



Part Number 30-2320
AEM X-WIFI UEGO/EGT Module

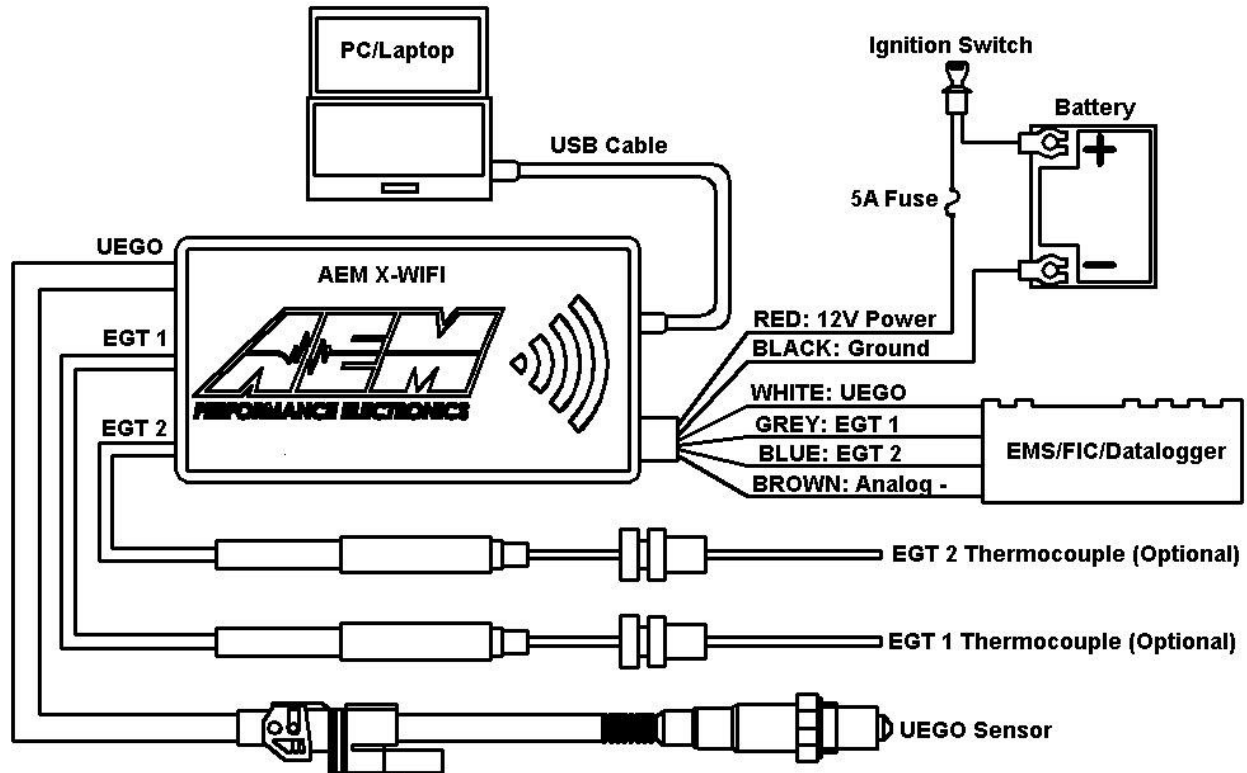


Figure 1. Wiring Schematic

AEM X-WIFI Parts

- 1 x 30-2320 X-WIFI Module
- 1 x 30-2001 UEGO Sensor
- 1 x 35-8535 Install Kit (UEGO Bung and 6 Butt Connectors)
- 1 x 10-2320 Installation Instructions
- 1 x 35-3416 8-Pin Power Harness
- 1 x 35-3400 6-Pin UEGO Sensor Harness
- 1 x 35-3009 USB Cable
- 4 x Zip Tie

INSTALLATION

1. Disconnect the negative battery cable.
2. Find a suitable, in cab, mounting location and secure the X-WIFI module using the supplied zip ties. Note: The X-WIFI is not weatherproof and should not be mounted in the engine bay or exposed to outside elements
3. Plug the 8-pin power harness into the mating connector on the right side of the X-WIFI and connect the wires as shown in Figure 1.
4. Mount the UEGO sensor as shown in figure 3.
5. Connect the sensor to the X-WIFI using the 6-wire sensor cable. The connector with the grey latch connects to the sensor. The single-row connector connects to the left side of the X-WIFI.
6. Mount the optional EGT sensor(s) as shown in Figure 6.
7. Slide the heat shrink tube over the sensor cable and connect the EGT to the cable as shown below in Figure 7.
8. Connect the 3-pin EGT sensors cable(s) to the X-WIFI.

