



Installation Instructions for ***30-1910*** **Fuel Ignition Controller (F/IC)**

WARNING:



This installation is not for the electrically or mechanically challenged! Use the F/IC with **EXTREME** caution! If you are uncomfortable with anything about this, please refer the installation to an AEM trained tuning shop or call 800-423-0046 for technical assistance. You should also visit the AEM Performance Electronics Forum at <http://www.aempower.com>

NOTE: AEM holds no responsibility for any engine damage that results from the misuse of this product!

This product is legal in California for racing vehicles only and should never be used on public highways.

Thank you for purchasing the AEM F/IC. Inside the box you will find the F/IC module, a universal wiring harness, a software cd, and all the other components needed to install and tune the F/IC via a laptop or PC. See Figure 1. For those that desire a plug and play installation, AEM has started developing application specific harnesses for some of the more popular applications. Please visit the F/IC section of the AEM Electronics Forum (www.aempower.com) for product availability and information.



- Kit Contents:
- * F/IC Module
 - * Flying Lead Harness
 - * Bypass plug
 - * Instructions
 - * Software CD
 - * USB Cable
 - * Vacuum Hose (3 Ft)
 - * Tee Fitting
 - * Zip Tie (3)

Figure 1. Kit Contents

Getting started

The first step in connecting the F/IC is to determine what features/functions are needed and which functions are not needed. The F/IC comes with a universal flying lead that has 40 non-terminated wires. At first glance, the bundle of wires is quite intimidating. However, by answering some questions about your vehicle and what you want to do with the F/IC, some of the wires can be eliminated. Before we begin, we must learn the two types of connections used with the F/IC: the tap and the intercept. See Figure 2.

WIRE CONNECTIONS

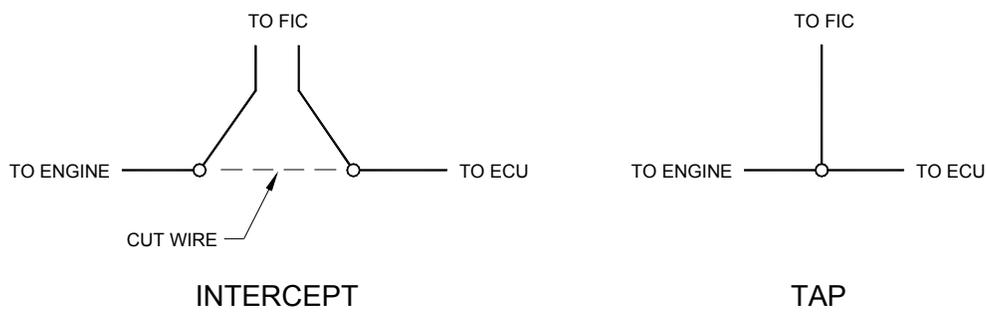
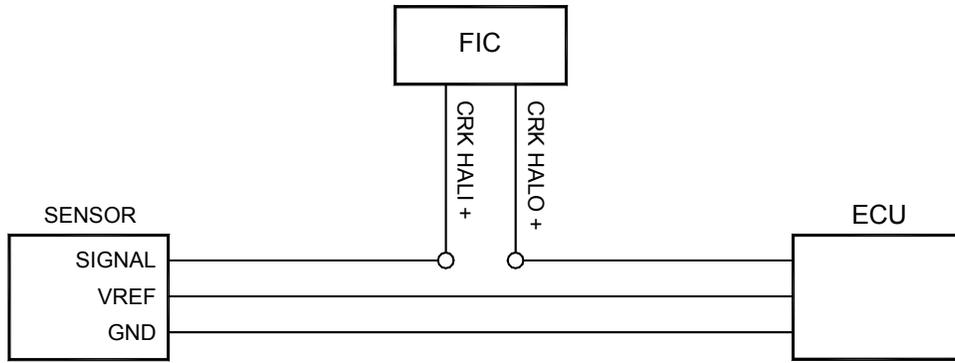


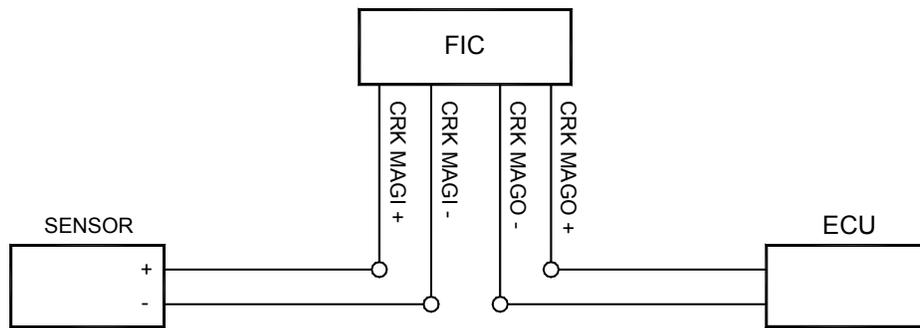
Figure 2. Wire Connections

Does your vehicle have a Mag or Hall style crank sensor? Mag style sensors typically have two wires. Hall style sensors typically have three wires. Vehicles have a Mag or a Hall style crank sensor, not both. If your vehicle has a Mag sensor, the two Hall sensor

crank wires can be eliminated. If your vehicle has a Hall sensor the four Mag sensor wires can be eliminated. Connect the crank sensor as shown below in Figure 3.



