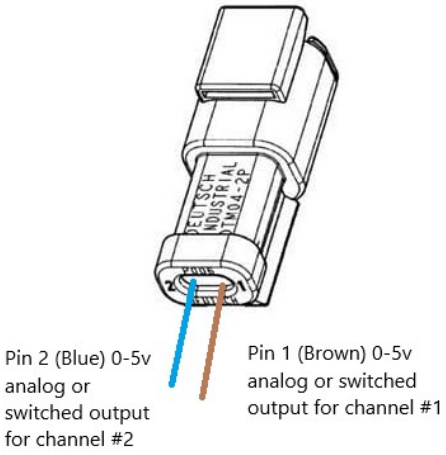


Pictured below is an example of the input selection from the gauge when the ECU is connected to the software. Note that the voltage output from the gauge is visible on the input

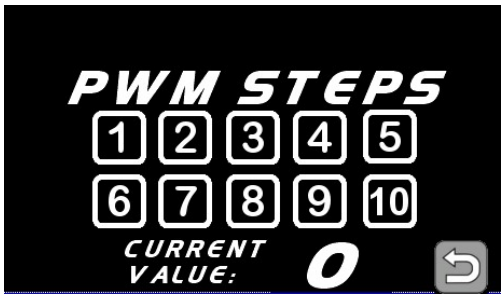


In our example we then tied the Boost up / down rotrary switch that we previously configured as one of Axis used by our boost table.





2 Pin Analog Out Connector (Brown and Blue Wires) *(Not needed if you are using the CAN transmission listed above)*
The termination of these two wires is dependent on the inputs that are assigned in the Haltech Tuner software. These two outputs may be configured for **Boost Control and Traction Control** or may be used for **Nitrous arm and Purge** if that option is selected in the settings screen Either output may be connected to a different ECU input (5 volt low current) or used with a 5 volt relay for Nitrous Arm / Purge if desired.



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.

**** Note that these two settings should be configured by competent personnel. Raising the BOOST too much or reducing the SLIP too much can have severe consequences. ****

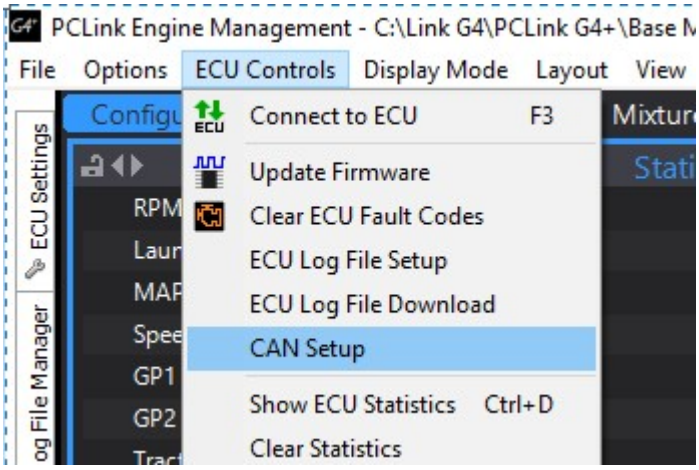
LINK G4 Integration

Software Configuration:

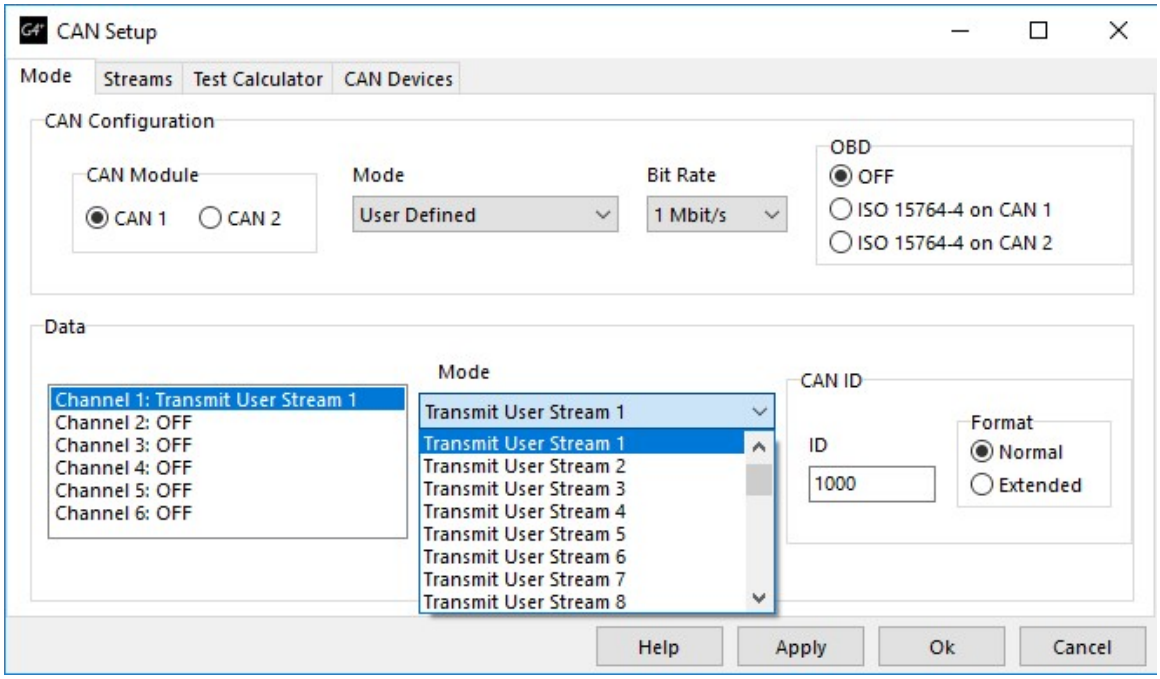
You will need the bti_gauges.lcs file which can be downloaded from:
http://www.btigauges.com/link--vipec.html (bottom of the page)
(This file may be found on the Link / Vipec product page at the bottom).

Drop this file into the CAN directory that typically resides at:
C:\Link G4\PCLink G4+\CAN

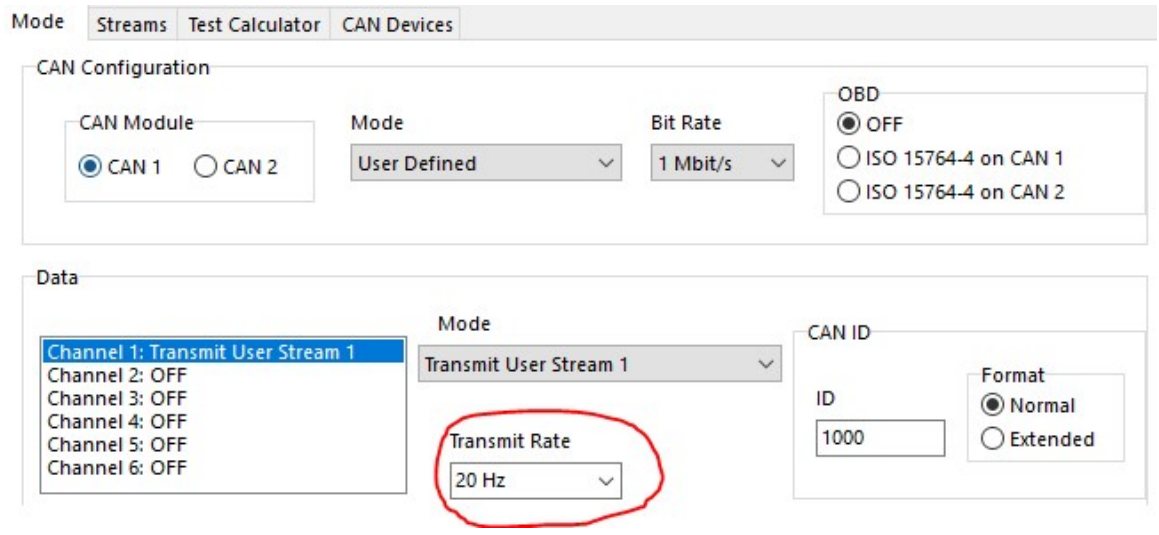
Open the Link or Vipec software and proceed to ECU Controls / CAN Setup:



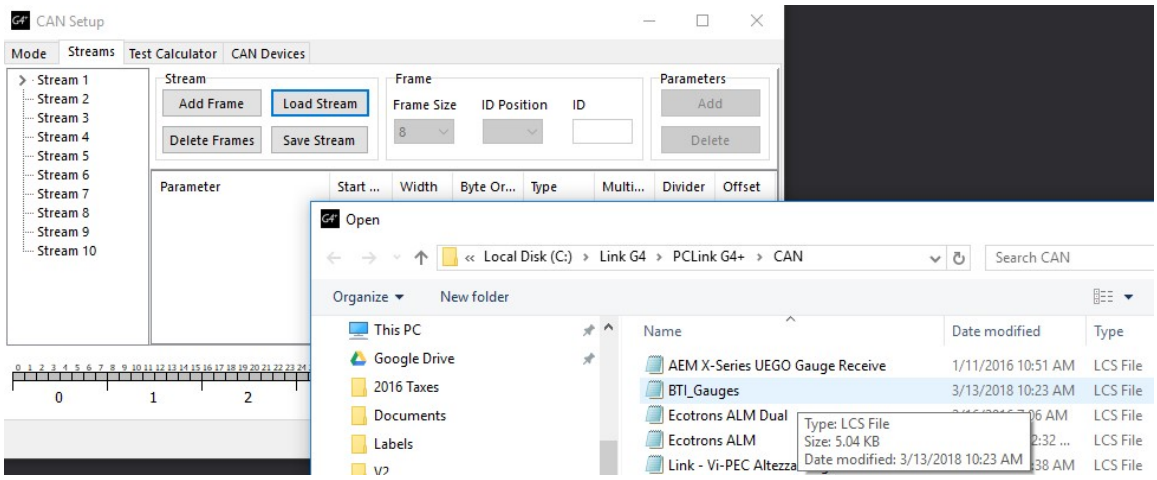
Select the CAN channel that you will be using. " CAN1" or "CAN2" (Drop in ECUs may be using "CAN 2" if that connector is used for switched power.)
Under the Mode tab, ensure that Mode is set to "User Defined", Baud Rate is "1 Mbit/s" OBD is OFF.
Ensure that Channel 1 is set to "Transmit User Stream 1, CAN ID = 1000, and set the Format to Normal.



