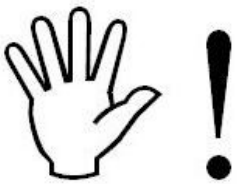
Instruction Manual

P/N 30-2226
6 CHANNEL CAN SENSOR MODULE



STOP! - READ THIS BEFORE INSTALL OR USE!

WARNING:
THIS INSTALLATION MAY REQUIRE WELDING OR INTEGRATION INTO A VEHICLE'S ELECTRICAL SYSTEM. DAMAGE TO SENSITIVE ELECTRONICS, FIRE, OR EXPLOSION MAY OCCUR IF PROPER PRECAUTION IS NOT TAKEN. IF THERE IS ANY DOUBT, **DO NOT** ATTEMPT THE INSTALLATION AND CONSULT A PROFESSIONAL.
NOTE: IT IS THE RESPONSIBILITY OF THE ENGINE TUNER TO ULTIMATELY CONFIRM THE CALIBRATION USE FOR ANY PARTICULAR ENGINE IS SAFE FOR ITS INTENDED USE. AEM HOLDS NO RESPONSIBILITY FOR ANY ENGINE DAMAGE THAT RESULTS FROM THE MISUSE OF THIS PRODUCT.

The AEM 6 Channel CAN Sensor Module enables a user to put analog, fuel level, and tachometer signals onto an AEMnet or CAN bus. The Sensor Module accommodates a wide variety of sensors and is housed in a sealed IP67 weather-resistant enclosure. Sturdy construction, protected inputs, and simple configuration make this the perfect entry point to get everything required to use an AEM CD-series dash on a carbureted or EFI vehicle. The Sensor Module supports the Bosch CAN 2.0b standard making it compatible with many third-party devices. Note: **The only AEMnet devices that are compatible with the CAN Sensor Module are the CD-series dash displays.**

Features

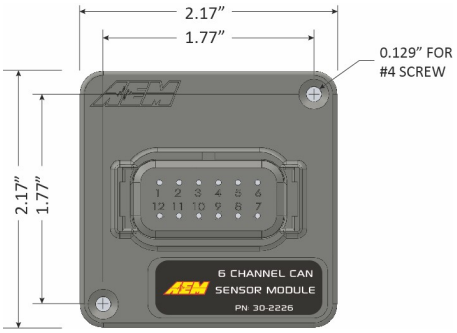
- Two (2) temperature (thermistor) inputs
- Two (2) dedicated 0-5V analog inputs
- One (1) dedicated fuel level input (0 to 250 Ohm range)
- One (1) tachometer/coil input
- Fixed CAN bus speed, header length, and base address
- IP67 Potted Enclosure / Sealed Connector - "dust tight" and protected against water spray
- Protected inputs

PN	QTY	Description
35-2214	1	MODULE, 6 CHANNEL CAN SENSOR MODULE
10-2226	1	INST, MODULE, 22 CHANNEL CAN SENSOR MODULE
1-3080	2	SCREW, FLT HD, 4-40X7/8"
1-2520	2	WASHER, 4-40 x .375"
35-5709	2	NUT, NYLOCK 4-40x9/64
4-1020	1	CONNECTOR, SLD, 12-WY PLG A
4-2013	13	TERMINAL, SKT, SZ 20, .05-.08

Installation

Mechanical

The Sensor Module may be mounted within the vehicle using hook-and-loop fastener (not included) or bolted (#4 screws included) to a suitable structure; a mounting/drill diagram is provided below. The module is weather-resistant (IP67) but is preferably mounted in a cool, dry area such as the driver compartment.



Sensor Wiring

- The Sensor Module should only be powered through the dedicated power and power ground pins, ***not*** sensor ground
- Every connected sensor should be connected to the dedicated *sensor* ground pins to ensure accurate readings
- Do not connect the Module's 5V sensor power to anything *other than* dedicated sensors that require 5V power, e.g. pressure sensors
- Route wiring away from sources of noise such as alternators, ignition components, or other high power/frequency wiring
- Shielded wire is suggested to reduce the susceptibility of noise; the shield should only be grounded/drained on one end of the wiring harness
- CAN wiring should utilized twisted pairs (> 1 TPI); shielding is recommended
- The Sensor Module's sensor ground should be at the same level as the sensor ground of any "tapped" sensors, i.e. existing/OEM sensors that are connected to an external ECU/device
- **The device pinout section includes a Suggested Interface column. This may make integration with an AEM Dash easier as sample layouts will be provided that follow these guidelines.**