RED - Connect to a switched, fused (5A) 12 volt power source.

BLACK – Connect to a clean power ground.

*BLUE - Connect to available 5 volt analog channel for EGT input.

*GREY - Connect to available 5 volt analog channel for EGT input.

*WHITE - Connect to Lambda + Input.

*BROWN - Connect to sensor ground. (Must be connected if the White, Grey, or blue wire is used)

**optional – only needed if using the available differential analog output*

Wiring notes:

GREY – The GREY wire should be connected to an available analog channel on the EMS or similar device.

BLUE – The BLUE wire should be connected to an available analog channel on the EMS or similar device.

WHITE – The WHITE wire should be connected to the Lambda + input on the EMS or the analog + input on a similar device.

BROWN – The BROWN wire should be connected to the Lambda – input or the analog – input. If the EMS or similar device does not have a – input, the BROWN wire should be connected to a sensor ground. If no sensor ground is available, the BROWN wire should be connected to a power ground. **Note: The BROWN wire must be connected in order to get correct readings from the analog outputs.**

Displaying Data with WIFI Enabled Electronic Devices

Real time AFR and EGT data from the X-WIFI can be viewed on WIFI enabled electronic devices using a standard web browser. Locate the network "AEM X-WIFI" and connect. Type the address 192.168.3.88 in the address bar of the browser and open the web page. A screen showing the AFR and EGT values will appear as shown below in Figure 2. If a UEGO sensor error is detected, the AFR value will display "Err" followed by a number. The number corresponds to the number of flashes on the error status light as described in the Status Lights section below. Visit the video gallery at www.aemelectronics.com for information on configuring specific WIFI enabled mobile electronic devices.

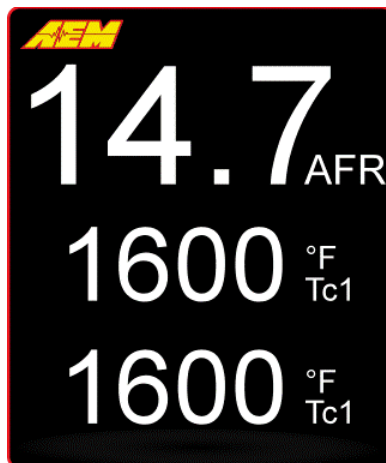


FIGURE 2. Web Page Data

UEGO Sensor Mounting

A weld-in M18 X 1.5 UEGO bung is supplied for sensor installation. Mount the UEGO sensor in the exhaust system at least 18 inches downstream from the exhaust port. If you anticipate high EGT's (over 800C), run a turbocharger, run at high RPM for extended periods of time or plan on running leaded race fuel then you must mount the sensor at least 36 inches or more downstream of the exhaust port as all of these can cause the sensor to overheat. **On turbocharged engines the UEGO sensor must be installed after the turbo charger, if not, the pressure differential will greatly affect the accuracy of the unit.** For accurate readings, the sensor must be mounted before catalytic converters and/or auxiliary air pumps. To prevent collection of liquids between the sensor housing and sensor element during the cold start phase, the installation angle should be inclined at least 10° from horizontal with the electrical connection upwards, see Figure 3.

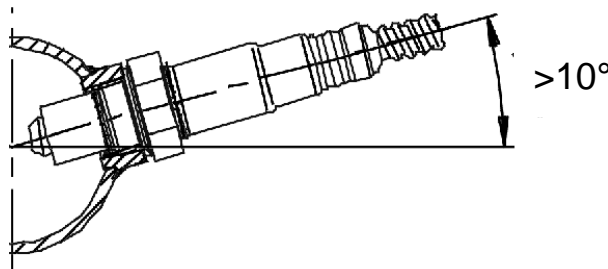


Figure 3. Minimum mounting angle for the UEGO Sensor

Status Lights

The AEM X-WIFI has two status lights, see Figure 4. The warm up status light on the left flashes during sensor warm up. Once the sensor reaches operating temperature, usually within 30 seconds, the light will remain on. During sensor warm up, AFR readings may not be accurate. The UEGO error status light on the right will flash if a sensor error is detected. The status light will flash on and off a number of times, followed by a short pause. The error codes are listed below in Table 1.



