Installation Instructions for:
EMS P/N 30-1070 and 30-1070U
2001-2004
K20A2 / K20A3 / K24A1
D17A1 / D17A2

<table>
✋ !	**WARNING:** This installation is not for the tuning novice nor the PC illiterate! Use this system with <u>EXTREME</u> caution! The AEM EMS System allows for total flexibility in engine tuning. Misuse of this product can destroy your engine! If you are not well versed in engine dynamics and the tuning of management systems or are not PC literate, please do not attempt the installation. Refer the installation to a AEM trained tuning shop or call 800-423-0046 for technical assistance. You should also visit the AEM EMS Tech Forum at http://www.aempower.com NOTE: AEM holds no responsibility for any engine damage that results from the misuse of this product!
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This product is legal in California for racing vehicles only and should never be used on public highways.

The AEM Engine Management System (EMS) is the result of extensive development on a wide variety of vehicles. Each system is engineered for a particular application. The AEM EMS differs from all others in several ways. The EMS is a "stand-alone", which completely replaces the factory ECU and features unique plug and play technology. There is no need to modify the factory wiring harness and in most cases the vehicle may be returned to stock in a matter of minutes. The AEMPro software is configured to work with the factory sensors and equipment, so there is no need for expensive or hard to find sensors, making replacements and repairs as simple as with any stock vehicle. For stock and slightly modified vehicles, the AEMPro software can be programmed with base parameters, providing a solid starting point for beginner tuning. For more heavily modified cars, the EMS has many spare inputs and outputs allowing the elimination of add-on rev-limiters, boost controllers, nitrous controllers, fuel computers, etc. It also includes a configurable onboard data logger capable of recording 512kb of information. Every EMS comes with all functions installed and activated, and there are no expensive options or upgrades to be performed.

Please visit the AEM EMS Tech Forum at http://www.aempower.com and register. We always post the most current strategy release, PC Software and base calibrations online. On the forum, you will find many helpful hints/tips to make your EMS perform it's best.

While the base map may be a good starting point and will save considerable time and money, it will not replace the need to tune the specific application. AEM base maps are tuned conservatively and are not intended to be driven aggressively. Ignoring this can and will damage your engine.

If the UEGO EMS was purchased, the stock O2 #1 sensor should be removed and replaced with the AEM sensor supplied with the EMS. The UEGO EMS furnishes the user with real time, accurate and repeatable air/fuel ratio values. The system consists of an internal air fuel ratio (AFR) controller, wiring harness, and a wide band oxygen sensor with a weld-in sensor bung.

The heart of the AEM wideband controller is the Bosch LSU4.2 Universal Exhaust Gas Oxygen (UEGO) sensor. This type of sensor is commonly referred to as "laboratory grade" and works on a different principle than the normal oxygen sensor found in most vehicles. Its unique design makes precision AFR measurements possible over the entire operating range. UEGO type sensors use a "current pump" within the sensor itself to determine the actual oxygen concentration within the sensing element or, lacking any oxygen, it determines the amount of oxygen required to regain stoichiometric operation. The output is in the form of a very small current, which varies depending on the air-fuel ratio. This is completely different from normal oxygen sensors (1, 2, and 4 wire types), which directly output a voltage.

Each AEM UEGO sensor is individually calibrated using a laser trimmed resistor integral found on the connector body. This process replaces the traditional "free air" calibration procedure when changing sensors and implements a sensor specific calibration for unparalleled accuracy.

Read and understand these instructions BEFORE attempting to install this product.

1) **Removing the Stock Engine Control Unit**
   a) Access the stock Engine Control Unit (ECU). The location of the ECU is underneath the glove box.
   b) Carefully disconnect the wiring harness from the ECU. Avoid excessive stress or pulling on the wires, as this may damage the wiring harness. Some factory ECU's use a bolt to retain the factory connectors, and it must be removed before the harness can be disconnected. There may be more than one connector, and they must all be removed without damage to work properly with the AEM ECU. Do not cut any of the wires in the factory wiring harness to remove them.
   c) Remove the fasteners securing the ECU to the car body, and set it aside. Do not destroy or discard the factory ECU, as it can be reinstalled easily for street use and troubleshooting.