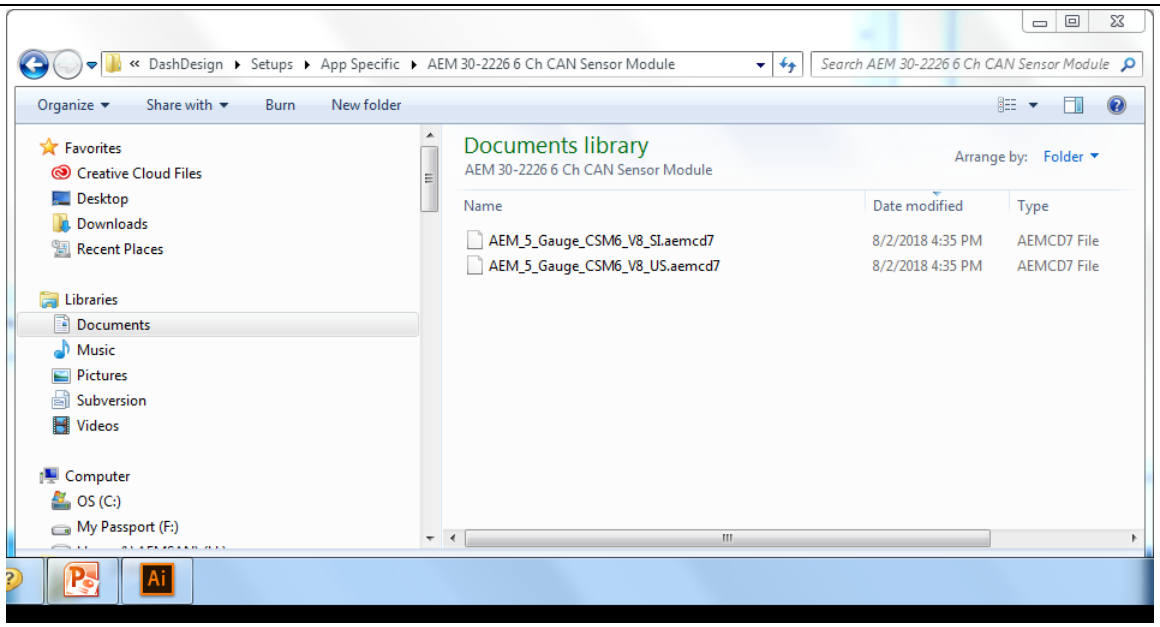
Quick Setup with AEM Dash

Be sure to install the latest version of the AEM DashDesign software.

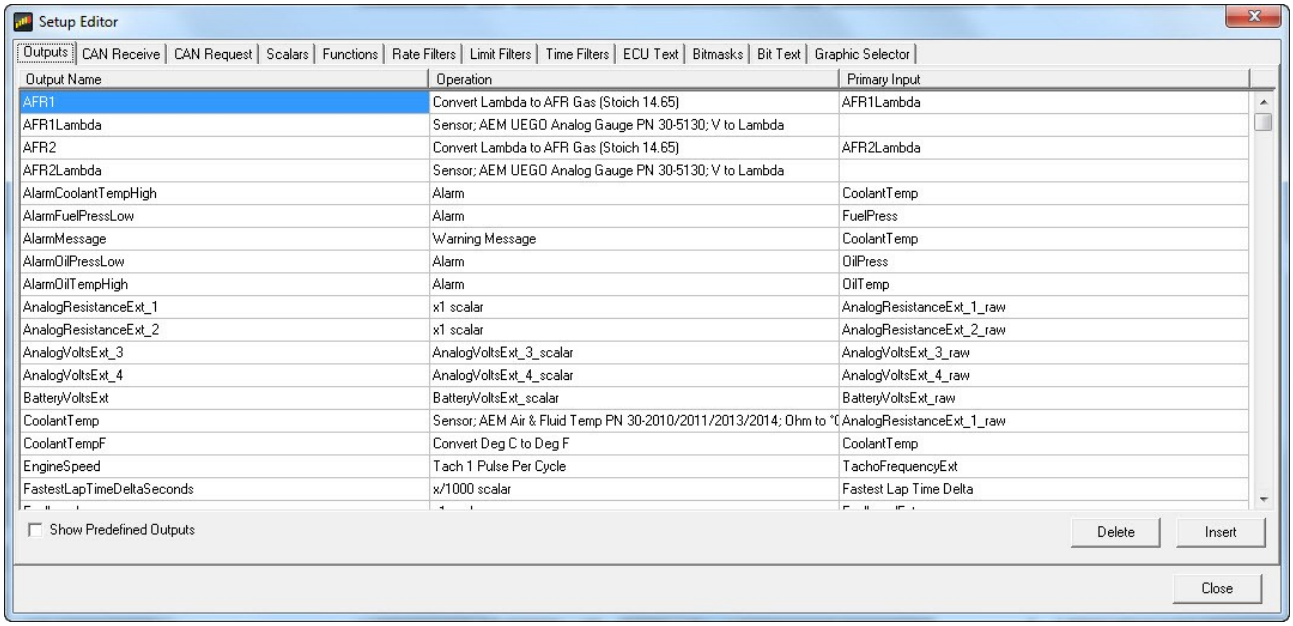
Follow this Software Download link directly or follow the graphical instructions below.

The website will always contain the latest release version of DashDesign software. Your version number may be different than the example above.

Once installed, you will find a library of setup files in your \Documents\AEM\DashDesign directory. In the \Documents\AEM\DashDesign\Setups\App Specific\AEM 30-2226 6 Ch CAN Sensor Module folder you will find all currently available setup files for your 30-2226 6 Channel CAN Sensor Module. They have a ".aemcd7" extension. The file name describes each one.



A quick primer on basic setup modifications
The display editor is the core tool for editing a setup. To open the tool, go to **Setup | Display...**



You can think of the display editor as a collection of tools for creating items on your screens. A DashDesign setup consists of four logical components: Primary Inputs, Operations, Outputs and Gauges. These are defined as follows:

- **Primary Inputs** are raw data manipulated by an operation.
- **Outputs** are objects that obtain information from one or more sources or other outputs. An output manipulates the obtained data according to the operation associated with the output. The result can then be used in a gauge or another output.
- **Operations** are objects that define how the data is manipulated by an output. Examples of operations are scalars, functions and alarms.
- **Gauges** are objects that are placed on a screen page. There are two types of gauge; static and variable.
  - **Static** gauges do not change their appearance on the screen and include gauges such as text labels or graphics.
  - **Variable** gauges change their appearance to reflect data obtained from an output. Examples of variable gauges are bar graphs, tachos and numerical text gauges.

- **Predefined Outputs** are pre-configured within the system and can be used in many ways. Some examples include: Log Mem Free (kb) which displays the amount of free logging memory (logging versions only) and Night Mode Input Status. This output displays the state of the Night Mode 12v input (Grey wire in flying lead bundle).

Click the Show Predefined Outputs box in the Display Editor to add all Predefined Outputs to the list.

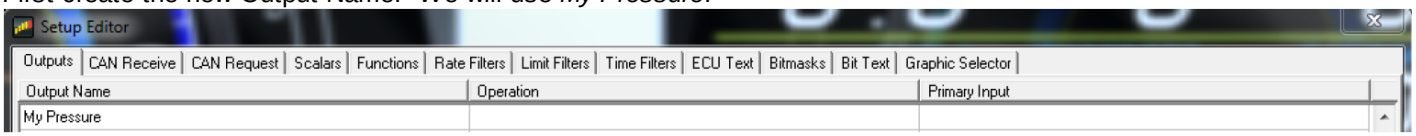
Two common modifications necessary are 1.) Creating a new Pressure Sensor Output and 2.) Modifying the tach output scalar based on the number of engine cylinders.