Figure 4. UEGO Status Lights

# of Flashes	Fault	Corrective Action
1-6	Sensor Wiring and/or sensor	Check sensor cable for broken wires/shorts
7	System voltage below 10 volts dc	Check electrical system for good connections and proper function

Table 1. Error Codes

UEGO Analog Output

The UEGO analog output from the AEM X-WIFI is a linear dc voltage signal that varies from **0.5 Vdc at 8.5:1 AFR Gasoline to 4.5Vdc at 18.0:1 AFR Gasoline** over the operating range of the X-WIFI. The signal is used for sending information to a data logger or an engine management system like the AEM EMS or F/IC. The transfer function for the output is listed below.

$$\text{AFR} = 2.375(\text{V}) + 7.3125$$

For example, if the output is 2.0 Vdc, the AFR is 12.06:1
 $2.375 * 2.0 + 7.3125 = 12.06$

A table showing the analog output voltage and corresponding Air/Fuel ratios for some of the common fuels is shown below in Table 2.

VOLTS	LAMBDA	AFR GAS	AFR METHANOL	AFR E85	AFR ETHANOL
0.50	0.58	8.5	3.7	5.6	5.2
0.71	0.61	9.0	3.9	5.9	5.5
0.92	0.65	9.5	4.1	6.3	5.8
1.13	0.68	10.0	4.4	6.6	6.1
1.34	0.71	10.5	4.6	6.9	6.4
1.55	0.75	11.0	4.8	7.3	6.7
1.76	0.78	11.5	5.0	7.6	7.0
1.97	0.82	12.0	5.2	7.9	7.3
2.18	0.85	12.5	5.4	8.2	7.7
2.39	0.88	13.0	5.7	8.6	8.0
2.61	0.92	13.5	5.9	8.9	8.3
2.82	0.95	14.0	6.1	9.2	8.6
3.03	0.99	14.5	6.3	9.6	8.9
3.11	1.00	14.7	6.4	9.7	9.0
3.24	1.02	15.0	6.5	9.9	9.2
3.45	1.05	15.5	6.7	10.2	9.5
3.66	1.09	16.0	7.0	10.6	9.8
3.87	1.12	16.5	7.2	10.9	10.1
4.08	1.16	17.0	7.4	11.2	10.4
4.29	1.19	17.5	7.6	11.5	10.7
4.50	1.22	18.0	7.8	11.9	11.0

Table 2. AFR Values

Configuring the AEM EMS

With an EMS calibration open, go to Setup>Sensors>Oxygen Sensor #1(2)>O2 Sensor #1(2) Cal Table>Table, and enter the values below into the O2 Sensor #1(2) Cal Table.

Voltage	AFR	Voltage	AFR	Voltage	AFR	Voltage	AFR
0.00	8.43	1.40	10.64	2.81	13.99	4.21	17.31
0.16	8.43	1.56	11.02	2.96	14.34	4.37	17.69
0.31	8.43	1.72	11.40	3.12	14.72	4.52	18.05
0.47	8.43	1.87	11.75	3.28	15.10	4.68	18.05
0.62	8.79	2.03	12.13	3.43	15.46	4.84	18.05
0.78	9.17	2.18	12.49	3.59	15.84	4.99	18.05
0.94	9.55	2.34	12.87	3.74	16.20	NA	NA
1.09	9.90	2.50	13.25	3.90	16.58	NA	NA
1.25	10.28	2.65	13.61	4.06	16.96	NA	NA

Table 2. EMS Software Values

Connect the WHITE Analog Output + wire to the EMS Lambda input and the BROWN Analog Output – wire to the EMS sensor ground. Table 3 below lists the Lambda and Sensor ground pin locations for the different EMS part numbers.