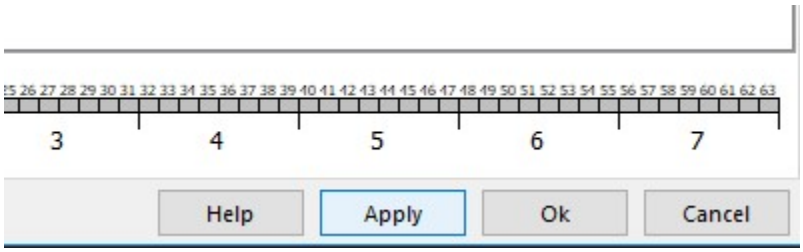
Ensure that the “Transmit Rate” is set to “20 Hz”



Proceed to the “Streams” tab, select “Stream 1” in the left hand pane and click “Load Stream”. Select the BTI_Gauges LCS file.



Click “Apply” and “OK” to finish the setup.



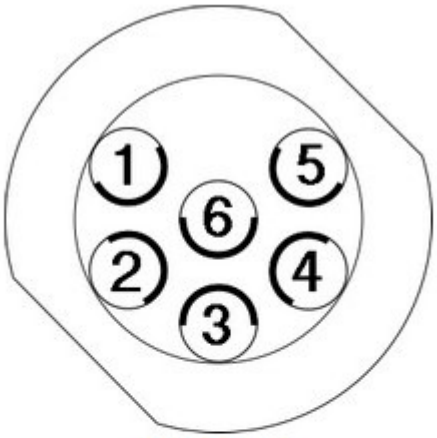
Plug and Play harness installation:

Wiring Instructions

The Link / Vipec integrations are available with three different cable options:

1. 6 Pin Amphenol connector
2. Plug and Pin harness that must be pinned into the main ECU connector
3. Drop in ECU header connector

6 Pin Amphenol connector:



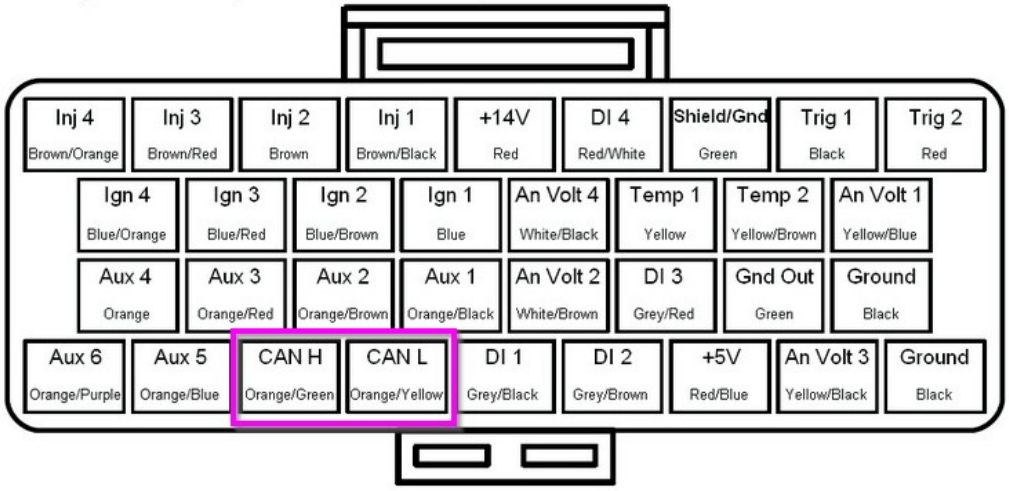
CAN_F Pinout
looking into back of connector

Pin	Colour	Function
1	Brown	Ground
2	Blue	NC
3	White	CAN H
4	Green	CAN L
5	Yellow	ECU RS232 TX
6	Grey	ECU RS232 RX

Notice that the red wire in the harness must be terminated to a switched on 12 volt power source.

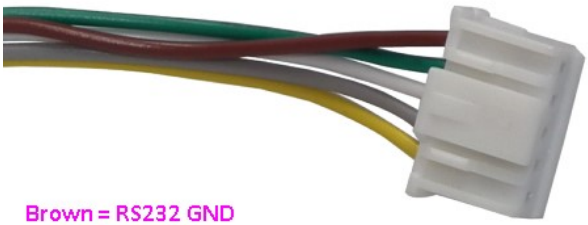
Plug and Pin termination:

Viewed looking into ECU header (or wire side of loom connector)



Drop-in ECU Connector:

This cable plugs directly into the 5 pin header CAN 1 or CAN 2 header on the circuit board:



Brown = RS232 GND
Green = CAN L
White = CAN H
Grey = RS232 Rx
Yellow = RS232 Tx

CAN bus 1 uses a 5 pin connector and is labeled on the ECU as 'CAN 1/RS232'.
If using this connector for CAN ensure the cable being used doesn't have Serial wires connected as this can act as an aerial and prevent USB communications from working.

CAN 1/RS232 Connector		
Pin	**Function**	**Colour**
1	Comms GND	Brown
2	CAN1 L	Green
3	CAN1 H	White
4	RS232-RX	Grey
5	RS232-TX	Yellow

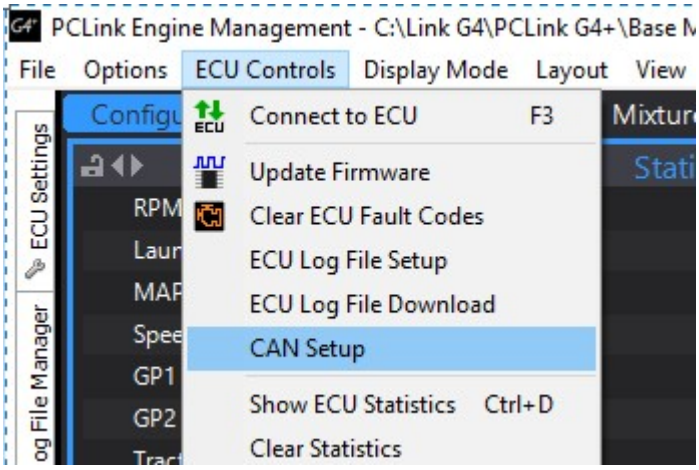
CAN bus 2 uses a 5 pin connector and is labeled on the ECU as 'CAN 2/OBD'.

CAN 2/OBD Connector		
Pin	**Function**	**Colour**
1	GND	Brown
2	CAN2 L	Green
3	CAN2 H	White
4	NC	Grey
5	+14V	

To learn more about CAN see PCLink help.

Notice! The Drop-in ECU connectors only have power on the "CAN 2" connector. There will be a RED wire coming off of the connector that must be terminated to a switched on power source. This may be used on the CAN 2 connector with the included pigtail or CAN 1 may be used but the red wire will need to be removed from the connector or cut and wired into a 12 volt switched ignition source.

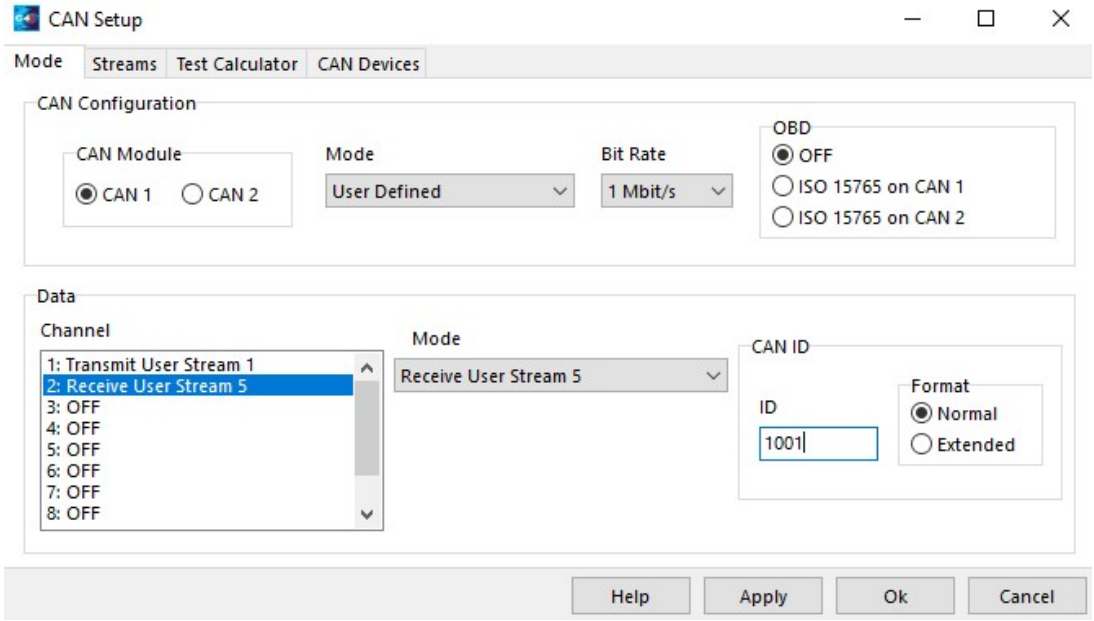
Can Xmit: Enabling this function will the display to send data back to the ECU over the CAN bus. This function is better suited for the G4 X series ECUs as they do not have the CAN transmission size limit that the G4 + ECUs have. This function may be used with the G4 + series, but some of the standard transmission data may have to be omitted from one of the frames in the transmission data stream.