2) **Installing and Routing the UEGO Sensor (UEGO EMS Only)**
   a) Remove the forward most O2 sensor and replace it with the supplied UEGO sensor.
   b) Connect the sensor and route the wire through the firewall to the EMS being careful in staying away from heat and the suspension.

3) **Installing the AEM Engine Management System.**
   a) Plug the factory wiring harness into the AEM EMS and position it so the wires are not pulled tight or stressed in any manner. Secure the EMS with the provided Velcro fasteners.
   b) Plug the comms cable into the EMS and into the PC (not supplied).
   c) Install the supplied AEM CD and open the AEMPro software.
   d) Turn the ignition ON but do not attempt to start the engine.
   e) Go to: "*ECU | Send New Calibration*". Upload the base calibration file (.cal) that most closely matches the vehicle's configuration to be tuned. Full details of the test vehicle used to generate each map can be found in the *"Notes"* section in the *"Setup"* window of the AEMPro software. The base maps can be found in the Nissan folder located in: *"My Computer | Local Disk (C:) | Program Files | AEM | AEMPro | Startup Calibrations"*
   f) Set the throttle range: Select the "*Configure*" drop down menu, then "*ECU Setup | Set Throttle Range*" and then follow the instructions given on the screen.
   g) Verify the ignition timing: Select the "*Configure*" drop down menu, then "*ECU Setup | Set Ignition*". Use a timing light and compare the physical engine timing to the parameter "*Ignition Timing*" displayed. Use the "*Advance/Retard*" buttons to make the timing number match.
   h) Calibrate the lambda sensor channel (UEGO Only): With the ignition "on" and the sensor unplugged, change the *"O2 #1 Gain" (Setup | Sensors | Oxygen Sensor | Oxygen Sensor #1 | Options - O2 Sensor #1)* until the *"O2 #1 Volts"* parameter displays 3.94 Volts (+/- 0.02 Volts). This should yield an "*O2 #1 Gain*" near 1.28. If using the non-UEGO EMS, keep the "*O2 #1 Gain*" at 1.0.

4) **Ready to begin tuning the vehicle.**
   a) Note: This calibration needs to be properly tuned and is not recommended for street use. **NEVER TUNE THE VEHICLE WHILE DRIVING.**

Application Notes for EMS P/N 30-1070

WARNING: Improper use of the Variable Valve Control (VVC) in the AEMPro software will lead to engine failure. AEM Plug N' Play base maps that use VVC are tuned for stock camshafts. Any different camshaft used will require a rework of the calibration file. The K20A2, K20A3, and K24A1 engines use VVC with the addition of VTEC. It is important to note that even if stock camshafts are used with the base VVC mapping unchanged, engine damage can result if the VTEC is tuned improperly.

Make:	Acura/Honda	Spare Injector Drivers:	Inj #5, Pin B14/C2
Model:	---	Spare Injector Drivers:	Inj #6, Pin B16/C3
Years Covered:	2002-2004	Spare Injector Drivers:	* Inj #7, Pin B18/C4
Engine Displacement:	1.7-2.4L	Spare Injector Drivers:	Inj #9, Pin E21/C7
Engine Configuration:	Inline 4	Spare Coil Drivers:	---
Firing Order:	1-3-4-2	Boost Solenoid:	PW #2, Pin C12/E10
N/A, S/C or T/C:	N/A	EGT #1 Location:	Pin B10/C8
Load Sensor Type:	MAP	EGT #2 Location:	Pin B11/C9
Map Min:	0.32V @ -13.9 PSI	EGT #3 Location:	Pin B12/C10
Map Max:	4.84V @ 10.94 PSI	EGT #4 Location:	Pin B13/C11
# Coils:	4	Spare 0-5V Channels:	Spare Temp, Pin E29
Ignition driver type:	0-5V Logic	Spare 0-5V Channels:	Gear, Pin E14
How to hook up CDI:	---	Spare 0-5V Channels:	---
# Injectors:	4 (Inj 1-4)	Spare Low Side Driver:	Low Side #3, Pin B22
Factory Injectors:	215-330cc Saturated	Spare Low Side Driver:	Low Side #4, Pin B21
Factory Inj Resistors:	No	Spare Low Side Driver:	Low Side #9, Pin E20
Injection Mode:	Sequential	Spare Low Side Driver:	Idle #2, Pin A17
Knock Sensors used:	1	Spare Low Side Driver:	Idle #4, Pin B24
Lambda Sensors used:	2	Spare Low Side Driver:	Idle #6, Pin E19
Idle Motor Type:	PW	Spare Low Side Driver:	Idle #8, Pin A31
Main Relay Control:	Yes (hardware controlled)	Check Engine Light:	Low Side #10, Pin E31
Crank Pickup Type:	Hall Effect	Spare High Side Driver:	High Side #4, Pin E28
Crank Teeth/Cycle:	24 + 2	Spare Switch Input:	Switch #1, Pin C15/E11
Cam Pickup Type:	Hall Effect	Spare Switch Input:	Switch #2, Pin C16/E12
Cam Teeth/Cycle:	4 + 1	Spare Switch Input:	Switch #3, Pin C17/E13
Transmissions Offered:	M/T, A/T	Spare Switch Input:	Switch #4, Pin B9
Trans Supported:	M/T Only	Spare Switch Input:	Switch #5, Pin E16
Drive Options:	FWD	Spare Switch Input:	Switch #6, Pin E22
Supplied Connectors:	Plug C with Connectors	A/C Switch Input:	---