Creating a new Pressure Sensor Output
Outputs are values, texts or graphics that are used by gauges or other outputs. The output that it passes is determined by the operation that it uses.

To set up a new output:

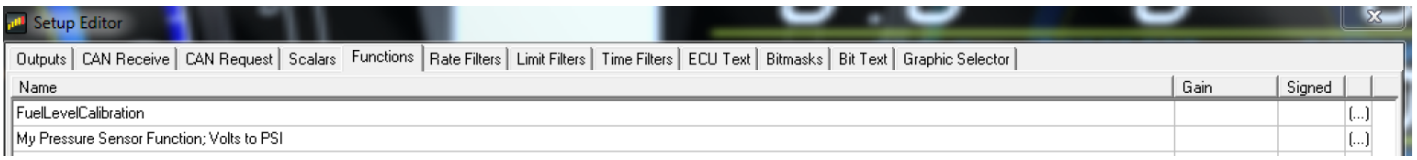
- Click the Insert button in the Outputs tab.
- Enter the name of the new output. This should describe what the output actually generates.
- Select the operation to be used by the output from the drop-down list.
- Select the input from the drop down list.

In our example below, we will create a new scaled pressure sensor output that can be used to drive a gauge on the dash. It will use the Analog 3 input from the 30-2206 on Pin 7. Three things are required. 1.) You must create a new Output Name. 2.) You must add an Operation to scale the voltage into pressure units. 3.) You must define a Primary Input. First create the new Output Name. We will use *My Pressure*.

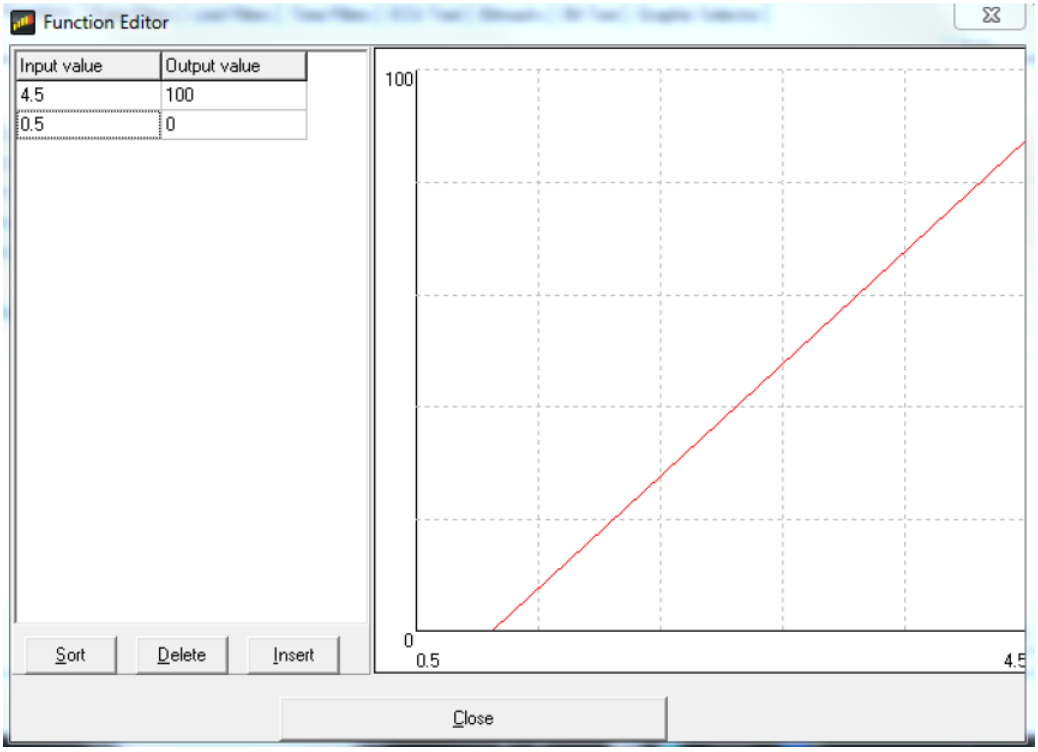


For this example, let's assume that the sensor is a typical 0-5V analog sensor that is calibrated as follows: 0.5 volts = 0 psi and 4.5 volts = 100 psi. Consult your sensor documentation for proper calibration values. There are several options but the easiest method is to use a Function table. Lets create a new Function to define this calibration.

In the Functions tab, create a new Function. We will call it My Pressure Sensor Function; Volts to PSI. It will convert voltage to PSI.

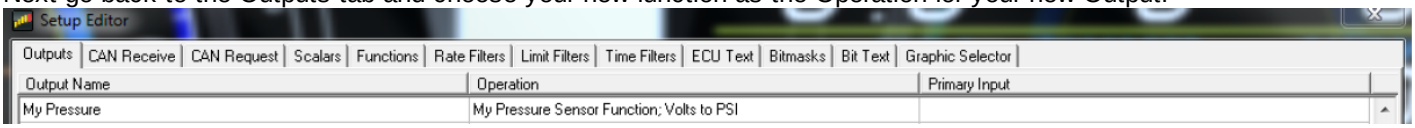


Click on the (...) symbol to define the function table. Enter the data as shown below to create the calibration curve.

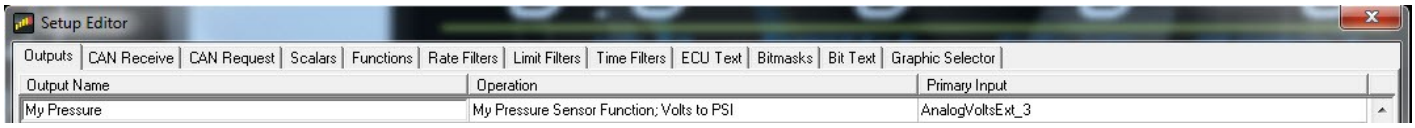


Click the Insert button to add data points. Only two points are required for a linear function. The data is interpolated. More points can be added for non-linear functions.