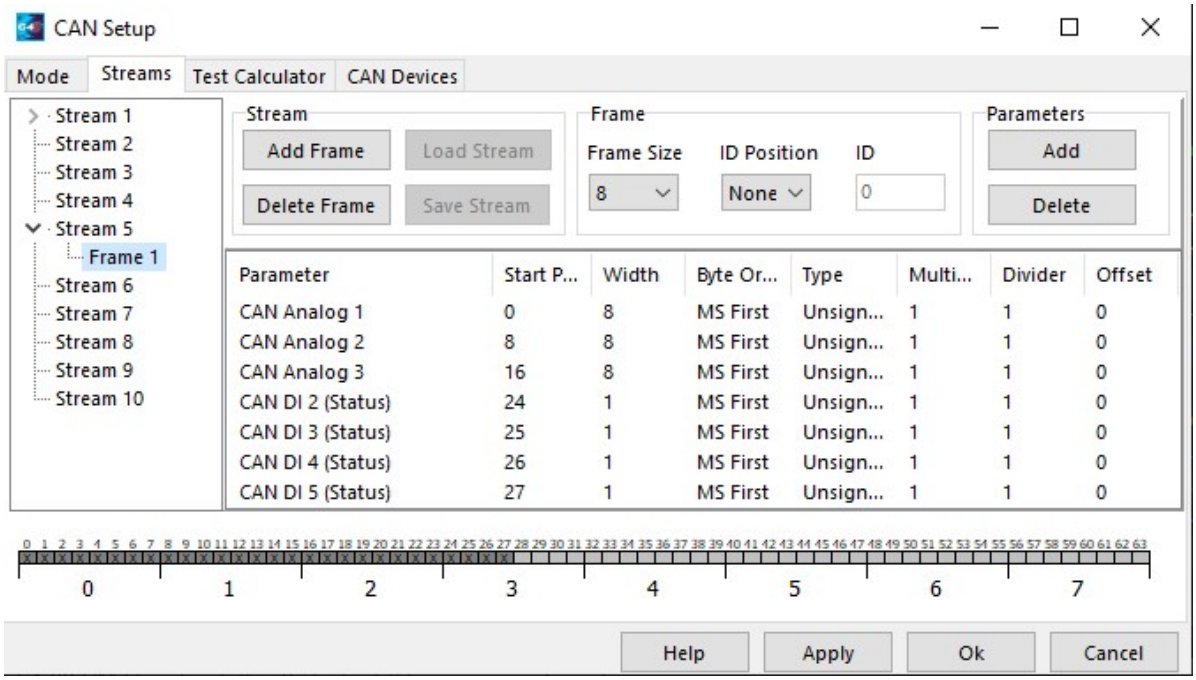
Creating the transmit stream:

Navigate into the CAN Setup under the ECU Controls

In this example we created a Data Channel 2 set to Receive User Stream 5 on CAN ID 1001:

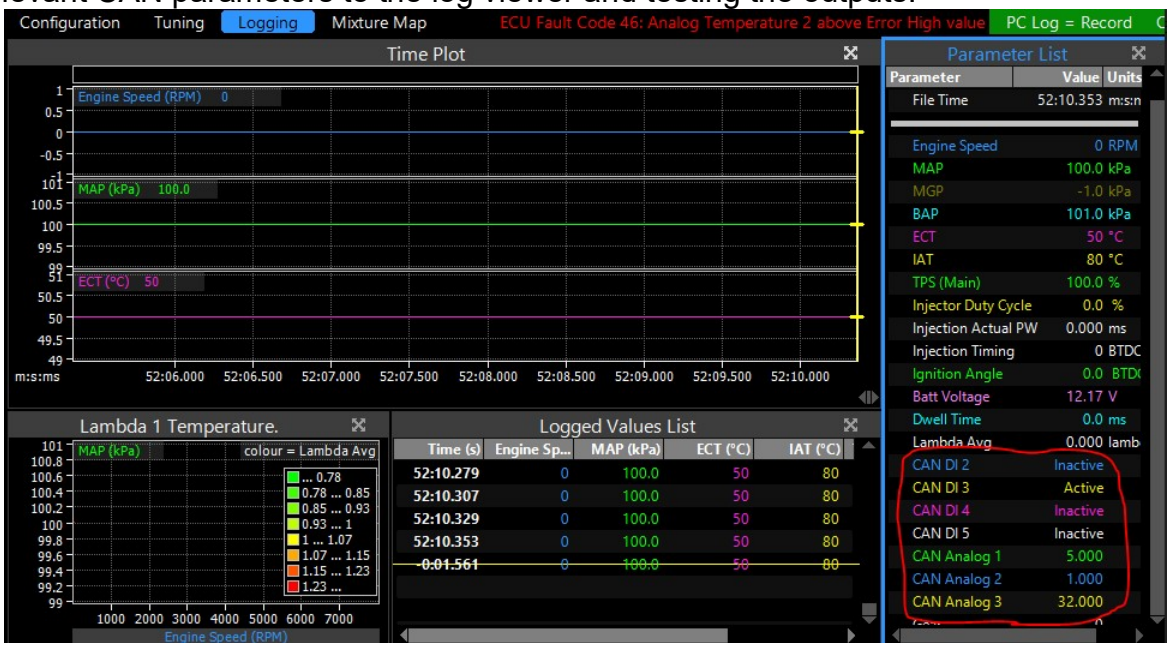


The Stream will then need to be configured. In this example we used Stream 5. Frame 1 will need to look like this:



CAN Analog 1: 8 bit width Boost Control (Value of 1-10 Boost PWM step dependant)
CAN Analog 2: 8 bit width Slip Control (Value of 1-10 Slip PWM step dependant)
CAN Analog 3: 8 bit width AWD Bias (Value 0-100)
CAN DI 2 : 1 bit width Antilag (Value 0-1)
CAN DI 3 : 1 bit width Launch Control (Value 0-1)
CAN DI 4 : 1 bit width Nitrous (Value 0-1)
CAN DI 5 : 1 bit width Flat Shift (Value 0-1)

Note the potential values that may be sent with each Parameter. These parameters may be tested by adding the relevant CAN parameters to the log viewer and testing the outputs:

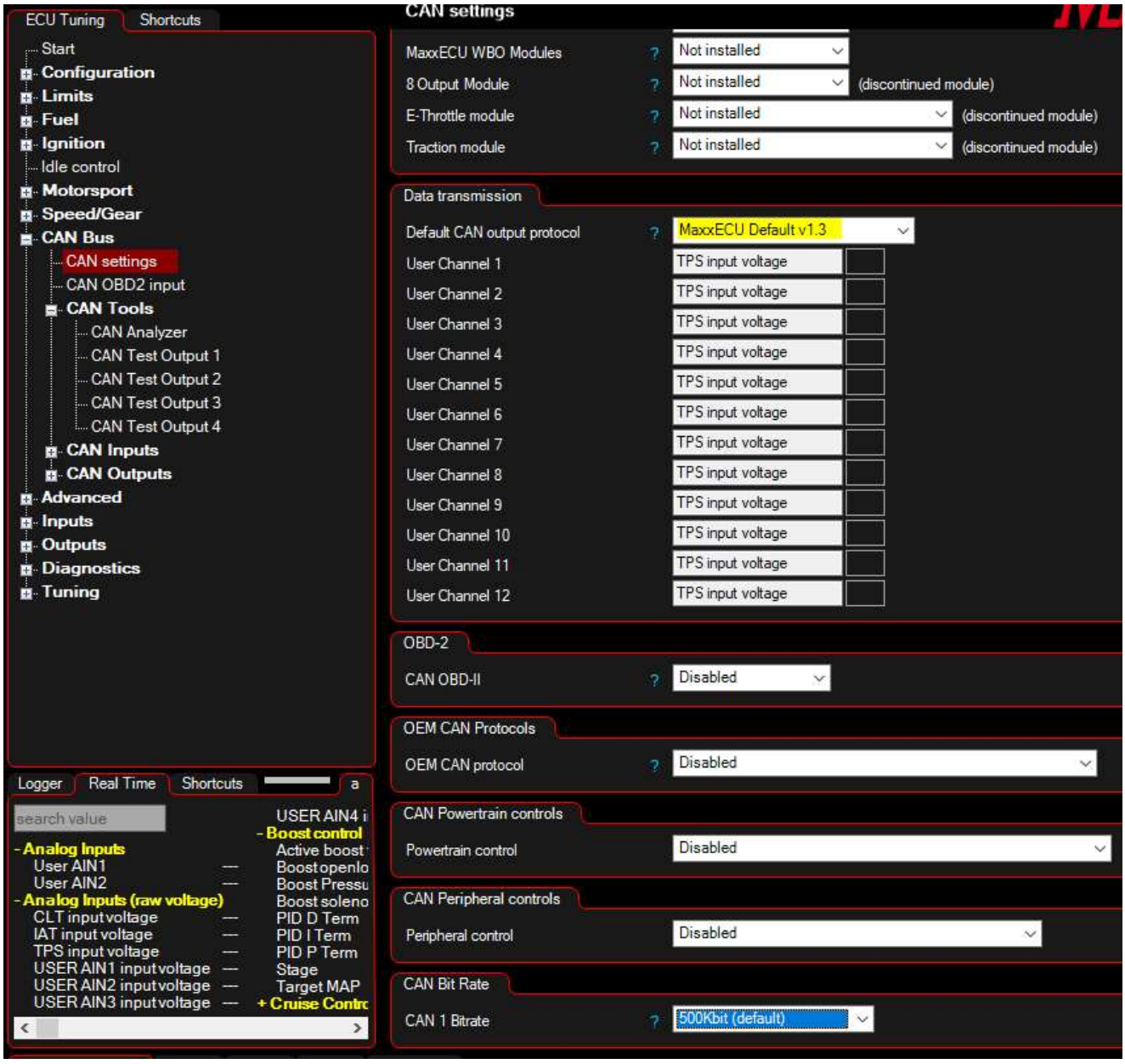


Once the parameter communication has been verified, it is up to the user / tuner to take the available data received and create a strategy in the PC Link software to perform the desired function.

MaxxECU STREET/SPORT/V1/RACE/PRO (48-pin connector 1)

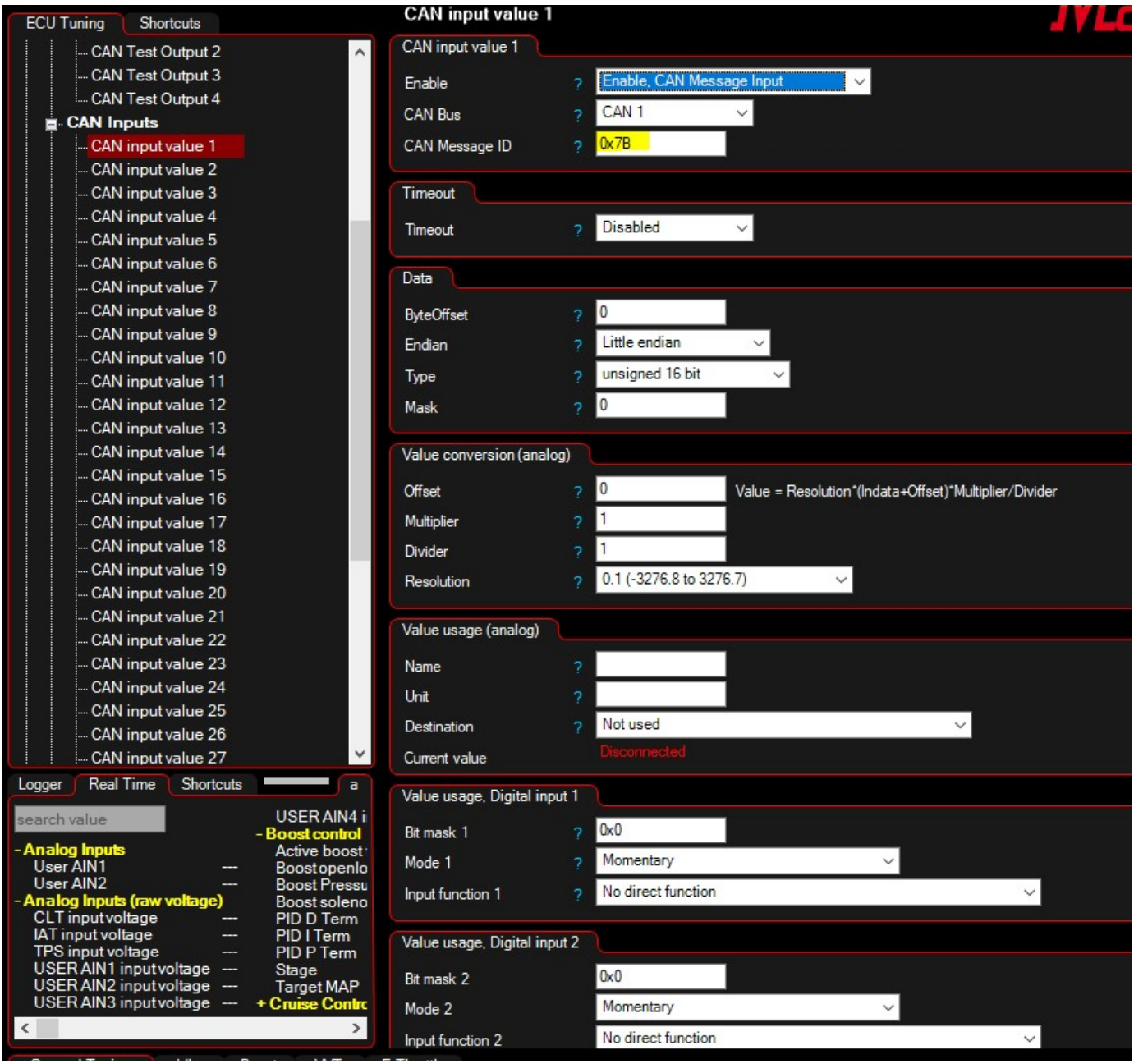
E1	CAN H
E2	CAN L

Software Configuration:

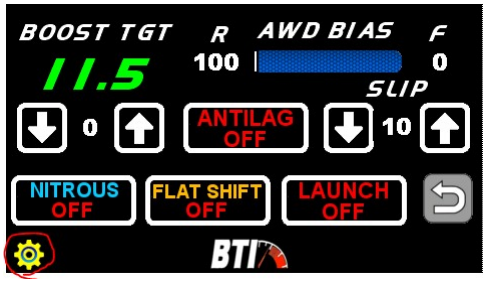


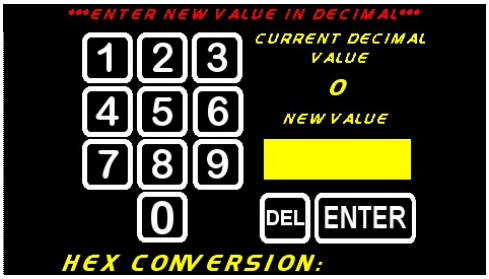
Under the CAN Bus > CAN Settings tab, make sure that MaxxECU Default v1.3 is selected. The default baud rate for MaxxECU is 500 Kb/s. Ensure that the gauge has the same baud rate when the MaxxECU option is selected in the INTEGRATIONS screen

CAN Message inputs may be setup, but that will be specific to each car.

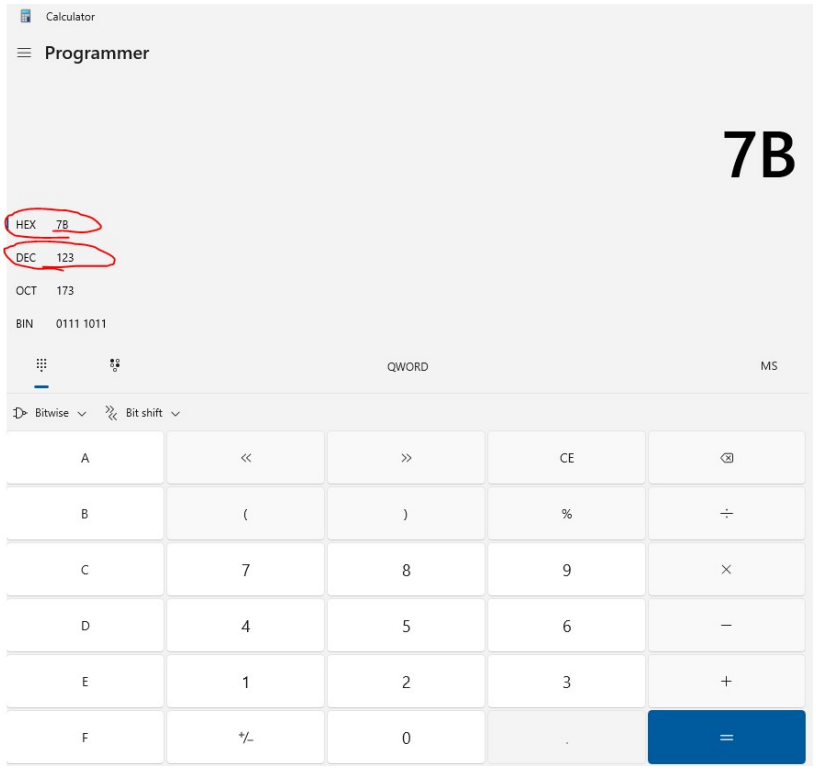


Make note of the CAN message ID as that is configurable in the gauge. The address is configured in the CAN Output screen under the Yellow cog wheel.





Pro Tip: Note that the CAN Message ID is entered into the gauge as a DECIMAL value with a HEX conversion shown at the bottom. The Address listed in the MaxxECU software is shown in HEX.
If you don't know how to convert from DECIMAL to HEX, open the Widows calculator and click on the navigation button on the top left corner. Select "Programmer and a DECIMAL to HEX conversion will be shown.
In this case 0x7B is selected in the software. The conversion to DECIMAL will be "123" which would be the address entered into the gauge.