Notes:

- AEM base maps utilize Injector #7 to turn OFF the Alternator for added power. This is performed at VTEC engagement, which has shown up to 5 extra horsepower. However, if long term high revving, like road racing, is to be performed, it is recommended to turn this function OFF or change the conditions in a way where the battery can remain charged. To keep the alternator ON all the time, in the AEMPro software go to:

  Options | Configure Outputs | Output | Fuel7 | Uncheck Active

- Internal Logging: because these vehicles do not have a constant 12V wire in the factory ECU harness, a permanent 12V wire must be installed at Pin C1 for the Internal Log Memory. The pins and connector in this kit can be used. Note: External (PC) Logging works regardless of this 12V wire.

2001-up Honda (Multiplex) Vehicles:

The 30-1070 supports applications that use the following engines: K20A2, K20A3, K24A1, D17A1, D17A2. These motors originally came from the following chassis's: RSX Type-S, RSX Base/Civic Si, CR-V, Civic EX, Civic DX/LX, respectively. While the 30-1070 can drive these engines in the vehicles listed above, the EMS will not support the factory A/C Switch and Coolant Gauge that are driven by Honda's Multiplex System. Note: the 30-1030 EMS was designed specifically for these vehicles.

The coolant gauge will not work with the 30-1070, however, the AEM base map is set to trigger the Check Engine Light if the water temperature exceeds 230F (110C). This output serves as a programmable dash light for coolant temperature.

PnP			The Plug and Play system comes with this configured for proper operation of this device. Is still available for reassignment by the end user.
Available			The function is not currently allocated and is available for use
Dedicated			The location is fixed and can not be changed