Next go back to the Outputs tab and choose your new function as the Operation for your new Output.



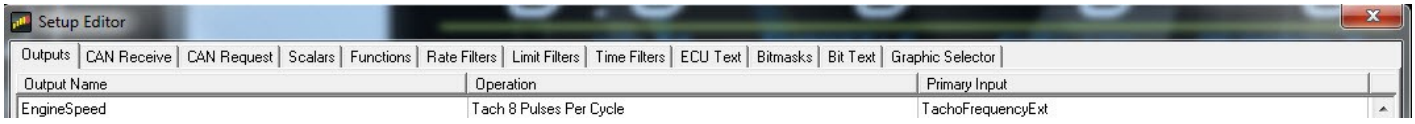
Finally, select the Primary Input which in this case will be AnalogVoltsExt_3



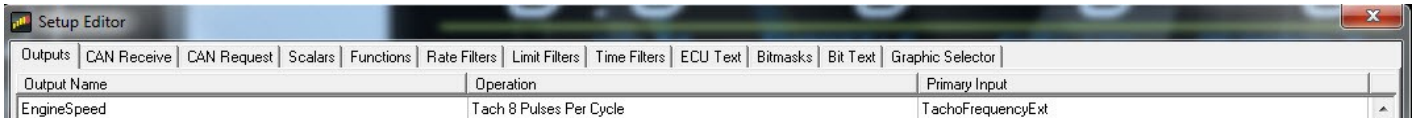
Your new *My Pressure* output can pass pressure sensor data, scaled in units of PSI, from the Analog 3 (Pin 7) input of the 30-2226 CAN Sensor Module to any Gauge item in your Dash setup.

Modifying the tach output scalar

AEM provided dash setup files will include pre-configured tach output scalars. It's very simple to configure your tach input. Find the EngineSpeed output in the Setup Editor. In the example below you can see it uses a scalar for 8 pulses per engine cycle. This is typical for a V8 engine using a distributor/coil combination when the tach input to the 30-2226 is tapped into the coil negative terminal.

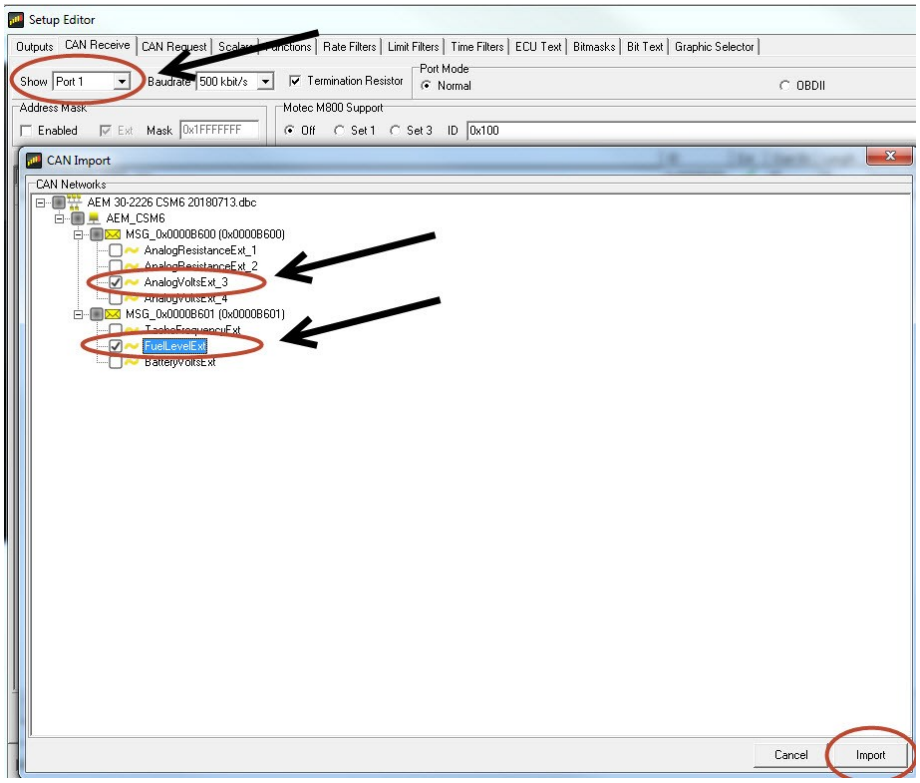


If your tach input has a different number of pulses per cycle, simply select from the other available options.