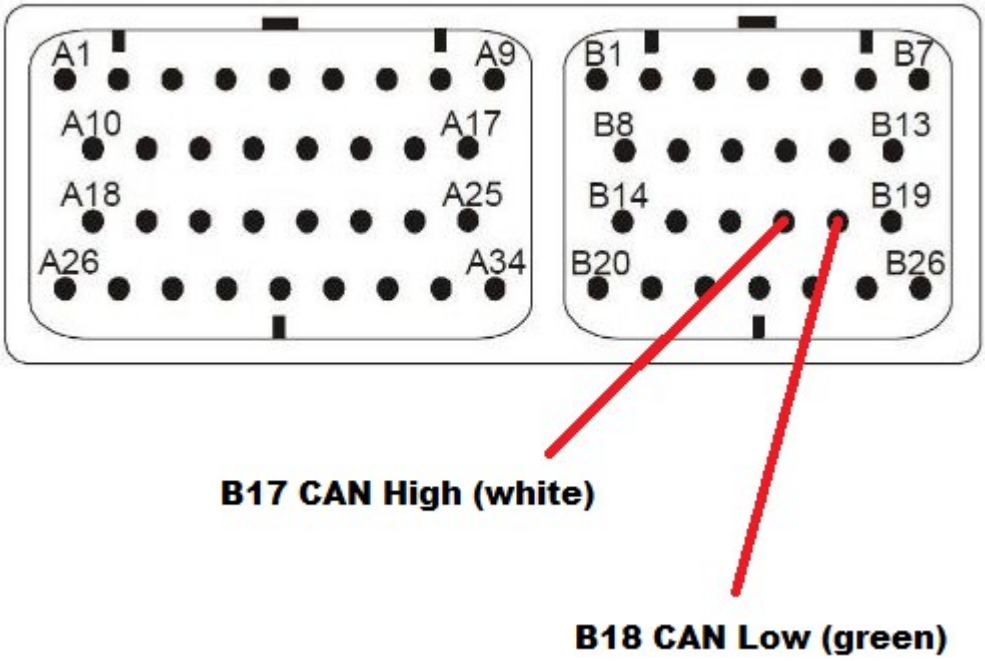
The CAN output is as shown:

CAN Analog 1:	8 bit width	Boost Control (Value of 1-10 Boost PWM step dependant)
CAN Analog 2:	8 bit width	Slip Control (Value of 1-10 Slip PWM step dependant)
CAN Analog 3:	8 bit width	AWD Bias (Value 0-100)
CAN DI 2 :	1 bit width	Antilag (Value 0-1)
CAN DI 3 :	1 bit width	Launch Control (Value 0-1)
CAN DI 4 :	1 bit width	Nitrous (Value 0-1)
CAN DI 5 :	1 bit width	Flat Shift (Value 0-1)

MoTeC M1 Integration

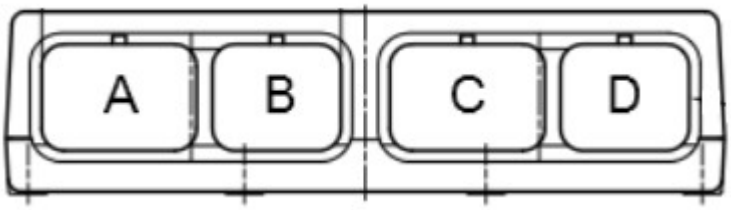
MoTeC M130 Connector Pin-out:

B17	CAN_HI	CAN Bus 1 High
B18	CAN_LO	CAN Bus 1 Low



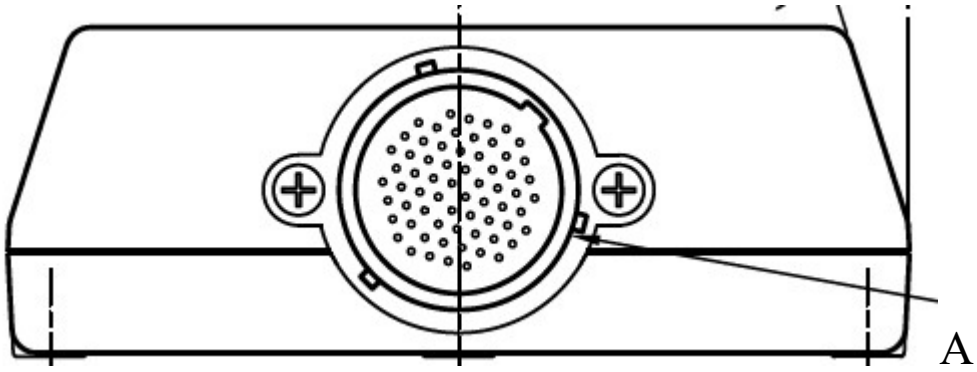
MoTeC M142 and M150 Pin-out:

D17	CAN1_HI	CAN Bus 1 High
D18	CAN1_LO	CAN Bus 1 Low



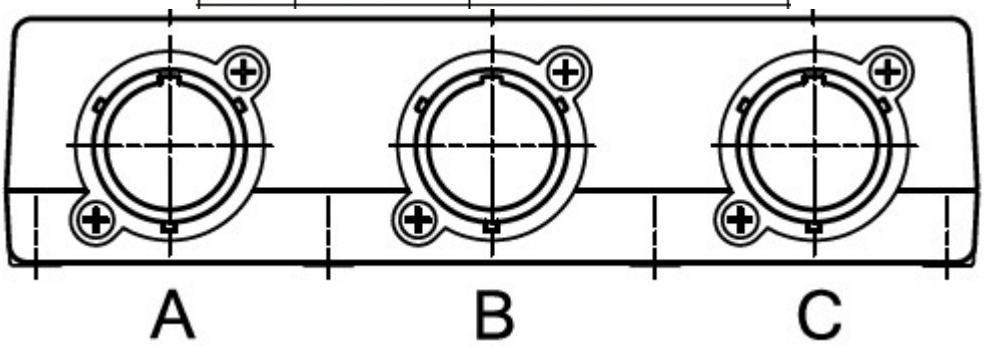
MoTeC M170 Pin-out:

A31	CAN_LO	CAN Bus 1 Low
A40	CAN_HI	CAN Bus 1 High



MoTeC M182 & M190 Pin-out:

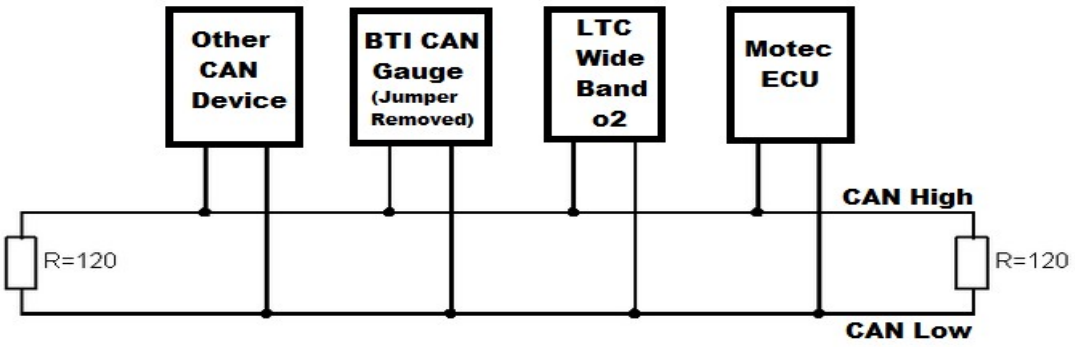
C24	CAN1_HI	CAN Bus 1 High
C31	CAN1_LO	CAN Bus 1 Low

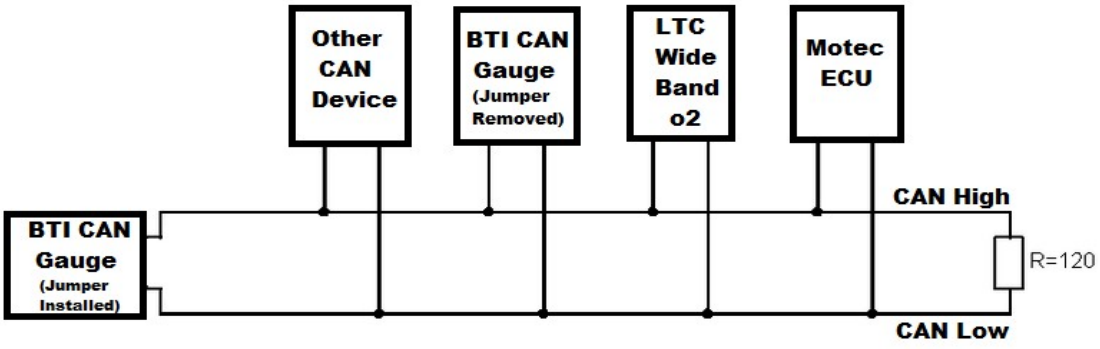


Making the connections:

The terminations to the Motec CAN bus are relatively simple as it only consists of two wires: CAN High and CAN Low. These connections can be soldered to the CAN bus or you may use the supplied 3M T-Tap connectors.

Note that the Yellow Termination Jumper located in the back of the BTI gauge should be removed if the gauge is not the last device in the CAN bus or there is already a termination resistor in your CAN bus.