HALL STYLE CRANK CONNECTION

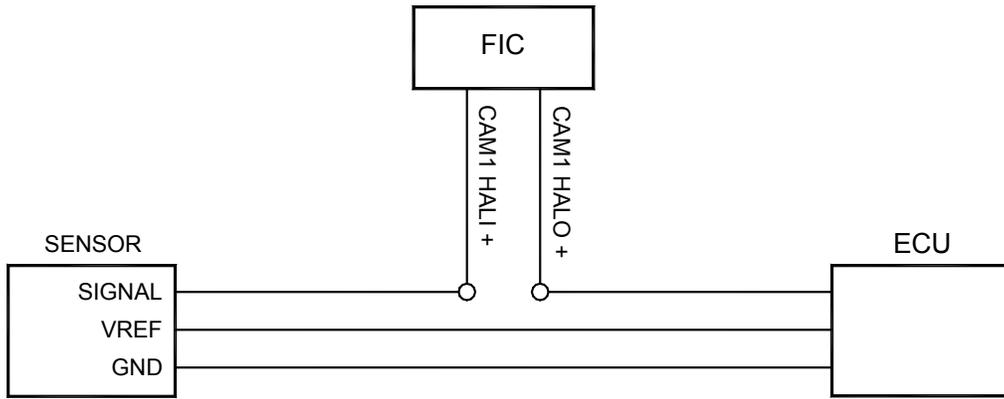


MAG STYLE CRANK CONNECTION

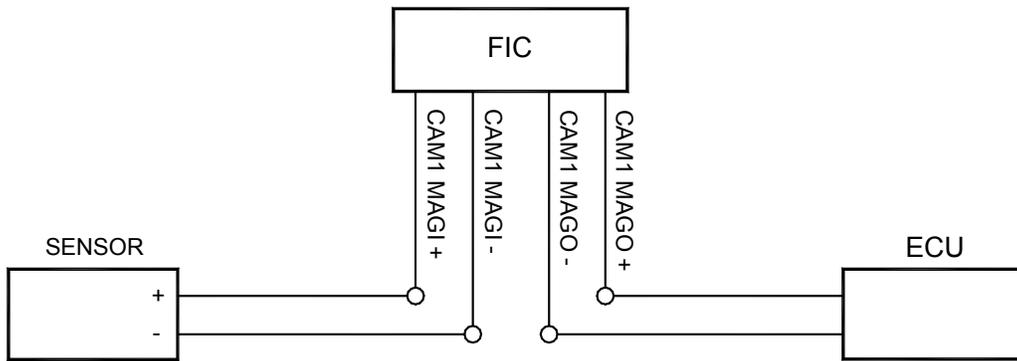
Figure 3. Crank Sensor Connection

Does your vehicle have one or two cam sensors? If your vehicle has one cam sensor, the two Cam 2 Hall wires and four Cam 2 Mag wires can be eliminated.

Does your vehicle have a Mag or Hall style cam sensor? As with the crank sensor, a vehicle will have one or the other, not both. Either the Cam 1 Hall or the Cam 1 Mag wires can be eliminated. Connect to Cam sensor as shown below in Figure 4.



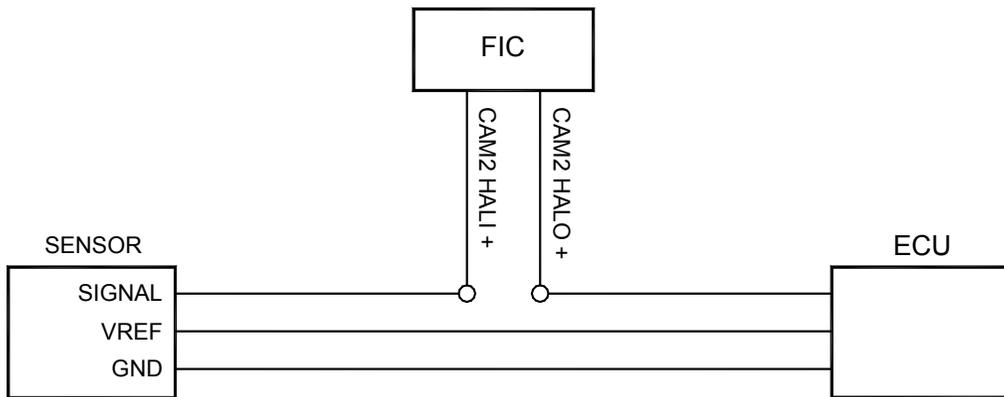
HALL STYLE CAM 1 CONNECTION



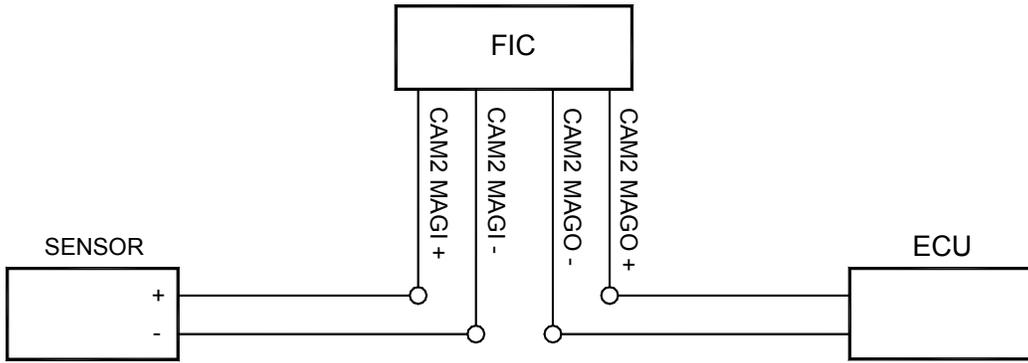
MAG STYLE CAM 1 CONNECTION

Figure 4. Cam 1 Connection

If your vehicle has two cam sensors, connect the Cam 2 sensor as shown below in Figure 5.