AEM EMS P/N	Lambda #1 Pin	Lambda #2 Pin	Sensor GND Pin
30-1000/1001/1002/1040/1042	D14	D16	D21
30-1010/1012/1050/1052	C16	A23	C18
30-1020/1060	D7	D14	D12
30-1030/1031/1070	C13	C14	A16
30-1080	C16	C8	C14
30-1081	C16	B11	C14
30-1100/1101	B47	B48	B65
30-1110	1C	9C	13C
30-1120/1121/1130	B6	B14	B9
30-1220	30	31	60
30-1300	4	66	17
30-1310/1311/1312/1313	76	75	92
30-1320	71	73	34
30-1400	29	43	46
30-1401	44	43	46
30-1510	C2-31	C2-33	C2-32
30-1600/1601/1602/1603	19	NA	21
30-1610/1611/1612	46	52	50
30-1620/1621/1622/1623	29	55	30
30-1710	2N	4J	2C
30-1720	C3	D3	O3
30-1800	C3	A2	D4
30-1810	D19	B17	B19
30-1820/1821	A26	D25	C35
30-6100/30-6101	B47	B48	B65
30-6010/6012/6050/6052	C16	A23	C18
30-6000/6001/6002/6040/6042	D14	D16	D21
30-6060	D7	D14	D12
30-6310/30-6311/30-6313	76	75	92
30-6320	71	73	34

Table 3. EMS Pin Locations

Configuring the AEM F/IC

With an FIC calibration open, go to Setup>Aux Gauge, and complete the Aux gauge setup window as shown below in Figure 5.

Volts In	Meter Value
0.5	8.5
0.94	9.56
1.39	10.61
1.83	11.67
2.28	12.72
2.72	13.78
3.17	14.83
3.61	15.89
4.06	16.94
4.5	18

Figure 5. F/IC Aux Gauge Setup

Connect the WHITE Analog Output + wire to the Aux Gauge input and the BROWN Analog Output – wire to the sensor ground. Table 4 below lists the Lambda and Sensor ground pin locations for the different FIC part numbers.

AEM F/IC P/N	Lambda Pin	Sensor GND Pin
30-1910(X)	Pin 18 of 22-pin connector	Pin 5 of 22-pin connector
30-1930(X)	Pin 18 of 22-pin connector Pin 20 of 20-pin connector	Pin 5 of 22-pin connector

Table 4. F/IC Pin Locations

Thermocouple Mounting

The optional thermocouple comes with a stainless steel compression style mounting adapter. The mounting adapter consists of three pieces: compression nut, ferrule sleeve, threaded body. The threaded body has 1/8" NPT male threads. To install the sensor, the threaded body can either be threaded into a hole with mating 1/8" NPT threads, or welded to the pipe/manifold. Remove the compression nut, ferrule sleeve, and thermocouple from the threaded body. For a welded installation, drill a 13/32" hole and weld the threaded body, being careful not to cause any distortion. . For a threaded installation, either thread the body into an existing hole with 1/8" NPT threads or drill a hole using an "R" size drill bit and cut the threads using a 1/8" NPT tap. With the compression nut and ferrule sleeve on the thermocouple, insert the thermocouple into the threaded body so the tip of the thermocouple is near the center of the pipe/manifold and tighten the compression nut to the threaded body. See Figure 6. Table 5 below lists some of the common EGT measurements and corresponding thermocouple mounting locations.

EGT Measurement	Mounting Location
Individual Cylinder EGT	1-2 inches from exhaust port
Turbine Inlet Temperature	2-3 inches from turbine inlet
Cylinder Bank EGT	Header collector

Table 5. Common Thermocouple Mounting Locations

When using both thermocouples for comparison (bank 1 EGT and bank 2 EGT for example), make sure to mount both thermocouples in a similar fashion (distance from port, tip depth, tube diameter, etc) so the readings are not influenced by installation differences.