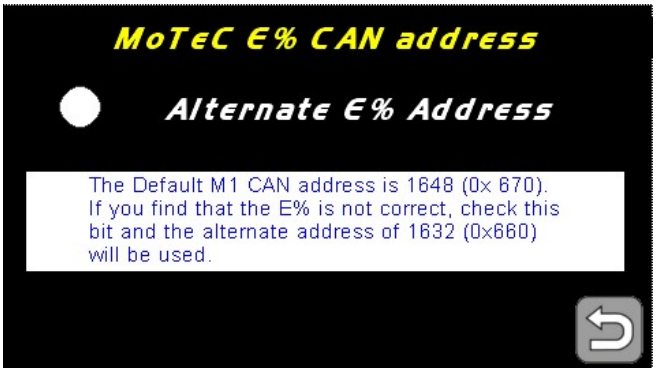




Upon powering up a properly terminated gauge, the Gauge will display the interface and version number.
M1 CAN bus options:
This gauge is designed to read the O2 sensor data from an LTC wideband controller.
The gauge will look for sensor #1 data on 0x460 and sensor #2 data on 0x461 which should be default values. In the event that you do not have an LTC, some of the more popular packages will output the analog O2 sensor data on the first byte of 0x651.
The gauge will look for O2 sensor #1 data there if no LTC modules are detected.

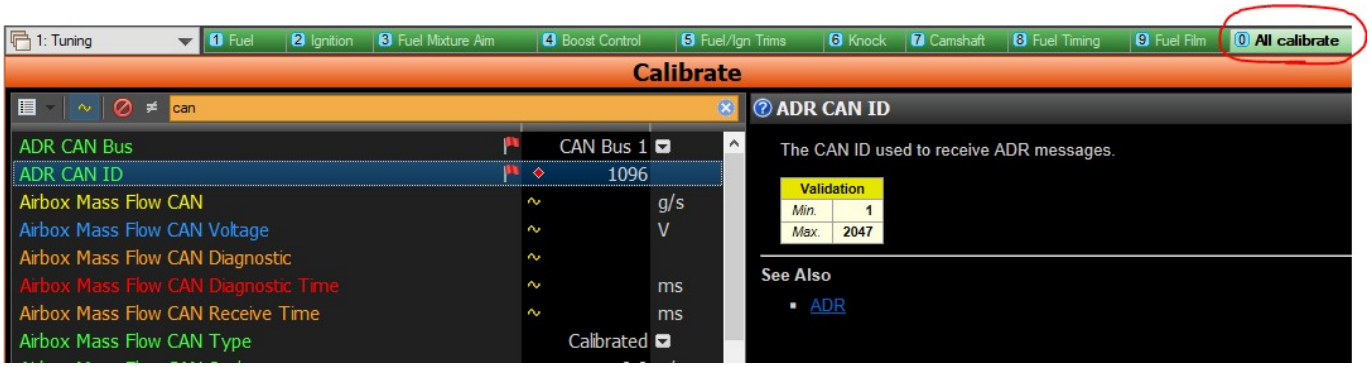
Torque and Horsepower are not standard parameters in the M1 CAN protocol. The John Reed package outputs this data on CAN address 0x647 and this display is designed to read those parameters. Horsepower is a 16 bit word starting at byte 0 where one bit = .1 Watt. Torque is a 16 bit word starting at byte 16 where one bit = 1 Nm.

Note: In the event that Fuel Composition (**E%**) data is not available, Touch the white cog wheel to enter the settings and touch the "Integrations" button. MoTec M1 should be selected. Accept that setting and you will be taken to the following screen which allows for an alternate **E%** CAN address to be used.

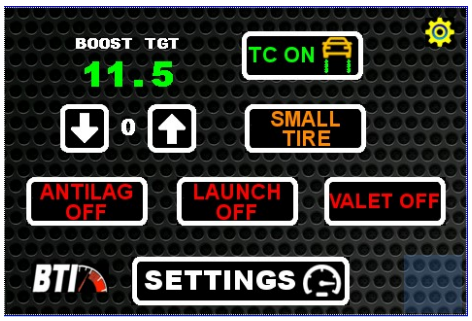


Example CAN transmit configuration in M1 Tune

In order to transmit CAN commands over the CAN bus to the M1 ECU, the ADR CAN bus must be configured The ADR CAN ID is entered in the M1 Tune software as a decimal value.

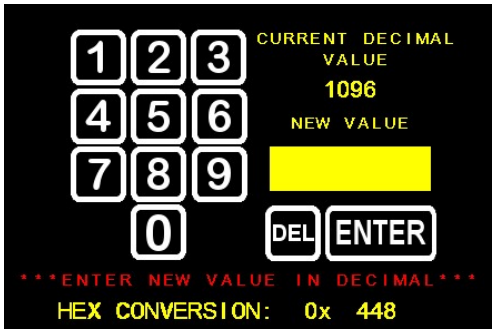


The same value must be entered into the BTI touch screen as a decimal value as well:



**Note that CAN XMIT must be enabled in the setup screen.

Press the white cog wheel in order to enter the CAN control screen:
Press the yellow cog wheel in order to configure the ADR CAN ID



Once the ADR CAN ID is configured, the inputs for the control buttons must be configured in the M1 Tune software

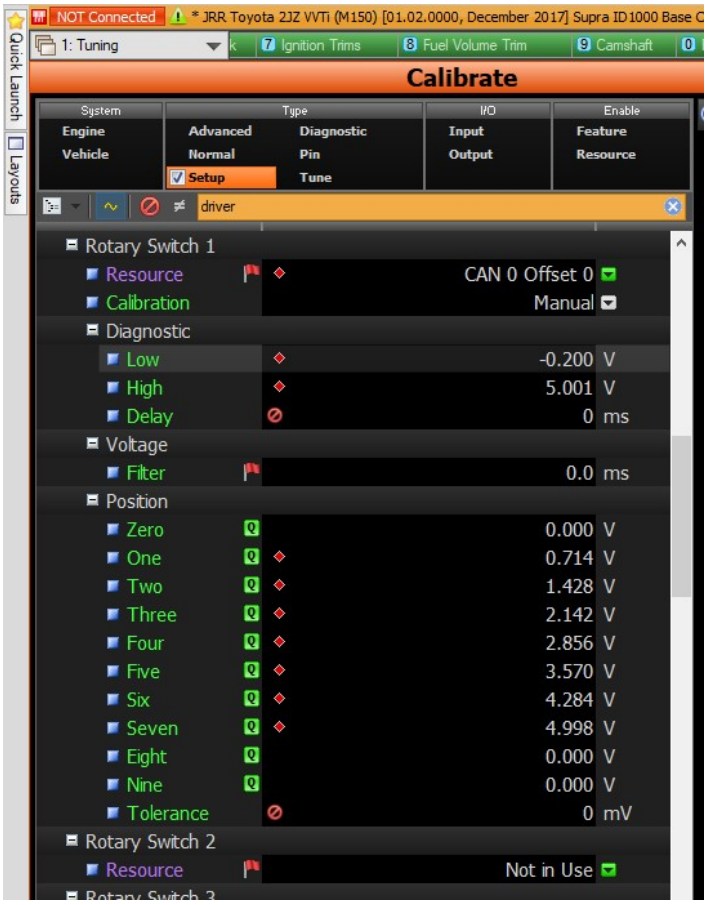
The data stream is as follows:
** All values listed in decimal**

----------"CAN 0"----------

Byte 0 (16 bits) (MoTeC offset 0)	Byte 1 (16 bits) (MoTeC offset 2)	Byte 2 (16 bits) (MoTeC offset 4)	Byte 3 (16 bits) (MoTeC offset 6)
Boost Control 0 – 5000 Divided by PWM Steps Received as 0v - 5 v	Antilag Off = 0 / On = 5000 Received as 0v or 5v	Launch Off = 0 / On = 5000 Received as 0v or 5v	Valet Off = 0 / On = 5000 Received as 0 or 5v

----------"CAN 1"----------

Byte 0 (16 bits) (MoTeC offset 0)	Byte 1 (16 bits) (MoTeC offset 2)	Byte 2 (16 bits) (MoTeC offset 4)	Byte 3 (16 bits) (MoTeC offset 6)
Trac Control / Slip Selectable for Multi-step or on / off	Tire Size Small = 0 / Big = 5000 Received as 0v or 5v	Launch Target	Not used



Example Boost control configuration using Rotary Switch 1.

Resource must be set to:
CAN 0 Offset 0
Diagnostic high and low must be set outside of the potential values to be expected.

Note that the CAN value comes in as a voltage and the peak voltage is 5 volts. The Boost PWM steps will determine how many positions will be used and the voltage value for each position will be the total of 5 volts divided by the number of steps.

In this example we have Boost PWM steps set to 7 so each position is worth .714 volts.

Example Tire Size configuration using Driver Switch 1.