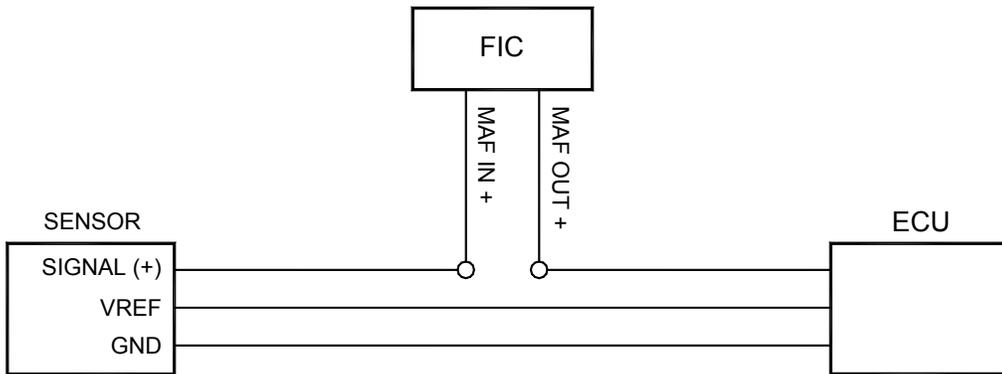
HALL STYLE CAM 2 CONNECTION



MAG STYLE CAM 2 CONNECTION

Figure 5. Cam 2 Connection

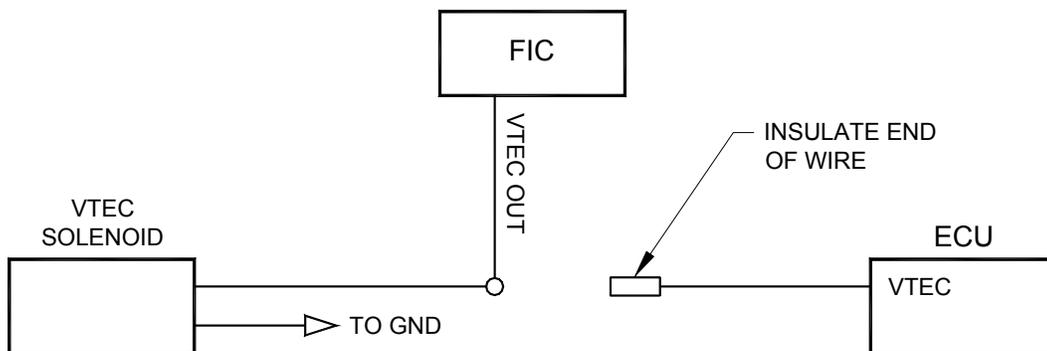
Do you want to modify or clamp the MAF sensor voltage? If not, the two MAF sensor wires can be eliminated. If so, connect the MAF sensor as shown below in Figure 6.



MAF CONNECTION

Figure 6. MAF Sensor Connection

Does your vehicle have VTEC? If not, the VTEC wire can be eliminated. If so, connect the VTEC wire as shown below in Figure 7.

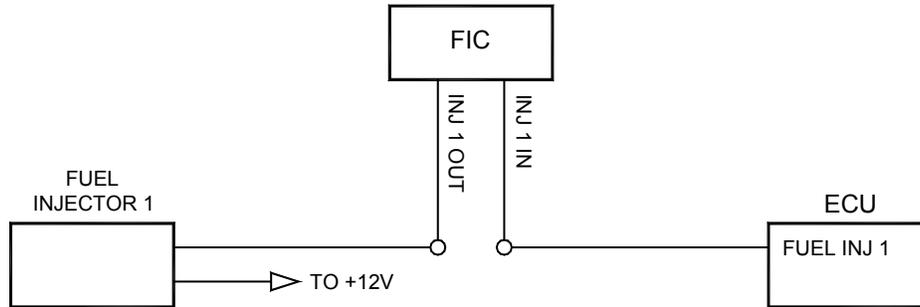


VTEC CONNECTION

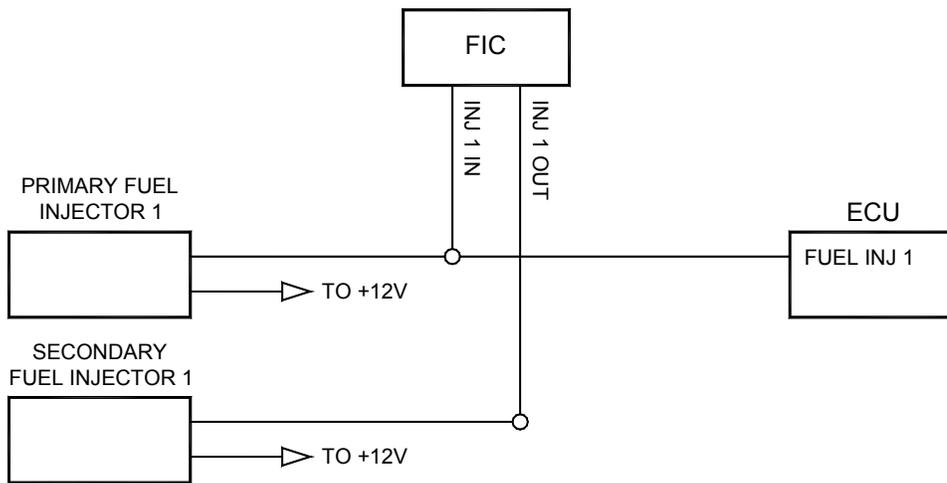
Figure 7. VTEC Connection

How many injectors do you want to control with the F/IC? The F/IC has 6 injector drivers. There are two wires per driver. The wires for the unused drivers can be eliminated.

Do you want to control the primary injectors on the engine, or control additional secondary injectors? Connect the injectors as shown below in Figure 8.



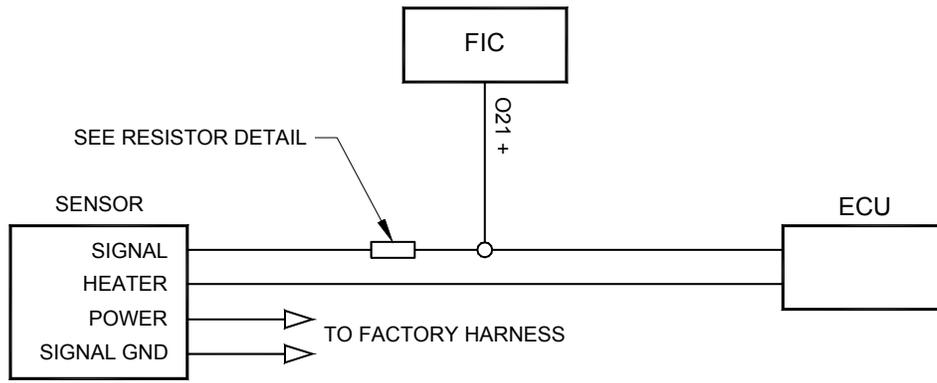
PRIMARY FUEL INJECTOR CONNECTION



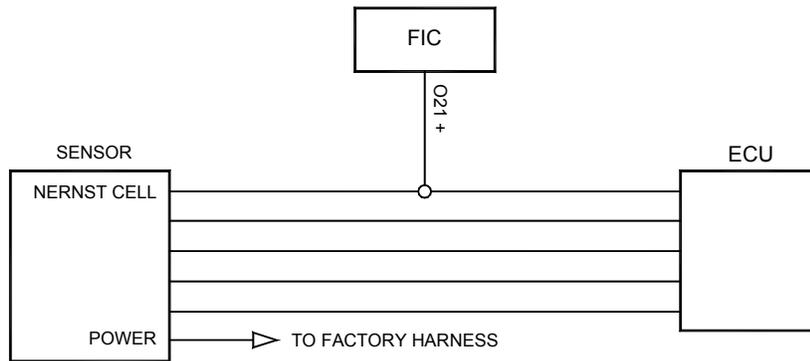
SECONDARY FUEL INJECTOR CONNECTION

Figure 8. Fuel Injector Connection

Do you want to modify the oxygen/UEGO sensor signals? If not, the oxygen/UEGO sensor wires can be eliminated. If so, connect the sensors as shown below in Figure 9