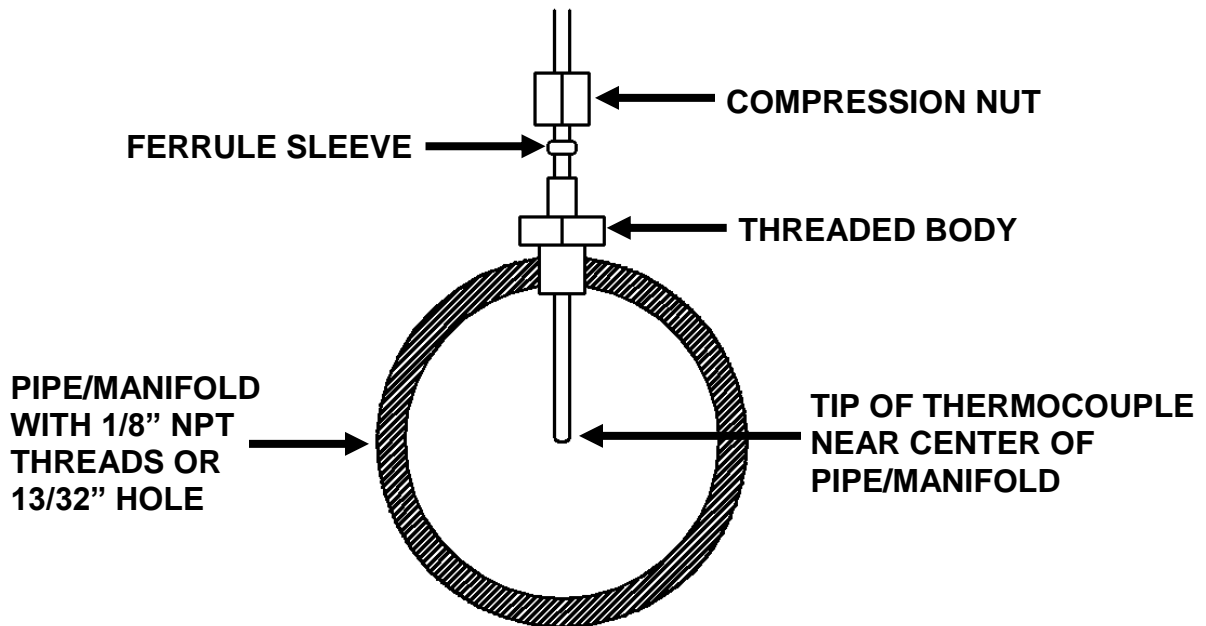


Figure 6. Thermocouple Mounting

Connecting the Thermocouple

Slide the supplied heat shrink onto the sensor cable. Connect the RED wire from the thermocouple to the RED wire on the harness and the YELLOW wire from the thermocouple to the YELLOW wire on the harness using the supplied 4-40 screws and hex nuts. Make sure the connections are not touching. Center the heat shrink over the connections and apply mild heat to the heat shrink until it shrinks over the connections. See Figure 7.

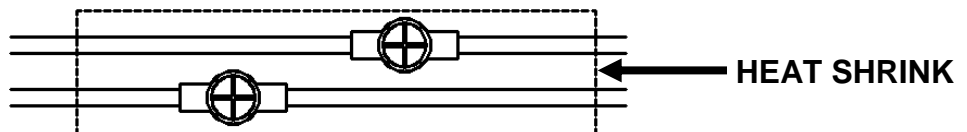


Figure 7. Thermocouple to Cable Connection

EGT Analog Outputs

The analog EGT outputs from the AEM X-WIFI are linear dc voltage signals that vary from **0.5 Vdc at 0 Degrees Fahrenheit (-18 Degrees Celsius) to 4.5Vdc at 1800 Degrees Fahrenheit (982 Degrees Celsius)** over the operating range of the X-WIFI. The signals are used for sending information to a data logger or an engine management system like the AEM EMS or F/IC. The transfer functions for the analog outputs are listed below in Degrees Fahrenheit and Degrees Celsius.

$$\text{Temperature (Degrees Fahrenheit)} = 450 * \text{Voltage} - 225$$

For example, if the output is 2.5 Vdc, the temperature is 900 Degrees Fahrenheit.

$$450 * 2.5 - 225 = 900 \text{ Degrees Fahrenheit}$$

$$\text{Temperature (Degrees Celsius)} = 250 * \text{Voltage} - 143$$

For example, if the output is 2.5 Vdc, the temperature is 482 Degrees Celsius.

$$250 * 2.5 - 143 = 482 \text{ Degrees Celsius}$$

A list of output voltages and corresponding temperatures is shown below in Table 6.