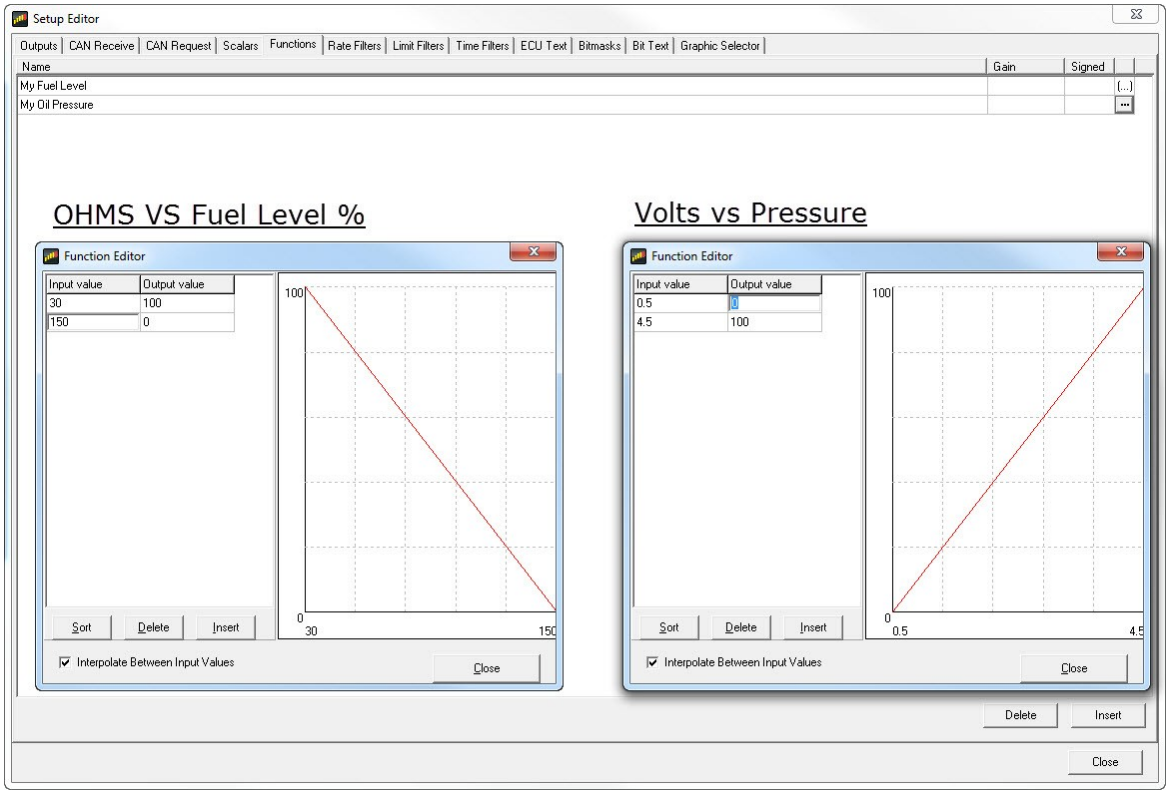


Adding 30-2226 to an Existing CD-X Dash Setup

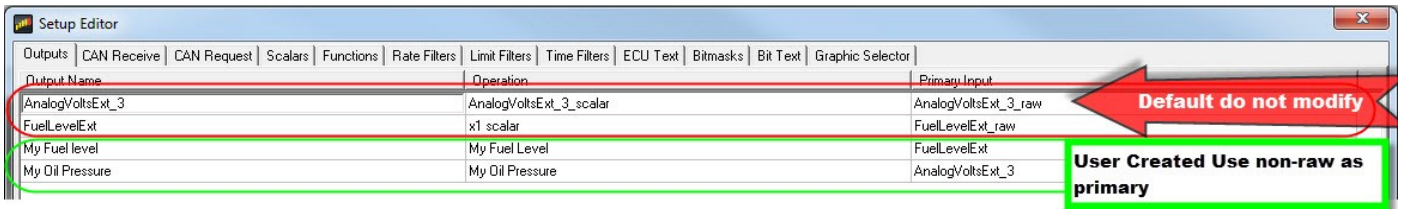
Open your existing dash set up. Go to Setup-> Display- > CAN Receive-> Import CAN->Select the file 30-2226 CSM6.dbc-> Open. ONLY select the inputs being used. See example below.



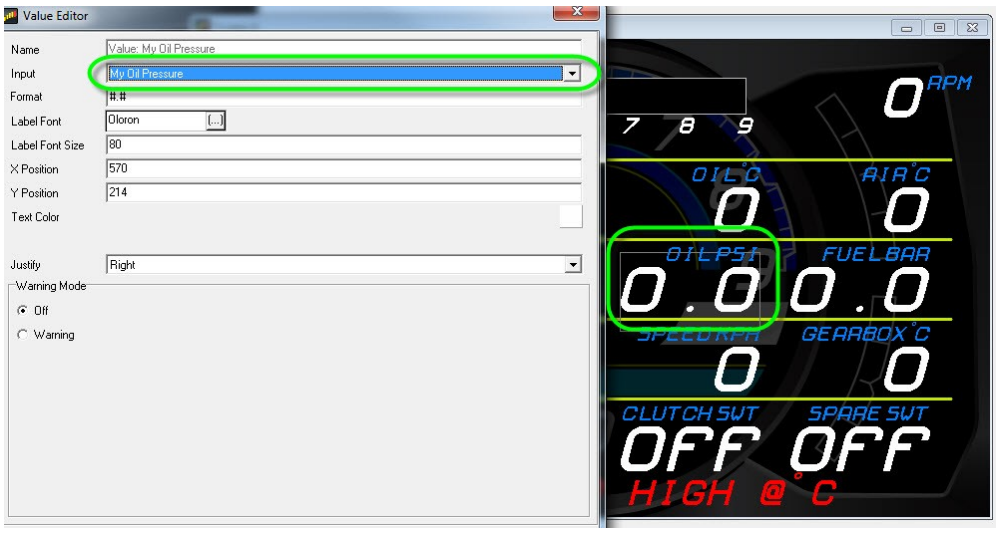
Create functions for sensors that are being used. The data can be obtained from manufacturers data sheet or from user testing. The function name and data (for example..."My Oil Pressure" or "My Fuel level") will need to be entered manually.