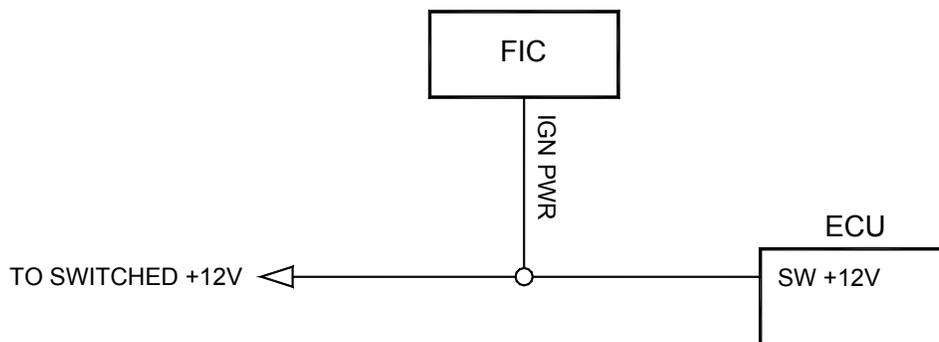
NARROW BAND O2 SENSOR CONNECTION



WIDE BAND O2 SENSOR CONNECTION

Figure 9. Oxygen/UEGO Sensor Connection

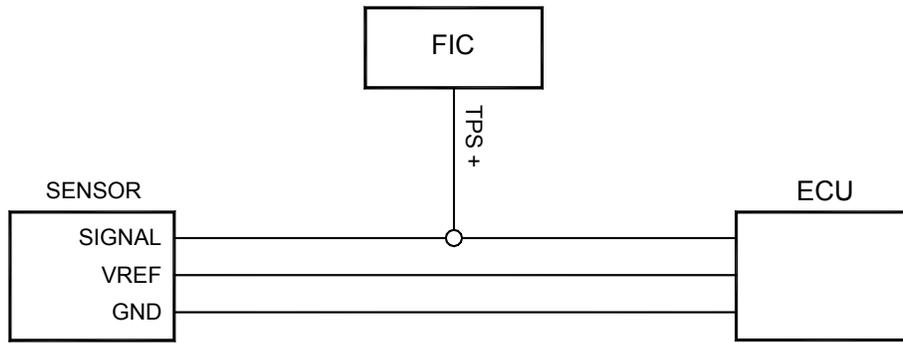
Connect the F/IC power wire as shown below in Figure 10.



SWITCHED +12 VDC CONNECTION

Figure 10. F/IC Power Connection

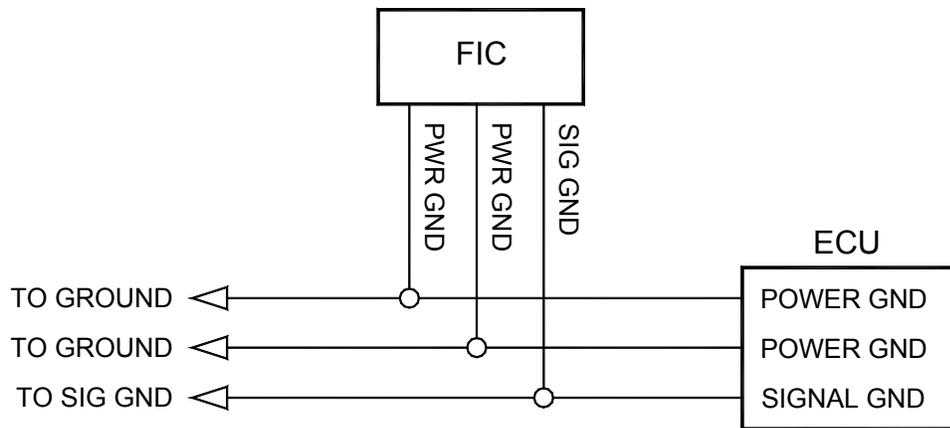
Connect the TPS signal to the F/IC as shown below in Figure 11.



TPS CONNECTION

Figure 11. TPS Connection

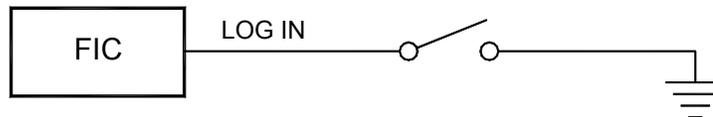
Connect all three F/IC grounds as shown below in Figure 12.



GROUND CONNECTION

Figure 12. Power Ground Connections

Do you want to use the F/IC's internal data logger? If so, connect the logger input as shown below in Figure 13.



LOGGER CONNECTION

Figure 13. Logger Trigger Connection

Connect the boost line to manifold pressure as shown below in Figure 14.

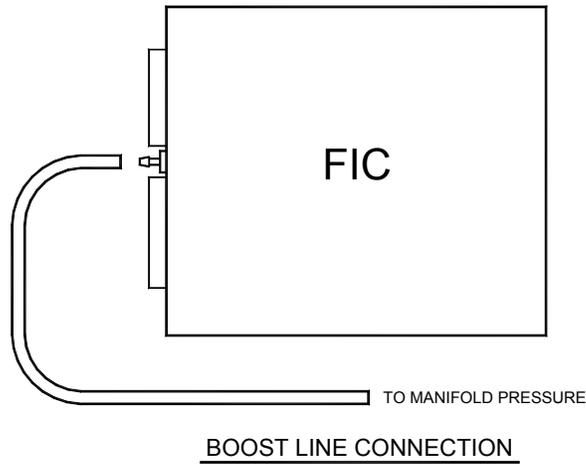


Figure 14. Boost Connection

Connect the F/IC to the PC using the supplied USB cable. See Figure 15.