VOLTAGE	°F	°C
0.50	0	-18
0.75	113	45
1.00	225	107
1.25	338	170
1.50	450	232
1.75	563	295
2.00	675	357
2.25	788	420
2.50	900	482
2.75	1013	545
3.00	1125	607
3.25	1238	670
3.50	1350	732
3.75	1463	795
4.00	1575	857
4.25	1688	920
4.50	1800	982

Table 6. Analog EGT Calibrations

Configuration

The AEM X-WIFI has two configuration buttons. Configuration button one is used for accessing the WIFI setup options. Configuration button two is used for future updates. See Figure 8.



Figure 8. Configuration Buttons

WIFI

AEM X-WIFI is preconfigured for adhoc communications with standard WIFI settings that are suitable for most applications. The IP address, subnet mask, and SSID are listed below:

IP address: 192.168.3.88
Subnet Mask: 255.255.0.0
SSID: AEM X-WIFI

The default X-WIFI settings are permanently stored in the module and can be restored by the following sequence. Plug the USB cable into the pc/laptop. Press and hold configuration button 1. With configuration button 1 depressed, plug the USB cable into the X-WIFI and continue to hold configuration button 1 for eight seconds then release.

The AEM X-WIFI is also capable of secure infrastructure WIFI communications. The communication settings are configurable in the advanced configuration window. The advanced configuration window can be viewed using a standard hyper terminal communication. The settings for the hyper terminal communication are shown below in Figure 9.

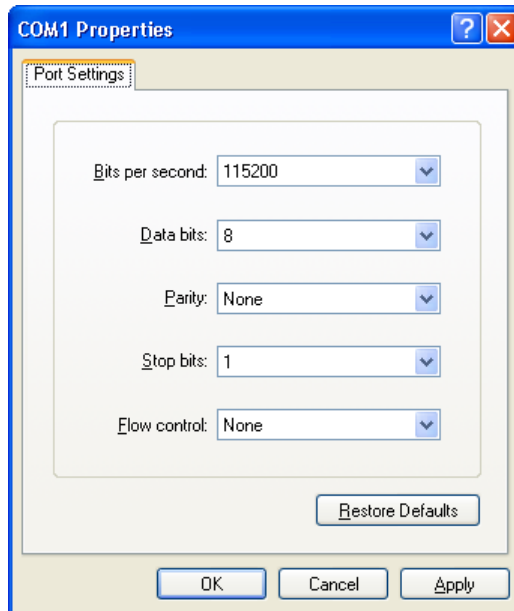


FIGURE 9. HYPER TERMINAL SETTINGS

To view the advanced configuration screen, open the hyper terminal communication, but do not connect. Plug the USB cable into the pc/laptop. Press and hold configuration button 1. With configuration button 1 depressed, plug the USB cable into the X-WIFI and continue to hold configuration button 1 for two seconds, then release. Click the connect button on the hyper terminal communication. The advanced configuration screen will appear as shown below in Figure 10.

