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CAN Bus Gauge for AEM V2 and EMS-4 Wiring and Installation Manual Doc version 2.3 **Notice:** This product is intended for Off-Road use only. Never take your eyes off of the road while using this device. If you are uncomfortable with wire termination, please have this device installed by a competent shop.

Patent Pending

Wiring harness installation:

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

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

AEMnet CONNECTORS

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



Figure 1: AEMnet connectors, wire entry view

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

Table 1: AEMnet connector pinout

INSTALLING THE AEMnet ADAPTER HARNESS

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

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

Table 2: CAN1L and CAN1H pin locations

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

п п п п п O 2019191716154131211 10 8 8 7 6 5 4 8 8 9 b 10 8 8 7 6 5 4 8 2 1 2019 1817 16 1514 1812 11 10 26 31 37 37 55 37 55 28 58 ******** 0 50 55 55 57 56 55 54 55 55 51 504545474645444454241 ब इ स इ व ट र र स्ट य व 0 20787677767274737271 70 35 35 37 36 35 31 35 35 31 10 39 55 37 36 55 34 55 32 31 Π PLUG B PLUG A

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

 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



B6 37 88 01 02 03 04 05 08 07 A1 47 43 44 A5 A8 A7 A5 A9 A10 31 B2 33 34 E5 C8 C9 C10 21 D2 D3 D4 A11 A12 A13 A14 A15 A19 A17 A18 A23 E0 510 519 B14 515 516 517 519 CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8 CT9 C25 C21 C22 D6 D7 D8 D9 D1; 624 B10 E19 B20 B21 B22 B23 B24 B20 C29 C30 C81 D19 D-4 D15 D15 A20 A29 A27 A28 A29 A30 A91 A32 C23 C24 C25 C29 C27 C28 Connector A Connector B Connector C Connector D

Figure 7: Wire-side view of pinout for 6030



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



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

99 100

EMS-4 CAN Bus wiring:





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

CAN Bus Termination Jumper: Remove this jumper if the gauge is not the last device on the CAN Bus. If there are multiple gauges, the last gauge should be the only gauge with the jumper installed.

Leave the jumper installed if the gauge is a stand alone installation and there is nothing else on the CAN Bus.

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

Configuring AEM V2:

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

AEM V2 and EMS-4 Configuration

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

Setup wizaru			لكالك
Wizard Types:	Configuration Name	Matched	
Feedback: Boost control Feedback: D2 control Ignition: Coil D well Injectors: Primaty Injectors: Staged Rev Limit: Staged Rev Limit: Main Sensor: Carl Crank Position (I Sensor: Coolart Temperature Sensor: Exhaust Gas Temp [E Sensor: Manifold Pressure (MAF) Sensor: Mass Air Flow (MAF) Sensor: Dati (JAFR) Sensor: 02 #12 (AFR) Sensor: 02 #12 (AFR) Sensor: 02 #12 (AFR) Sensor: 02 #10 (AFR) Sensor: Vehicle Speed (VSS) Setup: AEMNet Receive	AEMNet Datastream (01v17 fr	rmware a Matched	
Setup: Variable Valve Control Telemetry: AFMNet			
Telemetry: Serial	Conjuguration Notes: This wizard will enter in the default AB file for a CAN Datastream Gauge. WARNING: Settings from other Serie firmware version, this wizard must be	EMNet Telemetry settings into s 2 firmware versions will not v used if AEMNet telemetry will	the calibration work with this be enabled.
Auroan also double click	configuration to appluit	Apoly	Close

Figure 11: Selecting the AEMnet Datastream

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

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

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Data Byte 1 2 3	Channel Engine Speed Used by Last Byte Engine Load	Channel Alias				
Data Byte 1 2 3 4	Channel Engine Speed Used by Last Byte Engine Load Used by Last Byte	Channel Alias				
Data Byte 1 2 3 4 5	Channel Engine Speed Used by Last Byte Engine Load Used by Last Byte Throttle	Channel Alias				
Data Byte 1 2 3 4 5 6	Channel Engine Speed Used by Last Byte Engine Load Used by Last Byte Throttle Used by Last Byte	Channel Alias				
Data Byte 1 2 3 4 5 6 7	Channel Engine Speed Used by Last Byte Engine Load Used by Last Byte Throttle Used by Last Byte Air Temp	Channel Alias				

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:

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AN IE	elemetry 🗹 En	Table Speed Suu Kops V	
AN Me	essage 1 CAN Mess	sage 2 CAN Message 3 CAN Message 4	
D· Fr	01504000		
. L	XUTFUAUUU		
Data			
Byte	Channel	Channel Alias	
1	Engine Speed		
2	Used by Last Byte		
3	MAP Volts ~		
4	Used by Last Byte		
5	Ihrottle		
6	Used by Last Byte		
_	Air Temp		
7	Coolant Temp		
7 8			
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Notice that "MAP Volts" may change to one of the ADCR channels once you have made your selection. This behavior is normal:

ienera	1					
CAN Te	elemetry 🗹 Ena	able	Speed	500 kbps	~	
AN M	essage 1 CAN Mess	sage 2 CAN Message 3	CAN Mes	sage 4		
ID. G						
	x01F0A000	Use Extended For	mat			
Data						
Data Byte	Channel	Channel Alias				
Data Byte 1	Channel Engine Speed	Channel Alias				
Data Byte 1 2	Channel Engine Speed Used by Last Byte	Channel Alias				
Data Byte 1 2 3	Channel Engine Speed Used by Last Byte ADCR02	Channel Alias MAP Volts				
Data Byte 1 2 3 4	Channel Engine Speed Used by Last Byte ADCR02 Used by Last Byte	Channel Alias MAP Volts				
Data Byte 1 2 3 4 5	Channel Engine Speed Used by Last Byte ADCR02 Used by Last Byte Throttle	Channel Alias MAP Volts				
Data Byte 1 2 3 4 5 6	Channel Engine Speed Used by Last Byte ADCR02 Used by Last Byte Throttle Used by Last Byte	Channel Alias MAP Volts				
Data Byte 1 2 3 4 5 6 7	Channel Engine Speed Used by Last Byte ADCR02 Used by Last Byte Throttle Used by Last Byte Air Temp	Channel Alias MAP Volts				

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

Genera	al				
CAN T	elemetry 🗹 E	nable		Speed	500 kbps
CAN M	lessage 1 CAN Me	ssage 2	CAN Message 3	CAN Mes	sage <mark>4</mark>
ID:	0x01F0A001		Use Extended Form	at	
Data		. —			
- and					
Byte	Channel	Chann	el Alias		
Byte 1	Channel Flex Fuel Content	Chann Flex Fi	el Alias uel Freq, Flex Fue	l Per	
Byte 1 2	Channel Flex Fuel Content Used by Last Byte	Chann Flex Fi	el Alias uel Freq, Flex Fue	l Per	
Byte 1 2 3	Channel Flex Fuel Content Used by Last Byte Fuel Pressure	Chann Flex Fi	el Alias uel Freq, Flex Fue	l Per	
Byte 1 2 3 4	Channel Flex Fuel Content Used by Last Byte Fuel Pressure Oil Pressure	Chann Flex Fi	el Alias uel Freq, Flex Fue	l Per	
Byte 1 2 3 4 5	Channel Flex Fuel Content Used by Last Byte Fuel Pressure Oil Pressure Boost Target	Chann Flex Ft	e l Alias uel Freq, Flex Fue	l Per	
Byte 1 2 3 4 5 6	Channel Flex Fuel Content Used by Last Byte Fuel Pressure Oil Pressure Boost Target Used by Last Byte	Chann Flex Fi	el Alias uel Freq, Flex Fue	l Per	
Byte 1 2 3 4 5 6 7	Channel Flex Fuel Content Used by Last Byte Fuel Pressure Oil Pressure Boost Target Used by Last Byte EGT 1	Chann Flex Fr	el Alias uel Freq, Flex Fue	l Per	

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

Click on "Show Info" in order to generate the CAN Configuration Sheet with the Scalars and Offsets. We will need this info in order to

ensure that the displays are ac	ccurate.
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AN M	essage 1 CAN Mes	sage 2 CAN Message 3	CAN Mes	ssage 4	
D: (x01F0A000	Use Extended For	nat		
Data					
Byte 1	Channel Engine Speed	Channel Alias			
2	Used by Last Byte				
3	ADCR02	MAP Volts			
4	Used by Last Byte				
5	Throttle				
6	Used by Last Byte				
7	Air Temp				
8	Coolant Temp				

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.

Assertion F	ailed: Abort=Q	uit, Retry=Debug, Igr	nore=Continue		
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		Abort	Retry	Ignore]

Print this sheet out and hang onto it for later...

Operation:

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

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

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

"No parameter selected for screen # 1-12"

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

Use the center button to enter the screen configuration.

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

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

Configuring the MAP and Fuel pressure sensors:

Common Sensor multipliers and offsets:

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

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

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

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

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

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

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

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

CAN Message 2

ID: 0x01F0A001

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

CAN Message 4

ID: 0x01F0A003

Byte	Name	Units	Scalar	Offset	Min	Max	Signed?	Bitmask
1	O2 #1	Lambda	0.00390625018553692	0.50000023748726	0.5	1.496	No	
2	O2 #2	Lambda	0.00390625018553692	0.50000023748726	0.5	1.496	No	
3	Vehicle Speed [msb]	mph	0.00390625	0	0	256	No	

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

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

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

You will then be prompted to adjust the display update rate. This value can be set from 0-200 milliseconds. Use the left and right buttons to adjust accordingly. Use the center button to accept the Update Rate value.

You will then be prompted to enable or disable the peak hold screens. This applies only to single parameter screens and does not affect the Boost screen which always display peak boost episode values when ever selected.

In order to reset the peak value on the selected single parameter screen, press and hold the center button for 3 seconds until the "Reset" prompt appears.

Note that the peaks on the single parameter screens will continue to record peak values no matter what parameter you are monitoring.

Shift Light Configuration:

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

Warranty:

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

□ This warranty extends only to products distributed and/or sold by BTI Gauges. It is effective only if the products are purchased and operated in the USA. (Within the USA including US 48 States, Alaska and Hawaii.)

□ This warranty covers only normal use of the computer. BTI Gauges shall not be liable under this warranty if any damage or defect results from (i) misuse, abuse, neglect, improper shipping or installation; (ii) disasters such as fire, flood, lightning or improper electric current; or (iii) service or alteration by anyone other than an authorized BTI Gauge representative.

 $\hfill\square$ You must retain your bill of sale or other proof of purchase to receive warranty service.

 \Box No warranty extension will be granted for any replacement part(s) furnished to the purchaser in fulfillment of this warranty.