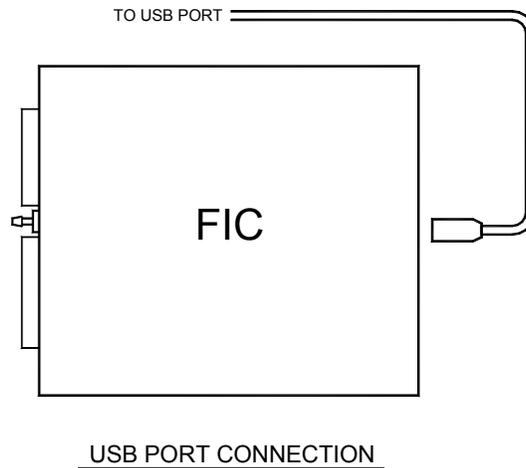


Figure 15. USB Com Cable Connection

Using the F/IC

The F/IC is a very unique product, capable of precise fuel and ignition control. However, the F/IC, by design, is a “piggyback” engine controller, not a stand-alone ECU. Because it is a piggyback controller, the F/IC relies heavily on the factory ECU. As factory ECU’s get more and more complex, it is more difficult to sustain improved engine performance with out the factory ECU “detuning” the engine. Thus, the key to using the F/IC is to make it work in harmony with the factory ECU.

Tuning Tips

- Tune the F/IC so the closed loop fuel trims are as close to zero as possible using the fuel maps. Most factory ECU’s can sense extra fuel and will promptly adjust the fuel trims to remove the extra fuel. For easy reference, fuel trims can be monitored with an OBDII scanner or equivalent device. Positive fuel trims are reduced by adding fuel. Negative fuel trims are reduced by removing fuel.
- **Keep it simple.** Many times it is not necessary to use every function of the F/IC to obtain the desired engine performance. If the desired engine performance can be achieved by adjusting only two maps, use only the two maps. There is no

benefit to adding fuel via the MAF fuel map, only to remove fuel in the MAP fuel map

- Be conservative when making changes. A small step in the wrong direction is less likely to damage an engine than a large step in the wrong direction.
- Use the oxygen sensor functions only when additional closed loop fuel is needed.

Absolute Pressure Explained

Note: The F/IC reads and displays absolute pressure. Please read the following section before tuning.

When talking pressure, there are two common ways pressure is represented, gauge, and absolute, gauge being by far the more common way. Take a tire for example, if the measuring gauge says 50 psi, we say the tire has 50 psi of air in it. However, that is not 100% correct. The tire actually has air at 50 psi above atmospheric pressure, which is known as psi gauge (psig). The total pressure, or absolute pressure (psia) is actually 50 psi on the gauge plus the atmospheric pressure. So, the absolute pressure is the gauge pressure plus the atmospheric pressure. What about boost gauges? Most boost gauges display gauge pressure both above and below atmospheric pressure. Pressure above atmospheric pressure is commonly referred to as "Boost" pressure. Pressure below atmospheric is commonly referred to as "Vacuum". So why the lesson on absolute pressure? **BECAUSE THE F/IC READS AND DISPLAYS ABSOLUTE PRESSURE!!** For easy reference, the following formulas can be used to determine, "Boost" and "Vacuum" pressures. Atmospheric pressure can be determined by reading the F/IC pressure with the key on and the engine off.

$$P_{(\text{boost})} = P_{(\text{F/IC})} - P_{(\text{atmospheric})}$$
$$P_{(\text{vacuum})} = P_{(\text{atmospheric})} - P_{(\text{F/IC})}$$

Now that you're starting to grasp absolute pressure, you might wonder why the F/IC reads absolute pressure. Well, absolute pressure is the only accurate, repeatable way to measure manifold pressure. Measuring only "Boost" pressure does not account for changes in atmospheric pressure. Changes in atmospheric pressure will cause changes in manifold pressure. For example, let's consider a boost gauge at high elevation, where atmospheric pressure is 12.7 psia. A boost gauge reading of 10 psi will give an absolute pressure of 22.7 psia (12.7 + 10). Now, take the same boost gauge at sea level, where atmospheric pressure is 14.7 psia. A boost gauge reading of 10 psi now gives an absolute pressure of 24.7 psia (10 + 14.7). The boost gauge displayed 10 psi boost in both locations, however, the absolute pressure was two psi greater at sea level. By measuring absolute pressure, instead of gauge pressure, the F/IC can be tuned correctly for all operating conditions.

Loading the FIC software

Insert the supplied software disk into your cd drive. The disk should automatically load. To manually load the software, double click the file "FICReleasexxxxx.exe". Follow the on-screen dialogue to finish the install

Open a File

Note: Changes made to FIC calibrations are made real-time. If you do not want to change a file, it is recommended that you save the file under a different name using the "Save As" function. Start the FIC software by double clicking on the AEM FIC icon on your desktop. Go to File>Open and locate the file"fic1.mdb". If the default file

locations were used to load the software, the fic1 file should be found in the FIC folder (C:\Program files\AEM\FIC) See Figure 16.

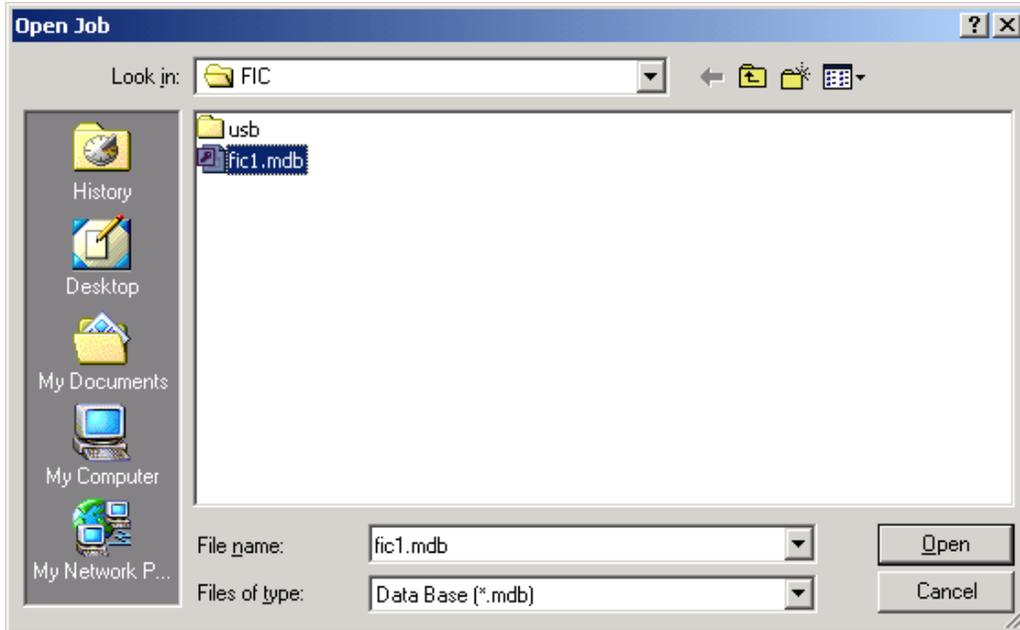


Figure 16. Open File

Saving a file under a different name

With a file open, go to File>Save-As. Select a file name and location to save the file in the Save As pop up window. See Figure 17.