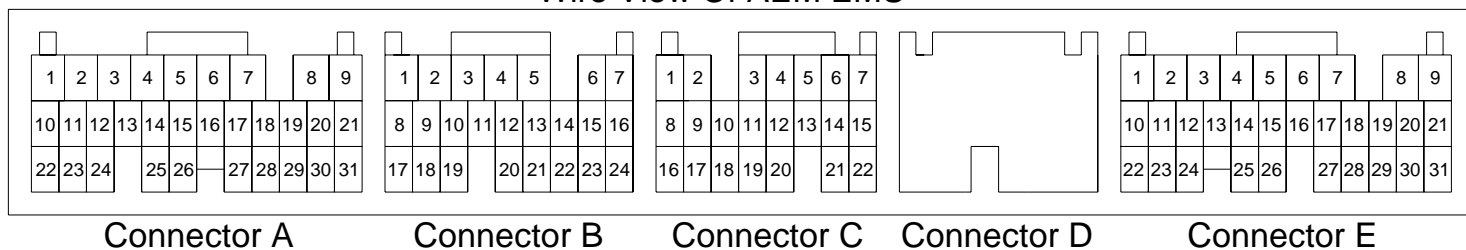| Pin	K20A2 / K20A3 / K24A1 / D17A1 / D17A2	30-1070 EMS	I/O	Availability
A1	Primary O2 Sensor Heater Control	Low Side Driver #1	Output	PnP for Primary O2 Heater
A2	Ignition Power 2	+12V Switched	Input	Dedicated
A3	Ignition Power 1	+12V Switched	Input	Dedicated
A4	Chassis Power Ground 2	Power Ground	Input	Dedicated
A5	Chassis Power Ground 1	Power Ground	Input	Dedicated
A6	Primary O2 Sensor	<Lambda #1>	<Input>	<O2 Input #1 | N/A for 30-1070U>
A7	Crank Position Sensor	Crank Sensor	Input	Dedicated
A8	Valve Position Sensor (K20A3/K24A1) / Knock Return (D17)	MAF	Input	Avail, 0-5 Volt Input
A9	Knock Sensor	Knock #1	Input	PnP for Knock Sensor
A10	Sensor Ground 2 (TPS, IAT, ECT)	Sensor Ground	Output	Dedicated
A11	Sensor Ground 1 (MAP)	Sensor Ground	Output	Dedicated
A12	Idle Air Control Valve	PW #1	Output	PnP for Idle Air Control
A13	EGR Valve Position Sensor (D17A2 Only)	Knock #2	Input	Avail, Knock Sensor
A14	Secondary O2 Heater Control (D17A1 Only)	Idle #1	Output	Avail, Switched Gnd, 1.5A Max
A15	Throttle Position Sensor	TPS	Input	Dedicated
A16	Primary O2 Sensor Ground (Except D17)	Sensor Ground	Output	Dedicated
A17	---	Idle #2	Output	Avail, Switched 12V, 1.5A Max
A18	Vehicle Speed Sensor	Spare Speed Sensor	Input	PnP for Vehicle Speed Sensor
A19	MAP Sensor	MAP	Input	Dedicated
A20	TPS Reference Voltage	+5V Sensor	Output	Dedicated
A21	MAP Sensor Reference Voltage	+5V Sensor	Output	Dedicated
A22	Primary O2 Sensor Heater Control (Except D17)	High Side Driver #2	Output	PnP for Primary O2 Heater
A23	Chassis Logic Ground 2	Power Ground	Input	Dedicated
A24	Chassis Logic Ground 1	Power Ground	Input	Dedicated
A25	Cam Position Sensor (iVTEC Motors) / Secondary O2 (D17A1)	Speed Sensor	Input	PnP for Variable Timing Control
A26	TDC Sensor	Cam Sensor	Input	Dedicated
A27	Ignition Coil No.4	Coil #5	Output	PnP for Coil 4
A28	Ignition Coil No.3	Coil #3	Output	PnP for Coil 3
A29	Ignition Coil No.2	Coil #2	Output	PnP for Coil 2
A30	Ignition Coil No.1	Coil #1	Output	PnP for Coil 1
A31	---	Idle #8	Output	Avail, Switched 12V, 1.5A Max
B1	VTC (+) Oil Solenoid Valve (Except D17)	High Side Driver #3	Output	PnP for Variable Timing Control
B2	Injector 4	Injector #4	Output	PnP for Injector 4
B3	Injector 3	Injector #3	Output	PnP for Injector 3
B4	Injector 2	Injector #2	Output	PnP for Injector 2
B5	Injector 1	Injector #1	Output	PnP for Injector 1
B6	Radiator Fan Control	Low Side Driver #8	Output	PnP for Radiator Fan
B7	Reverse Lock Solenoid Valve (K20A2 Only)	Injector #8	Output	Avail, Injector Gnd, 1.5A Max
B8	Engine Coolant Temperature Sensor	Coolant	Input	Dedicated
B9	VTEC Pressure Switch (Except D17A1)	Switch #4	Input	Avail, Switched Input
B10	Alternator L Signal	EGT #1	Input	Avail, RTD Temp
B11	---	EGT #2	Input	Avail, RTD Temp
B12	---	EGT #3	Input	Avail, RTD Temp
B13	Alternator FR Signal	EGT #4	Input	Avail, RTD Temp
B14	EGR (D17A2 Only)	Injector #5	Output	Avail, Injector Gnd, 1.5A Max