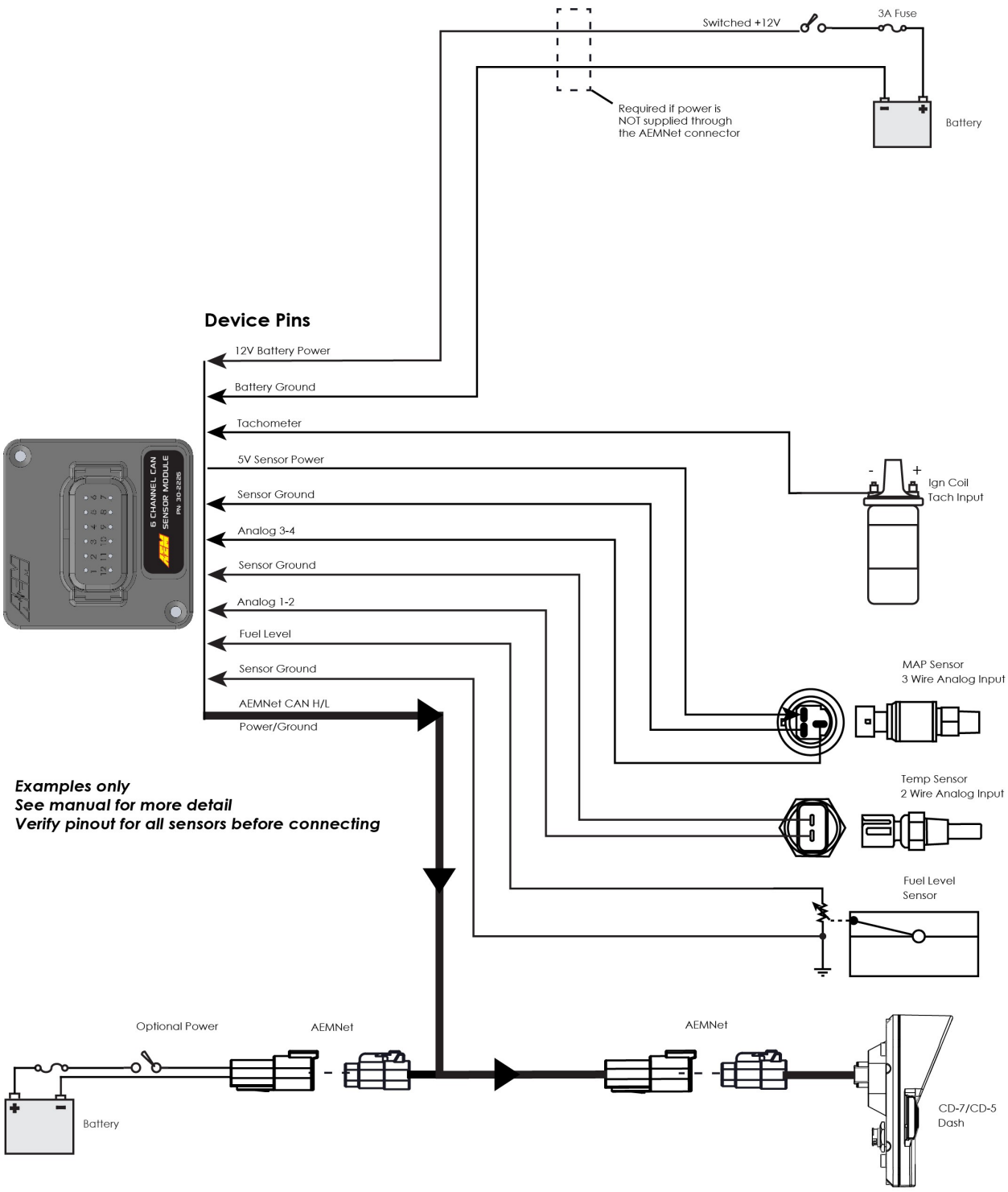
Create a new output/channel using the new function



Assign the new output to an item on the display

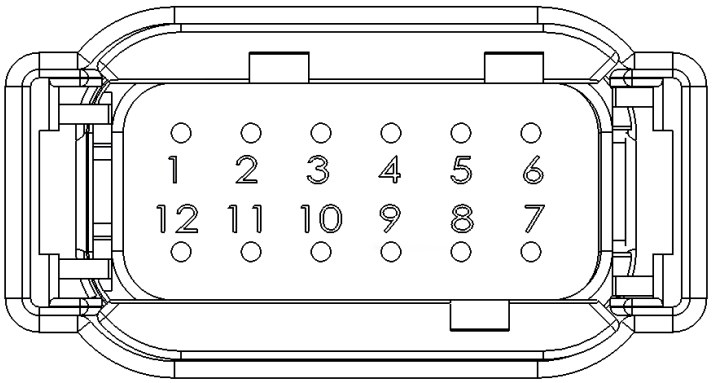


System Schematic



PERFORMANCE ELECTRONICS	Drawing: SYSTEM SCHEMATIC			
	30-2226 PRODUCT: 6 CH CAN Sensor Module	Date: 6/29/2018	Rev:	Engineer:

Device Pinout



Pin	Name	Function
1	12V Battery Power (+)	Primary ignition/battery power input
2	Battery Ground (-)	Primary ignition/battery ground input
3	AEMnet+ / CANH	AEMnet / CAN bus output
4	AEMnet- / CANL	AEMnet / CAN bus Output
5	Analog 1	Temperature / thermistor input, 2200 Ohm 5V pull-up
6	Analog 2	Temperature / thermistor input, 2200 Ohm 5V pull-up
7	Analog 3	0-5V Analog input, 100k Ohm 5V pull-up
8	Analog 4	0-5V Analog input, 100k Ohm 5V pull-up
9	Tachometer	Engine speed input (negative coil terminal) 12V pull-up
10	Fuel Level	0 - 250 Ohm fuel level sensor input
11	Sensor Ground	Dedicated sensor ground
12	5V Sensor Power	5V sensor reference power output

Analog Inputs 1 - 2

These inputs have a 2200 Ohm 5V pull-up resistor and are suitable for two-wire thermistor temperature sensors. It is not recommended to connect these inputs to pre-existing/OEM sensors that are already connected to a factory ECU or logging device. Please refer to the table below for connection examples.

New / Added Sensors	5V Sensor Power	Sensor Signal	Sensor Ground	Examples
Two wire temperature	✘	✓	✓	Intake, coolant/oil temperature, etc

✓ = Connect ✘=Don't connect ! = Read Notes

CAN Output

The measured resistance will be output via CAN and will have to be scaled to temperature in the receiving device. A thermistor's resistance varies non-linearly with temperature and thus the receiving device will likely require a look-up table to properly log or display temperature. The AEM CD series of dashes have this capability; please refer to the appropriate documentation.

Analog Inputs 3 - 4

These inputs have a 100kOhm 5V pull-up resistor and are suitable to measure voltage signals from 0-5V sensors or devices; either sensors that are being added to a vehicle or pre-existing (or OEM) sensors. Pre-existing/OEM sensors are presumed to be already connected to a factory ECU or logging device which will require different wiring considerations. Please refer to the table below for connection examples.