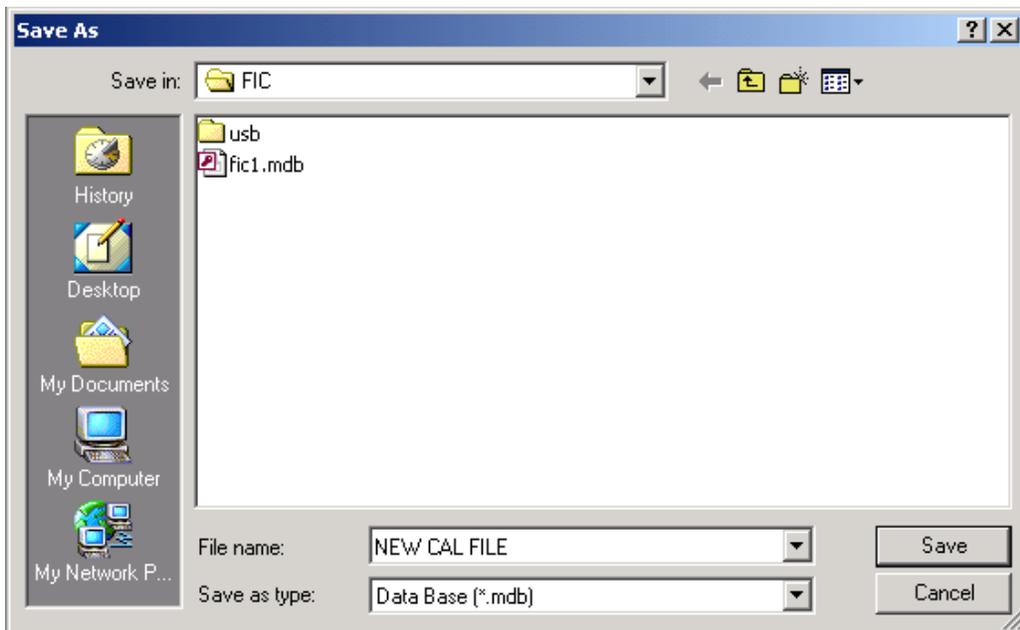
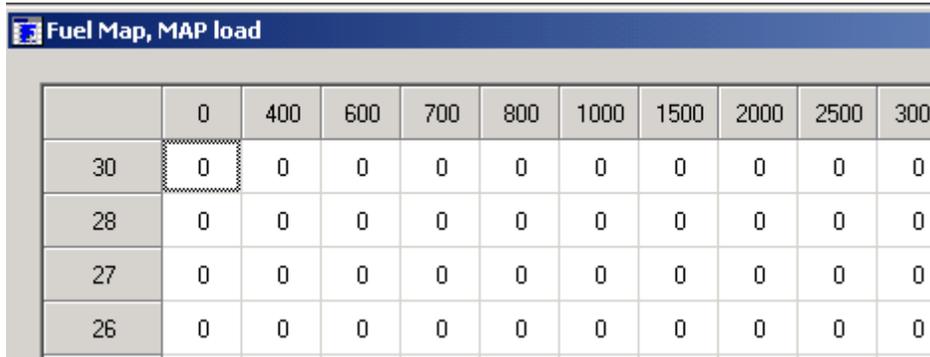


Figure 17. File Save As

Editing a Calibration

The FIC has 5 user configurable maps. Each map is 21X17 and has user configurable load and rpm breakpoints. The map cells have a white background, while the load and rpm breakpoints have a gray background. See Figure 18.

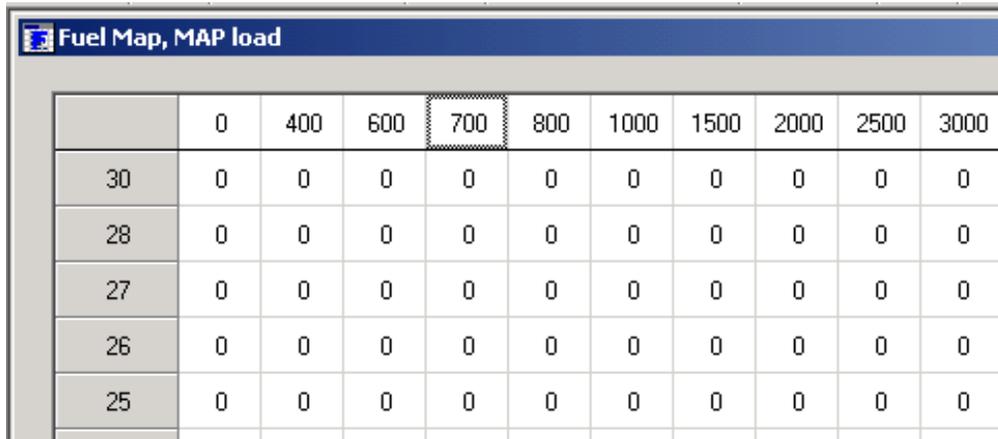


The screenshot shows a software window titled "Fuel Map, MAP load". It contains a grid with 11 columns and 5 rows. The columns are labeled with rpm values: 0, 400, 600, 700, 800, 1000, 1500, 2000, 2500, and 3000. The rows are labeled with load values: 30, 28, 27, and 26. The cell at the intersection of the 0 rpm column and the 30 load row is highlighted with a dotted border, indicating it is selected for editing.

	0	400	600	700	800	1000	1500	2000	2500	3000
30	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0

Figure 18. Map Cells and Breakpoints

To edit breakpoints, double click on a breakpoint. The background for the breakpoints will change from gray to white, signifying that the breakpoints can now be edited. See Figure 19.



The screenshot shows the same "Fuel Map, MAP load" window. In this view, the column headers (breakpoints) are highlighted with a white background, indicating they are selected for editing. The cell at the intersection of the 700 rpm column and the 30 load row is highlighted with a dotted border.