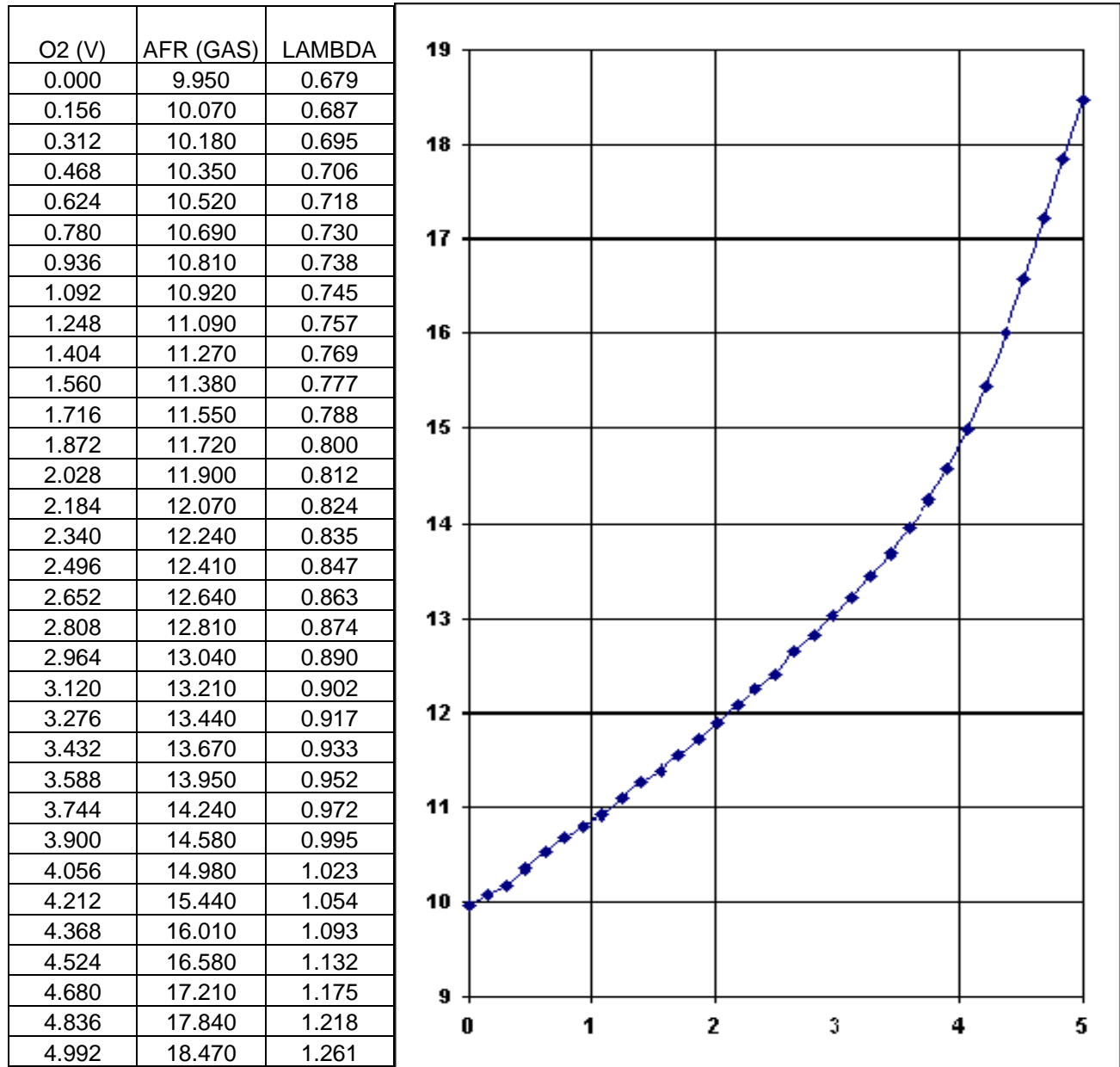|					
B15	VTEC Solenoid Valve (Except D17A1)	High Side Driver #1	Output	PnP for VTEC Solenoid
B16	---	Injector #6	Output	Avail, Injector Gnd, 1.5A Max
B17	Intake Air Temperature Sensor	AIT	Input	Dedicated
B18	Alternator Control (Except D17A1)	Injector #7	Output	Avail, Injector Gnd, 1.5A Max
B19	---	Idle #3	Output	Avail, Switched Gnd, 1.5A Max
B20	---	Low Side Driver #5	Output	Avail, Switched Gnd, 1.5A Max
B21	EVAP Purge Control Solenoid Valve	Low Side Driver #4	Output	Avail, Switched Gnd, 1.5A Max
B22	IMRC Solenoid Valve (K20A3 / K24A1 Only)	Low Side Driver #3	Output	Avail, Switched Gnd, 1.5A Max
B23	VTC (-) Oil Solenoid Valve (Except D17)	Injector #10	Output	PnP for Variable Timing Control
B24	---	Idle #4	Output	Avail, Switched 12V, 1.5A Max
C1	---	Permanent +12V	Input	Avail, Permanent Power
C2	---	Injector #5	Output	Avail, same as B14
C3	---	Injector #6	Output	Avail, same as B16
C4	---	Injector #7	Output	Avail, same as B18
C5	---	Injector #8	Output	Avail, same as B7
C6	---	Injector #10	Output	Avail, same as B23
C7	---	Injector #9	Output	Avail, same as E21
C8	---	EGT #1	Input	Avail, same as B10
C9	---	EGT #2	Input	Avail, same as B11
C10	---	EGT #3	Input	Avail, same as B12
C11	---	EGT #4	Input	Avail, same as B13
C12	---	PW #2	Output	Avail, same as E10
C13	---	Lambda #1	Input	Avail, same as A6
C14	---	Lambda #2	Input	Avail, same as E2
C15	---	Switch #1	Input	Avail, same as E11
C16	---	Switch #2	Input	Avail, same as E12
C17	---	Switch #3	Input	Avail, same as E13