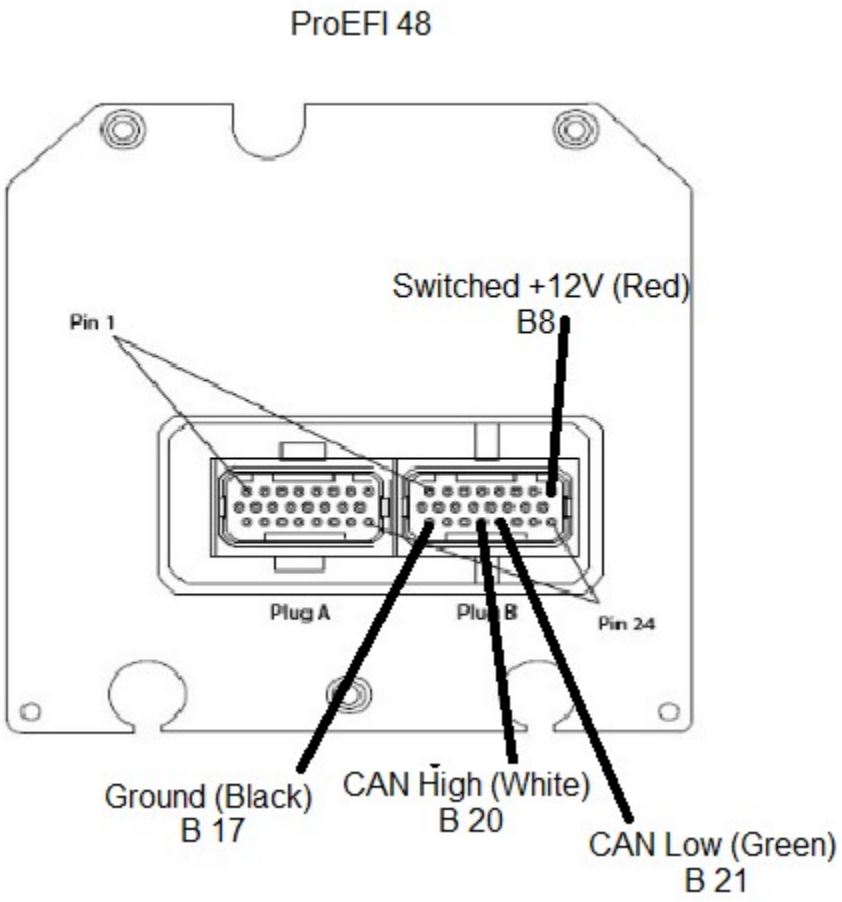
Resource must be set to:
CAN 1 Offset 2

ProEFI Integration

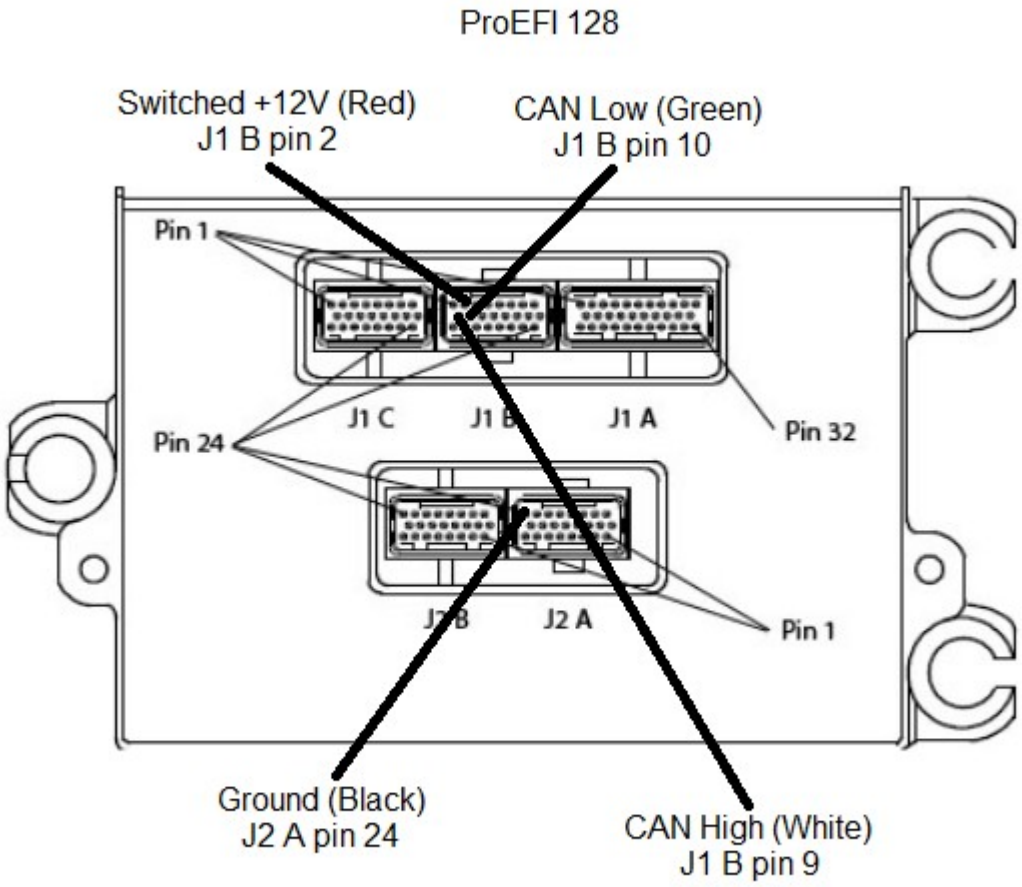
ECU Connections:

ProEFI 48:

Install a Blue T-Tap or solder wire B17 and plug in the Black ground wire form the 10 foot gauge cable.
Install a Blue T-Tap or solder wire B08 and plug in the Red power wire form the 10 foot gauge cable.
Install a Red T-Tap or solder wire B21 and plug in the Green CAN low wire form the 10 foot gauge cable.
Install a Red T-Tap or solder wire B20 and plug in the White CAN high wire form the 10 foot gauge cable.



Install the T-Tap or solder wire J2 – A24 and plug in the Black ground wire form the 10 foot CAN gauge cable.
Install the T-Tap or solder wire J1- B02 and plug in the Red power wire form the 10 foot CAN gauge cable.
Install the T-Tap or solder wire J1- B10 and plug in the Green CAN low wire form the 10 foot CAN gauge cable.
Install the T-Tap or solder wire J1 B09 and plug in the White CAN high wire form the 10 foot CAN gauge cable.



Operation:

Upon powering up a properly terminated gauge, the Gauge will display the splash screen with the display and the processor version number displayed.

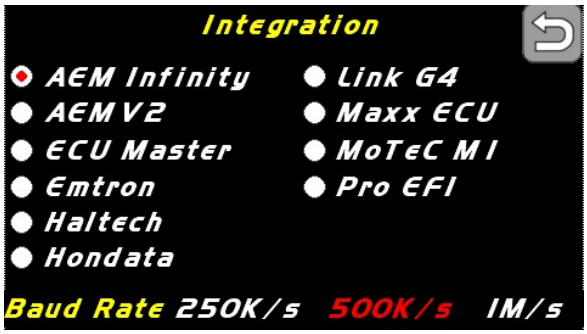
Touching the target is a shortcut to boost control as well as other functions that are integration dependant.
Touching the actual target data will toggle boost target to display peak boost instead as some ECUs or tunes do not show target boost.

Touching the double arrows » will change the screen to the gauge screen options.

Touching the yellow arrows on the end will scroll over to the next page of available screens.

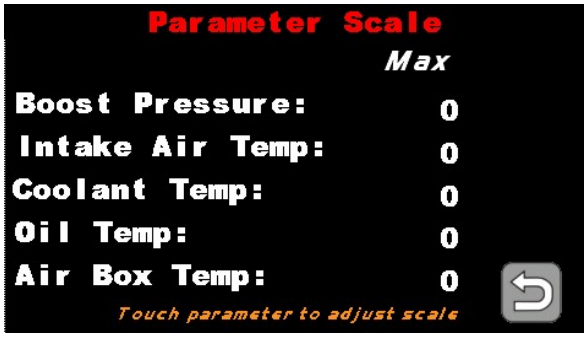
Gauge Setup Options:

Touch the cog wheel on the touch screen in order to configure the gauge.
This will bring you into a screen where the Boost Control, Traction Control, and Settings can be accessed.
Press the **SETTINGS** button will allow you to make the following changes:
UNITS button will allow the user to toggle between SAE and SI units. This applies to temperature,, speed, and distance.
Pressure Units will allow the user to toggle between PSI and Kpa units for all pressure parameters.
O2 button will change how the Oxygen sensor data is displayed. The options are AFR and Lambda.
O2 Count: Select “1X” if you are running 1 wideband O2 Sensor, select “2X” if you will be running 2 wideband O2sensors.
RPM Scale: Select “8000 RPM” if your redline is below 8000 RPM or select “10000 RPM” if redline is higher.

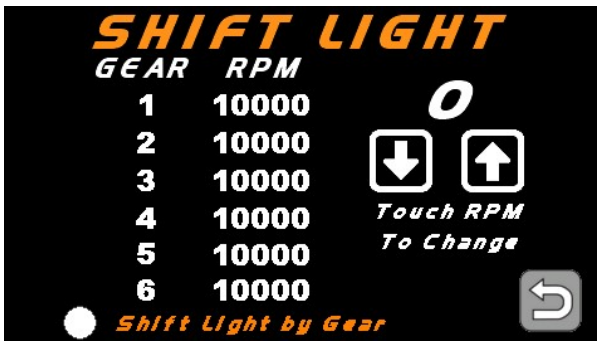


Integration: Pressing the Integration button will allow the user to determine which ECU CAN data stream will be received and interpreted by the BTI CAN display.
Baud Rate: Select the proper baud rate used to transmit the CAN data stream by touching the speed specified. Note that having the wrong speed on the CAN bus will cause the entire CAN bus to fault causing all communications to fail.