	0	400	600	700	800	1000	1500	2000	2500	3000
30	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0

Figure 19. Editing Breakpoints

To change the value of a breakpoint, select the breakpoint and type in the new value. Breakpoints can be selected using the arrow keys or the mouse. To linearly interpolate between breakpoints, highlight the desired breakpoints by using the left mouse button. After the breakpoints have been selected, right click the mouse and select calculate. The software will linearly interpolate all breakpoints between the left most and right most rpm breakpoints. When calculating load breakpoints, the software will interpolate between the upper most and lower most breakpoints. To change single cell values, select a cell using the arrow keys or mouse and type a new value. To change multiple cell values simultaneously, highlight the desired cells and right click the mouse. Select either set value or change value. Set value is used to give the same values to multiple cells. Change value is used to change multiple cells by the same percentage.

Fuel Map, Map Load (See Figure 20.)

The map based fuel map uses the onboard map sensor for its load input. Fuel can be added or removed from the engine based on engine speed and manifold pressure. A value of 12 in any of the cells will add 12 % of fuel to the engine. A value of -18 will remove 18% of fuel from the engine. A value of 0 will not add or remove any fuel from the engine.

Fuel Map, MAP load		RPM																				
		0	400	600	700	800	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500
LOAD - MAP - PSIA	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure20. MAP Sensor Based Fuel Map

Fuel Map, MAF Load (See Figure 21.)

The MAF based fuel map uses the signal wired to the MAF input wire for its load input. Fuel can be added or removed from the engine based on the MAF input and vehicle speed. A value of 12 in any of the cells will add 12% fuel to the engine. A value of -18 will remove 18% of fuel to the engine. A value of 0 will not add or remove any fuel from the engine.

Fuel Map, MAF load		RPM																				
		0	400	650	700	800	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500
LOAD - MAF - V/MS	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 21. MAF Sensor Based Fuel Map

Ignition map (See Figure 22.)

The ignition map is used to retard ignition timing. The load input for the ignition map is based on either MAP, MAF, or TPS. Timing will be removed from the engine based on the selected load input and engine speed. Since timing can only be removed from the engine, the ignition map only accepts negative numbers. For example, a value of -4 will retard the timing 4 degrees. The load input for the ignition map is selected from the setup window. Go to setup>system and the setup window will appear. In the ignition section, select the desired load input from the drop down menu.

The screenshot shows a software window titled "Ignition Map, Degrees". The window contains a grid with "RPM" on the horizontal axis and "LOAD - MAP - PSIA" on the vertical axis. The RPM axis ranges from 0 to 8000 in increments of 400. The Load axis ranges from 0 to 40 in increments of 2.5. All cells in the grid contain the value "0". The cell at the intersection of 800 RPM and 35 Load is highlighted with a dashed border.

	RPM																				
	0	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400	6800	7200	7600	8000
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 22. Ignition Map

MAF Map (See Figure 23.)

The MAF map is used to alter the MAF signal to the factory ecu. Like the ignition map, the MAF map load is based on either MAP, MAF, or TPS. The load input is selected from the MAF section of the setup window. The MAF map has two different operating modes, percent and voltage. The mode is also selected in the MAF section of the setup window. In the percent mode, the F/IC will measure the input voltage on the MAF input wire and modify the output voltage by the value in the MAF map. For an input voltage of 1 volt, a cell value of 6, the output voltage will be 1.06 volts. In the voltage mode, the F/IC will output the voltage value that is in the MAF map. For example, the F/IC will output 2.5 volts for a value of 2.5 in the MAF map.

MAF Map, Percent		RPM																				
		0	500	600	700	800	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500
LOAD - MAF - Volts	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Figure 23. MAF Map

O2 Map (See Figure 24.)

The O2 map is used to modify the O2 sensor signal to the factory ecu. The O2 map load input can be based on MAP, MAF, TPS, or O2 sensors. The O2 map also has three different operating models, fixed, percent, and voltage. The load inputs and modes are selected in the O2 section of the setup window. When in the voltage mode, the F/IC outputs a voltage, which is determined by the corresponding cells in the O2 map. In the voltage mode, for an O2 map cell value of 2.5, the F/IC will output 2.5 volts. When in the fixed mode, the F/IC outputs a square wave that alternates between the Bank Hi voltage and the Bank Lo voltage. The Bank Hi voltage, Bank Lo voltage, and square wave period are set in the O2 section of the setup window. The pulse width is determined by the cell value in the O2 map. For a Bank Hi of 2, and Bank Lo of 1, a period of 200 ms, and a cell value of 50, the F/IC will output 2 volts for 50 ms, 1 volt for 150ms, 2 volts for 50 ms, etc. In the percent mode, the F/IC will measure the O2 voltage, then modify it by the percentage value in the O2 map. For a measured value of 1 volt, a period of 200ms, and a cell value of 20, the F/IC will measure 1 volt for 5ms, then output 1.2 volts for 195ms, then measure again for 5ms, etc.

O2 Map, Percent		RPM																					
		0	500	600	700	1000	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	12000	
LOAD - MAP - PSIA	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	37.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	32.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	27.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Figure 24. O2 Map

Configuring the FIC

With the FIC software open, select Setup>System. See Figure 25.

The screenshot shows the 'Setup' window with the following configuration details:

- Com Port:** Port 10, Find button.
- Load display units:** PSIA.
- Fuel:** Injector response time: 486 uS.
- Ignition:** Load input: MAP, Slew rate: 0.125 Deg/5ms.
- MAF:** Load input: MAF, Mode: Percent, Max voltage clamp: 5.86.
- O2:** Load input: MAP, Mode: Percent, Period: 200 mS. Bank1 Hi voltage: 4, Bank1 Lo voltage: 2, Bank2 Hi voltage: 4, Bank2 Lo voltage: 2.
- FIC Logger:** Logger is recording when load is above 0 PSIA and TPS is above 0 % and RPM is above 0. Sample rate: 5 mS.
- VTEC:** VTEC is on when load is above 40 PSIA and TPS is above 100 % and RPM is above 12000. VTEC is off when load is below 0 PSIA or TPS is below 0 % or RPM is below 0.

Figure 25. F/I/C Setup Window

Com Port:

Enter the com port to which the FIC is connected. If not known, click Find and the software will search com ports 1-16 for the FIC.

Load Display Units:

The on board map sensor reads load in absolute pressure. The load can be displayed in PSI absolute or KPA absolute.

Injector Response Time:

This is the amount of time by which the start of fuel flow lags the injector open signal from the ecu. A typical value is 500 μ S.