New / Added Sensors	5V Sensor Power	Sensor Signal	Sensor Ground	Examples
Three wire pressure	✓	✓	✓	Manifold pressure, oil/water pressure, etc
Three wire position	✓	✓	✓	Throttle/pedal position, linear potentiometer, etc
Three wire flow	!	✓	✓	Check with manufacturer, some MAFs require 12V power yet output a 0-5V signal
Device	✘	✓	✓	AEM 30-4110 UEGO Gauge with 0-5V Output
Existing / OEM Sensors				
Three wire pressure	✘	✓	✓	Manifold pressure, oil/water pressure, etc
Three wire position	✘	✓	✓	Throttle/pedal position, linear potentiometer, etc
Two wire temperature	✘	✓	✓	Intake, coolant/oil temperature, etc
Three wire flow	✘	✓	✓	0-5V voltage-style MAF sensor
Device	✘	✓	✓	AEM 30-4110 UEGO Gauge with 0-5V Output

✓=Connect ✘=Don't connect

CAN Output

The measured voltage will be output via CAN and will have to be scaled to the desired units (e.g. temperature, pressure, percentage, etc) in the receiving device. A thermistor's voltage/resistance varies non-linearly with temperature and thus the receiving device will likely require a look-up table to properly log or display temperature. Most non-temperature sensors require a simpler linear scaling. The AEM CD series of dashes have both of these capabilities; please refer to the appropriate documentation.

Tachometer Input

This input is suitable for measuring engine speed from a variety of sources such as an ignition coil's negative (-) terminal or an ignition box/driver's 'tachometer' output. If your vehicle is equipped with an aftermarket high-output or multi-strike ignition system, do ***not*** connect this input to the ignition coil. Instead, use the dedicated tachometer output wire from your ignition system. "Flying Magnet" or VR style sensors should *not* be connected to the tachometer input.

CAN Output

The measured frequency will be output in Hertz via CAN and will have to be scaled to engine speed (RPM) in the receiving device. The AEM CD series of dashes have this capability; please refer to the appropriate documentation.

Fuel Level Sensor Input

This input is suitable for connection to a resistive fuel level sensor. The output of these sensors typically varies from slightly above 0 Ohms to a maximum of 250 Ohms. It is important that the AEM CAN Sensor Module is the only device connected to the fuel level sensor. Tapping on to a sensor that is already connected to an OEM ECU (or similar) will result in inaccurate readings.

CAN Output

The measured resistance will be output via CAN and will have to be scaled (typically linear) to fuel level (or percentage) in the receiving device. The AEM CD series of dashes have this capability; please refer to the appropriate documentation.

Note: The CAN output value, in Ohms, may appear to be slow to respond to input sensor signal changes. This is as-intended since this input is heavily filtered to account for fuel level slosh.

Connector and Accessory Part Numbers

The following is a list of compatible AEMnet accessories as well as part numbers for the main Module connector and terminals.

AEM PN	Description
35-2633	CONNECTOR KIT, 12-WY, DTM PLUG

AEM PN	Description
35-2624	DTM-Style 4-Way Plug Connector Kit. Includes Plug, Wedge Lock & 5 Female Pins
35-2625	DTM-Style 4-Way Receptacle Connector Kit. Includes Receptacle, Wedge Lock & 5 Male Pins
35-2626	DTM-Style 4-Way Connector Kit. Includes Plug, Receptable, 2 Wedge Locks, 5 Female Pins & 5 Male Pins
30-3606	AEMnet CAN bus Extension Cable, 2 ft
30-3607	AEMnet CAN bus Extension Cable, 5 ft
30-3608	AEMnet CAN bus Extension Cable, 10 ft
35-3440-F	AEMnet Female Termination Plug
35-3440-M	AEMnet Male Termination Plug

Compatible AEM Sensors

The following is a list of compatible AEM sensors as well as the type of input class and pull-up value it should be connected to.

AEM PN	Description	Input Type	Pull-Up Value (Ohms)
30-2010	Air Temp Sensor Kit. 3/8"NPT	Analog	2200
30-2011	Water Temp Sensor Kit. 3/8"NPT	Analog	2200
30-2012	Water Temp Sensor Kit. 1/8"NPT	Analog	2200
30-2013	Fluid Temperature Sensor DTM-Style Kit	Analog	2200
30-2014	Air Temp Sensor DTM-Style Kit	Analog	2200
30-2064	Exhaust Back Pressure Sensor Install Kit	Analog	100,000
30-2130-7	100 PSIa or 7 Bar Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-15	15 PSIa or 1 Bar Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-30	30 PSIa or 2 Bar Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-50	50 PSIa or 3.5 Bar Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-75	75 PSIa or 5 Bar Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-100	100 PSIg Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-150	150 PSIg Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-500	500 PSIg Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-1000	1000 PSIg Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2130-2000	2000 PSIg Stainless Sensor Kit. Stainless Steel Sensor Body	Analog	100,000
30-2131-15G	15 PSIg Brass Sensor Kit. Brass Sensor Body	Analog	100,000
30-2131-30	30 PSIa or 2 Bar Brass Sensor Kit. Brass Sensor Body	Analog	100,000
30-2131-50	50 PSIa or 3.5 Bar Brass Sensor Kit. Brass Sensor Body	Analog	100,000
30-2131-75	75 PSIa or 5 Bar Brass Sensor Kit. Brass Sensor Body	Analog	100,000
30-2131-100	100 PSIg Brass Sensor Kit. Brass Sensor Body	Analog	100,000
30-2131-150	150 PSIg Brass Sensor Kit. Brass Sensor Body	Analog	100,000