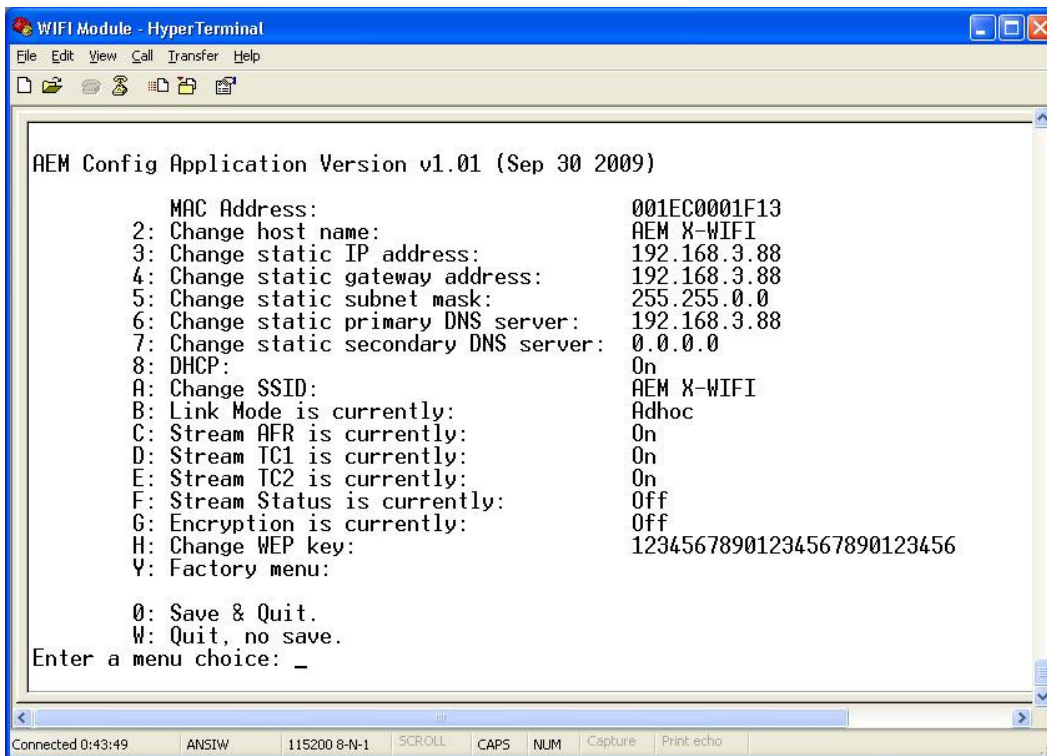
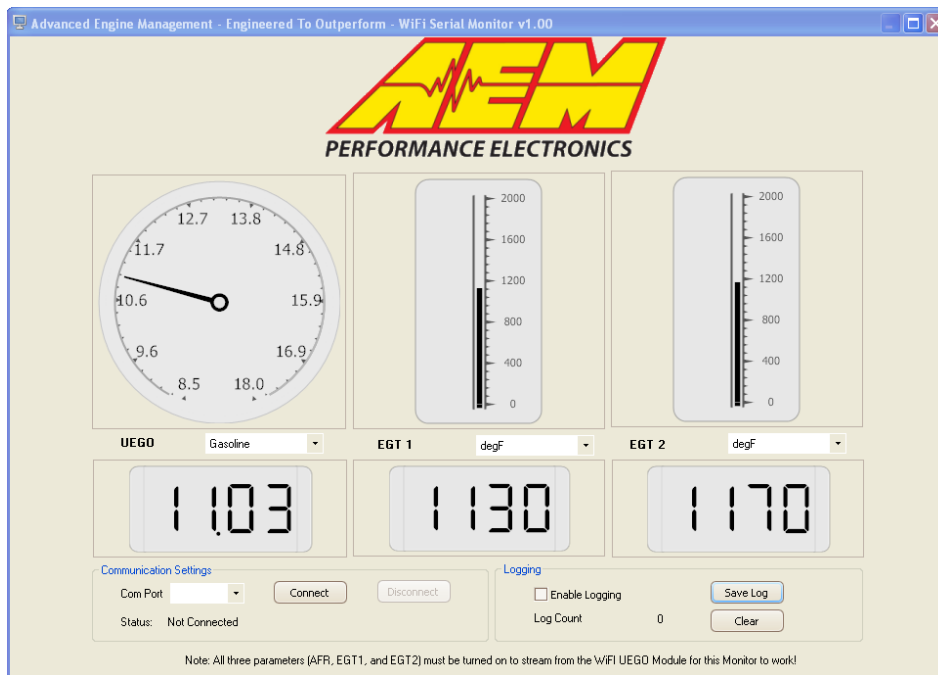


FIGURE 10. ADVANCED WIFI CONFIGURATION

Consult your router documentation for the necessary network settings.

Displaying Data with a PC/Laptop

Real time AFR and EGT data can also be viewed via a pc/laptop with USB connection. See figure 11. Download the data viewer program and instructions from the AEM Performance Electronics forum at www.aemelectronics.com.



Portable Power Connection Figure 11. PC Data Viewer

The AEM X-WIFI has an on-board barrel connector that can be used to power the module using a 5 amp 12Vdc power supply when a hard wired power connection is not desired. The power supply must have a 2.1MM ID X 5.5MM OD plug with the center pin positive. See Figure 12.



POWER CONNECTION

Figure 12. Barrel Style Power Connection

Connector Pinouts

The pinouts for the 6-pin sensor harness, 3-pin sensor harness, and 8-pin power harness are provided below in Figure 13.