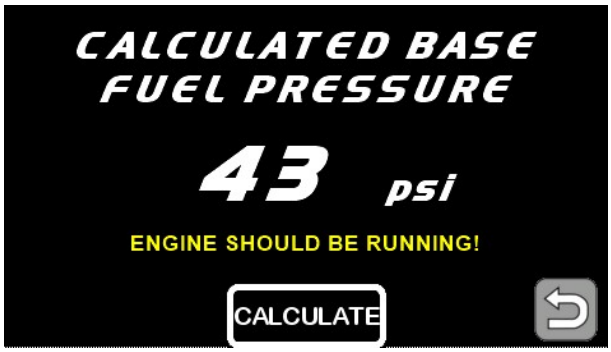
Most integrations will use 1 Mb/s, but AEM Infinity, AEM v2 and any OBD2 communications will use 500 Kb/s.



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.

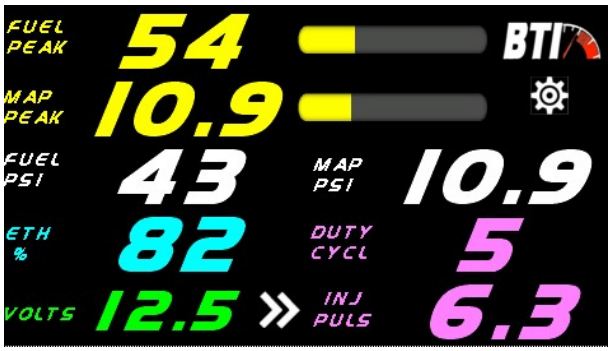


Shift Light Configuration:
If Shift Light by gear is not checked, only Gear 1 will be adjustable and the shift light will illuminate no matter what gear you are in.
If Shift Light by Gear is checked, touch the gear that you wish to change the shift light RPM on. That gear number will appear above the 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. The shift light should flash once the settings are saved.

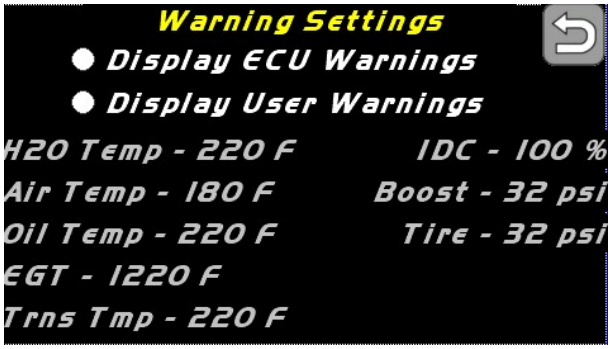


Base Fuel Pressure configuration:

In order to calculate the base fuel pressure, the engine should be idling and at running temperature. 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.

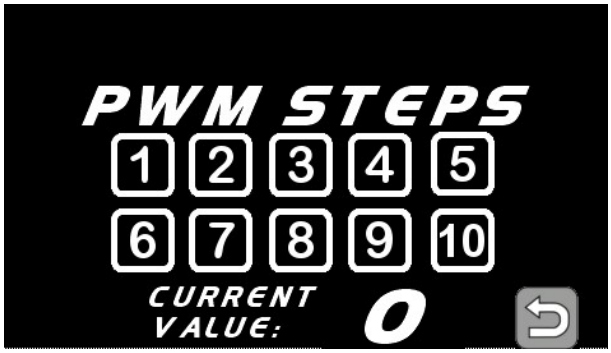


The Base Fuel calculation is used to verify that your rising rate fuel pressure regulator is working correctly as you should see your peak fuel pressure rise with your peak MAP pressure when you are one the Fuel screen.



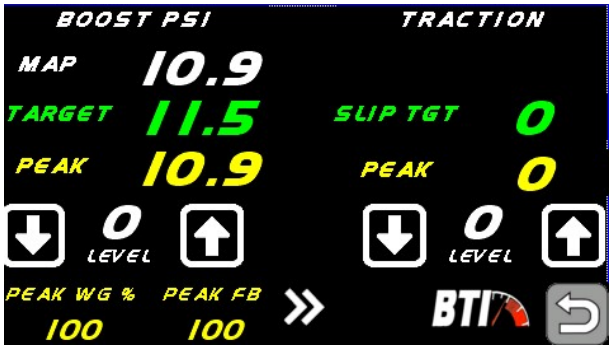
Display ECU Warnings: This setting will allow the screen to display warnings generated by some ECUs. Note that not all ECUs generate warnings.
Display User Warnings: This setting allows the user to determine warning thresholds for the parameters pictured to the left. Touch the parameter to set the value. (Note that these values are absolute and to not convert when switching units so be sure to have your desired units selected before setting these values.) Tire pressure warnings only work when using a CAN TPMS.

In the event that a user warning does trigger, the warning will be display and the parameter highlighted. The warning may be cleared which will cause the display to resume normal operation. There is a warning counter that will re-trigger for a condition that may have been cleared and corrected but the error has reoccurred.

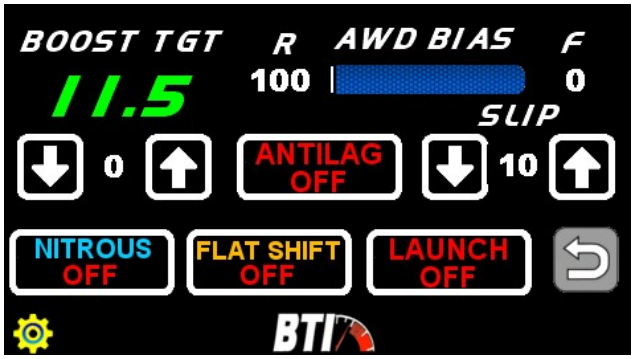


TRAC and BOOST PWM Steps:
Use these two buttons to configure how many steps are to be programmed in the Infinity Tuner software for Boost and Slip. Typically the scale is from 0-5 volts and the max amount of steps allowed is 10 which give you 11 settings (0-10). Example: a value of 10 here would make each step would have a value of .5 volts. A value of 1 here would give the step a value of 5 volts. It is **imperative** to view each step in the software when configuring this as there could be a potential difference with regard to ground.

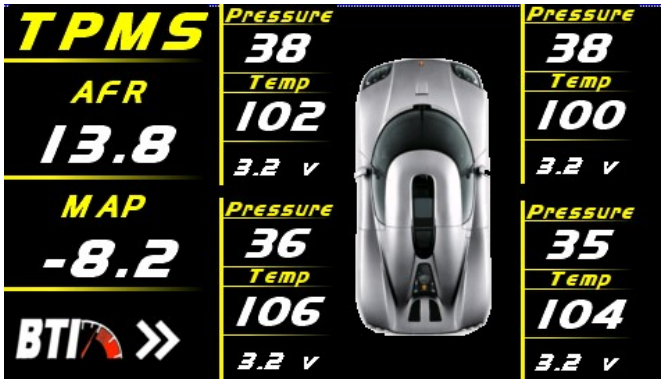
**** Note that these two settings should be configured by competent personnel. Raising the BOOST too much or reducing the SLIP too much can have severe consequences. ****



Analog outputs:
Use this screen to out a 0-5v analog output on the Blue and Brown analog output wires from the display. These output voltages are directly tied to the PWM steps mentioned above. Most of the newer ECUs will allow these changes over the CAN bus, but older ECUs like ECU Master Classic, AEM V2, and AEM Infinity are limited to using these analog outputs tied to the ECU analog inputs.

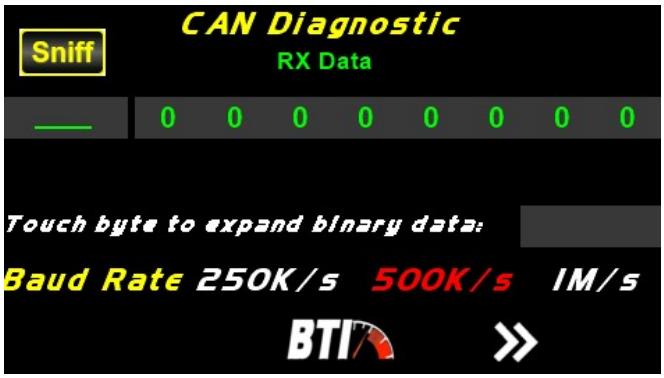


CAN Xmit:
This screen is used to transmit commands over the CAN bus. Depending on which ECU Integration that you have selected will determine the behavior of this screen and the way that the CAN output data is transmitted.
The yellow cog wheel is used to set the CAN address that this data is transmitted on.



Tire Pressure Monitoring System (TPMS):
This display is capable of monitoring TPMS over the CAN bus. Currently, either the BTI TPMS 1000, the BTI TPMS 500, or the Haltech TMS4 are compatible with this display. The BTI TPMS 1000 or Halteh TMS4 modules are used for ECUs that comminicate at 1Mb/s baud rate. The BTI TPMS 500 is used for ECUs that comminicate at 500 Kb/s (Infinity and AEM V2 or anything tied to OBD2).
These modules must be connected to the CAN bus for BTI display operation.

Gear Screen Gear display:
The Gear display is set do display calculated gear by default, but touching the gear if you have either Haltech or ProEFI will change the color to orange and display the Auto Gear instead of calculated gear.



CAN sniffer:
This screen will show the raw CAN bus data that the display is reading.
Pressing the Sniff button will allow you to input a CAN address and see the raw data for that address. Touching the individual byte will display the binary value for that byte down in the bottom right This is used to see a bit field where errors or triggers may be viewed.

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.