Specifications

Dimensions	width	2.1 / 55	in / mm
	length	2.1 / 55	in / mm
	height	1.3 / 34	in / mm
	mass	1.2 / 32	oz / g
Supply Voltage	min	7	VDC
	max	18	VDC
Supply Current (13.8V)	nominal	165	mA
Operating Temperature	min	-4 / -20	degF / degC
	max (16V Supply)	185 / 85	degF / degC
5V Sensor Supply	Current	250	mA
Analog Inputs 1 - 2	Range	0 - 65535	Ohm
	Resolution	1 (12-bit)	Ohm
	Pull-up (5V)	2,200	Ohm
	CAN Transmit Rate	100	Hz
Analog Inputs 3 - 4	Range	0 - 5	VDC
	Resolution	0.001 (12-bit)	VDC
	Pull-up (5V)	100,000	Ohm
	CAN Transmit Rate	100	Hz
Fuel Level Input	Range	0 - 250	Ohm
	Resolution	1 (12-bit)	Ohm
	Pull-up	5	VDC
	CAN Transmit Rate	50	Hz
Tachometer Input	Range	0 - 1500	Hz
	Resolution	1	Hz
	Pull-up	12	VDC
	Minimum Trigger Voltage	3	VDC
	Maximum Voltage (Sustained)	18	VDC
	CAN Transmit Rate	50	Hz

FAQ / Troubleshooting

My CAN Sensor Module doesn't seem to be outputting anything.

Confirm that your CAN bus is properly terminated and that all nodes are configured for the right bus speed. In addition, any receiving devices/nodes must be specifically configured to receive as the Module is configured to transmit; specifically, the CAN ID, bus speed, and number of ID bits.

Can I use the CAN Sensor Module with my AEM AQ-1, AEM CAN Gauge, or AEM ECU?

No, the CAN Sensor Module is only compatible with the CD-series dash displays and other third-party devices at this time.

Where can I find AEM .dbc files?

AEM dbc files are available via the AEM Forum and within the AEM CD-series dash display software installer. Please visit www.aemelectronics.com for more information and downloads.

Can I connect more than one 6 Channel CAN Sensor Module on one CAN bus?

No, this is not possible. Please use the AEM 22 Channel CAN Sensor Module if you need more inputs.

For support, contact AEM Technical Support at 1-800-423-0046 or gentech@aemelectronics.com.

AEMnet (CAN Bus) Output

WHITE WIRE = AEMnet+ / CANH
GREEN WIRE = AEMnet- / CANL

Bus Termination

All AEMnet/CAN networks must be terminated to have an equivalent of approximately 60 Ohms of resistance. Generally, this means a 120 Ohm resistor connected in parallel to AEMnet+/AEMnet- (or CANH/CANL) at both physical ends of the bus run.

CAN DBC definition files are available at www.aemelectronics.com

bit rate	500	kb/sec
format	29	bit ID
terminating resistor	None	
endianness	big / Motorola	
DLC	8	

0x0000B600 at 100Hz

Byte	Label	Data Type	Scaling	Offset	Range
0	Analog1	16 bit unsigned	1 Ohm/bit	0	0 to 65535 Ohm
1					
2	Analog2	16 bit unsigned	1 Ohm/bit	0	0 to 65535 Ohm
3					
4	Analog3	16 bit unsigned	0.001 V/bit	0	0 to 65.535 V
5					
6	Analog4	16 bit unsigned	0.001 V/bit	0	0 to 65.535 V
7					

0x0000B601 at 50Hz

Byte	Label	Data Type	Scaling	Offset	Range
0	Tacho	16 bit unsigned	0.1 Hz/bit	0	0 to 6553.5 Hz
1					
2	n/a	n/a	n/a	n/a	n/a
3					
4	n/a	n/a	n/a	n/a	n/a
5					
6	FuelLevel	8 bit unsigned	1 Ohm/bit	0	0 to 255 Ohm
7	Battery Voltage	8 bit unsigned	0.1 V/bit	0	0 to 25.5 V

12 Month Limited Warranty

AEM Performance Electronics warrants to the consumer that all AEM ELECTRONICS products will be free from defects in material and workmanship for a period of twelve months from date of the original purchase. Products that fail within this 12-month warranty period will be repaired or replaced when determined by AEM that the product failed due to defects in material or workmanship. This warranty is limited to the repair or replacement, at AEM's discretion, of the AEM Electronics part. In no event shall this warranty exceed the original purchase price of the AEM ELECTRONICS part nor shall AEM ELECTRONICS be responsible for special, incidental or consequential damages or cost incurred due to the failure of this product.

Warranty claims to AEM ELECTRONICS must be transportation prepaid and accompanied by dated proof of purchase. This warranty applies only to the original purchaser of product and is non-transferable. All implied warranties shall be limited in duration to the said 12-month warranty period. Improper use or installation, accident, abuse, unauthorized repairs or alterations voids this warranty.

AEM ELECTRONICS disclaims any liability for consequential damages due to breach of any written or implied warranty on all products manufactured by AEM ELECTRONICS.

Warranty returns will only be accepted by AEM ELECTRONICS when accompanied by a valid Return Merchandise Authorization (RMA) number. Product must be received by AEM ELECTRONICS within 30 days of the date the RMA is issued.

Please note that before AEM ELECTRONICS can issue an RMA for any electronic product, it is first necessary for the installer or end user to contact the tech line at 1-800-423-0046 to discuss the problem. Most issues can be resolved over the phone. Under no circumstances should a system be returned, or an RMA requested before the above process transpires. AEM ELECTRONICS will not be responsible for products that are installed incorrectly, installed in a non-approved application, misused, or tampered with.

Fuel Pumps installed with incorrect polarity (+&- wires crossed) will not be warranted. Proper fuel filtration before and after the fuel pump are essential to fuel pump life. Any pump returned with contamination will not be warranted.

Any AEM ELECTRONICS product, excluding discontinued products, can be returned for repair if it is out of the warranty period. There is a minimum charge for inspection and diagnosis of AEM ELECTRONICS parts which are out of warranty. Parts used in the repair of AEM ELECTRONICS electronic components will be extra. AEM ELECTRONICS will provide an estimate of repairs and must receive written or electronic authorization before repairs are made to the product.

Need additional help? Contact the AEM Performance Electronics tech department at 1-800-423-0046 or email us at tech@aemelectronics.com.