C18	---	Timing Ground	Input	Avail, Cam/Crank Gnd
C19	---	PW #1i	Output	Avail, PW #1 Inverted
C20	---	PW #2i	Output	Avail, PW #2 Inverted
C21	---	Injector #9i	Output	Avail, Injector #9 Inverted
C22	---	Injector #10i	Output	Avail, Injector #10 Inverted
E1	Fuel Pump Relay	Low Side Driver #11	Output	Dedicated
E2	Secondary O2 Sensor (Except D17A1)	Lambda #2	Input	PnP for Secondary O2 Sensor
E3	Chassis Logic Ground 3	---	N/U	Not Used
E4	Sensor Ground 3	Sensor Ground	Output	Dedicated
E5	FTP Sensor Reference Voltage	+5V Sensor	Output	Avail, 5 Volt Reference
E6	Secondary O2 Sensor Heater Control (Except D17A1)	Low Side Driver #12	Output	PnP for Secondary O2 Heater
E7	Main Relay	Main Relay	Output	Dedicated
E8	Primary O2 Sensor Heater Relay (Except D17)	Low Side Driver #2	Output	PnP for Primary O2 Heater
E9	Ignition	+12V Switched	Input	Dedicated
E10	---	PW #2	Output	Avail, Pulse Width Out
E11	---	Switch #1	Input	Avail, Switched Input
E12	---	Switch #2	Input	Avail, Switched Input
E13	---	Switch #3	Input	Avail, Switched Input
E14	Fuel Tank Pressure Sensor	Gear	Input	Avail, 0-5 Volt Input
E15	Electrical Load Detector	PR Press	Input	Avail, 0-5 Volt Input
E16	Power Steering Pressure Switch	Switch #5	Input	Avail, Switched Input
E17	---	Idle #5	Input	Avail, Switched Input
E18	A/C Clutch Relay	Low Side Driver #6	Output	PnP for A/C Clutch Relay
E19	---	Idle #6	Output	Avail, Switched 12V, 1.5A Max
E20	EVAP Bypass Solenoid Valve	Low Side Driver #9	Output	Avail, Switched Gnd, 1.5A Max