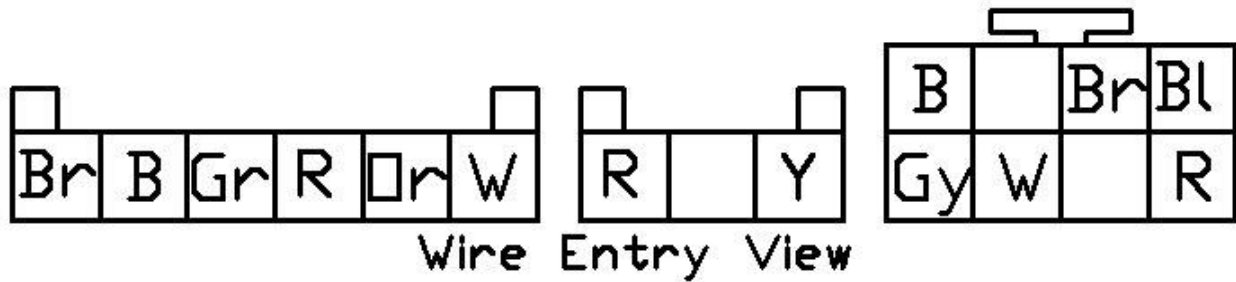


Figure 13. Harness Pinouts

Specifications

X-WIFI

Supply Current (nominal, peak)	1.5A, 3A peak
Differential Analog Outputs	3
Measuring Range: UEGO	8.5:1 to 18:1 AFR Gasoline, 0.58-1.22 Lambda
UEGO Sensor Accuracy	0.1 AFR
Measuring Range: EGT	0 – 1800 Degrees Fahrenheit, -18-982 Degrees Celsius
EGT Sensor Accuracy	0.75% FS
Operating Voltage (nominal)	8.5-15 volts dc
Harness & Connector Temp Limit:	105C
Web Browser Requirements	Javascript, Ajax, and Canvas for graphical web pages

Notes

If further tuning help is needed be sure to visit the video gallery or performance electronics forum at www.aemelectronics.com for comprehensive instructional videos and information.

The UEGO sensor contains a ceramic module and should not be subject to mechanical or thermal shock or it may be damaged. The sensor is not designed for operation on leaded fuels, doing so will dramatically shorten sensor life. Long term running in the rich region (Lambda < 0.95) will shorten sensor life. High exhaust temperatures (over 850C) will shorten sensor life. Engine oil consumption at a rate greater than 1 quart per 1,000 miles will shorten sensor life. With the UEGO Sensor installed, do not run the engine without power applied to the X-WIFI.

Replacement/Optional X-WIFI Components

30-2001	UEGO Sensor
35-4005	UEGO Sensor Bung
35-3416	8-Pin Power Harness
35-3400	6-Pin UEGO Sensor Harness
30-2065	K-Type Thermocouple with Bung (Optional)
35-2066	3-Pin Thermocouple Harness (Optional)

12 MONTH LIMITED WARRANTY

Advanced Engine Management Inc. warrants to the consumer that all AEM High Performance products will be free from defects in material and workmanship for a period of twelve (12) months from date of the original purchase. Products that fail within this 12-month warranty period will be repaired or replaced at AEM's option, when determined by AEM that the product failed due to defects in material or workmanship. This warranty is limited to the repair or replacement of the AEM part. In no event shall this warranty exceed the original purchase price of the AEM part nor shall AEM be responsible for special, incidental or consequential damages or cost incurred due to the failure of this product. The Bosch LSU 4.2 UEGO sensor has a limited life and is not warranted. Warranty claims to AEM must be transportation prepaid and accompanied with 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 disclaims any liability for consequential damages due to breach of any written or implied warranty on all products manufactured by AEM. Warranty returns will only be accepted by AEM when accompanied by a valid Return Goods Authorization (RGA) number. Product must be received by AEM within 30 days of the date the RGA is issued.

Please note that before AEM can issue an RGA for any product, it is first necessary for the installer or end user to contact the AEM Performance Electronics 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 a RGA requested before the above process transpires.

Need additional help? Contact the AEM Performance Electronics tech department at 1-800-423-0046 or tech@aempower.com, or visit the AEM Performance Electronics forum at <http://forum.aempower.com/forum/>