E21	EVAP Canister Vent Solenoid Valve	Injector #9	Output	Avail, Switched Gnd, 1.5A Max
E22	Brake Switch	Switch #6	Input	Avail, Switched Input
E23	K-Line	---	---	---
E24	Multiplex Control Unit	FM	Output	Dedicated
E25	---	Idle #7	Output	Avail, Switched Gnd, 1.5A Max
E26	Engine Speed Pulse	Low Side Driver #7	Output	PnP for Tach Signal
E27	Immobilizer Code	---	---	---
E28	---	High Side Driver #4	Output	Avail, +12V, 1.5A Max
E29	Service Check Signal	Spare Temp	Input	Avail, 0-5 Volt Input
E30	Write Enable Signal	---	---	---
E31	Malfunction Indicator Light	Low Side Driver #10	Output	Avail, Switched Gnd, 1.5A Max

Wire View Of AEM EMS

Connector A   Connector B   Connector C   Connector D   Connector E

Oxygen Sensor #1 Calibrations (UEGO EMS ONLY)

O2 (V)	AFR (GAS)	LAMBDA
0.000	9.950	0.679
0.156	10.070	0.687
0.312	10.180	0.695
0.468	10.350	0.706
0.624	10.520	0.718
0.780	10.690	0.730
0.936	10.810	0.738
1.092	10.920	0.745
1.248	11.090	0.757
1.404	11.270	0.769
1.560	11.380	0.777
1.716	11.550	0.788
1.872	11.720	0.800
2.028	11.900	0.812
2.184	12.070	0.824
2.340	12.240	0.835
2.496	12.410	0.847
2.652	12.640	0.863
2.808	12.810	0.874
2.964	13.040	0.890
3.120	13.210	0.902
3.276	13.440	0.917
3.432	13.670	0.933
3.588	13.950	0.952
3.744	14.240	0.972
3.900	14.580	0.995
4.056	14.980	1.023
4.212	15.440	1.054
4.368	16.010	1.093
4.524	16.580	1.132
4.680	17.210	1.175
4.836	17.840	1.218
4.992	18.470	1.261

Calculating the Air Fuel Ratio of common fuels from the Lambda value

Gasoline AFR = Lambda * 14.65
Methanol AFR = Lambda * 6.47
Diesel AFR = Lambda * 14.5
Propane AFR = Lambda * 15.7
Ethanol AFR = Lambda * 9.00
CNG AFR = Lambda * 14.5

UEGO Controller/Sensor Specifications (UEGO EMS Only)

Supply Voltage (nominal):	9 to 18 Volts
Measuring range:	0.68 to 1.26 Lambda
Type:	Bosch UEGO LSU4.2
Accuracy:	+/- 1%
Temperature Limit:	930C
Initial Warm-up Time:	Less than 20 seconds
Weight:	80 grams
Heater Current:	1.1A at 12.0V
Mounting:	M18 X 1.5 thread, Torque to 30 ft-lbs
Nominal Service Life:	100,000 km for Unleaded Fuel
	60,000 km for Leaded Fuel 0.15g Pb/l
	30,000 km for Leaded Fuel 0.40g Pb/l
	20,000 km for Leaded Fuel 0.60g Pb/l

Notes:

The sensor 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.

Do not run the engine with the UEGO sensor installed without power applied to the controller and the sensor plugged in.

Replacement Oxygen Sensor Components (UEGO EMS Only)

30-2001   Replacement UEGO Sensor
35-4005   O2 Sensor Bung, mild steel, welding required
35-4001   O2 Sensor Plug, mild steel

AEM Electronics Warranty

Advanced Engine Management Inc. 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 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. 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 Merchandise Authorization (RMA) number. Product must be received by AEM within 30 days of the date the RMA is issued.

Please note that before AEM 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 a RMA requested before the above process transpires.

AEM will not be responsible for electronic products that are installed incorrectly, installed in a non approved application, misused, or tampered with.

Any AEM electronics product can be returned for repair if it is out of the warranty period. There is a minimum charge of $50.00 for inspection and diagnosis of AEM electronic parts. Parts used in the repair of AEM electronic components will be extra. AEM will provide an estimate of repairs and receive written or electronic authorization before repairs are made to the product.