Ignition:

Select the load input for the ignition map. Set the slew rate for the ignition timing. A typical slew rate value is 0.125 degrees every 5 mS.

MAF:

Select the load input and operating mode for the MAF map. Set the maximum voltage clamp (max output voltage) for the MAF map.

O2:

Select the load input and operating mode for the O2 map. Set the period for the fixed and percentage modes. Set the high and low voltages for bank 1 and bank 2.

FIC Logger:

Set the on conditions and sample rate for the FIC internal logger. Note: The on conditions must be met and the logger trigger input must be grounded before the internal logger will begin logging.

VTEC:

Set the on/off conditions for the VTEC output wire.

Connecting to the FIC:

Note: when connecting to the FIC for the first time, the found new hardware window will appear. Manually direct the pc to the drivers in the USB folder (C:\Program files\AEM\FIC\USB). The found new hardware window will appear two times and two drivers will need to be loaded. Connect the FIC to the pc using the supplied USB cable. With a calibration already open, go to Setup>System. Click on the find button in the Com Port section of the setup window. See Figure 26.

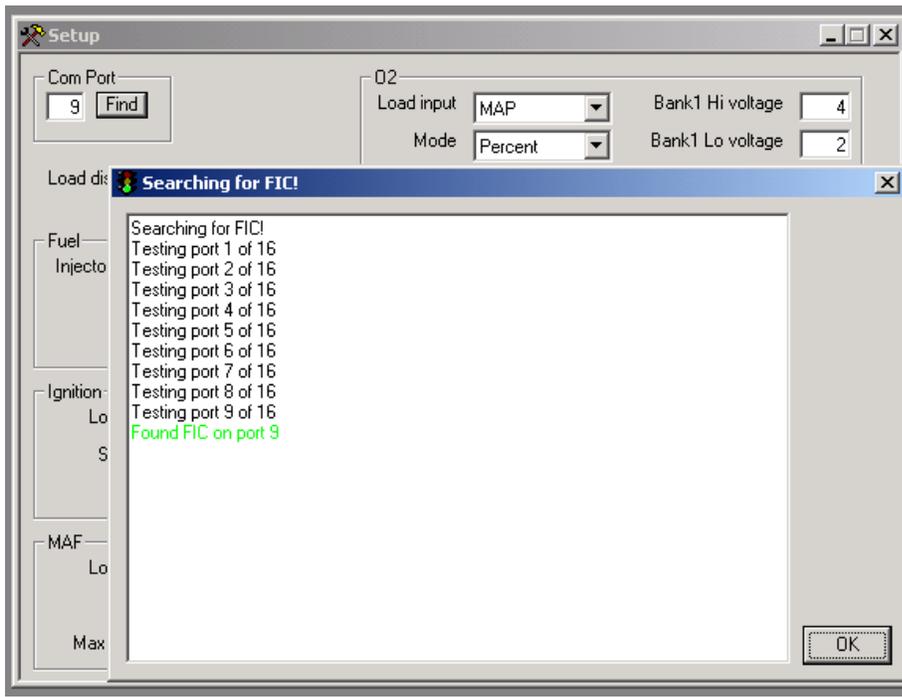


Figure 26. Finding the Com Port

Click OK after the FIC has been found. Go to ECU>Connect. The FIC will then connect to the software. Note: If the opened file does not match the file in the F/IC, a window will appear, asking if you want to copy the pc file to the F/IC or if you want to copy the F/IC file to the pc. Follow the on-screen instructions to proceed. See Figure 27.

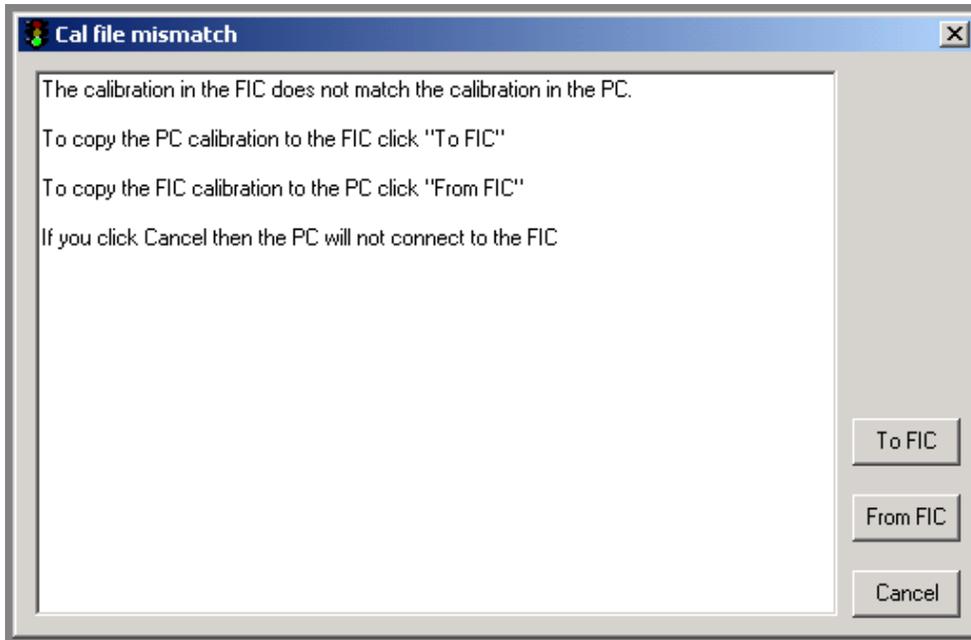


Figure 27. Connecting to the F/IC

To verify the connection status of the FIC, the footer in the lower left corner of the software will display either “On-line” or “Off-line”. See Figure 28.



Figure 28. F/IC Status On-line

Calibrating the FIC:

When an FIC is installed on a vehicle, it is necessary to calibrate the FIC before any tuning is performed. With the FIC already connected, go to ECU>Calibration. The calibration window will appear. See Figure 29.

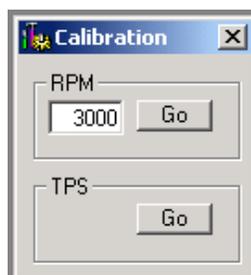


Figure 29. F/IC Calibration Window

The RPM calibration is performed by running the engine at the RPM shown in the RPM box, as directed by the on-screen instructions. Click Go in the rpm section and follow the on-screen instructions. The TPS calibration is a two-point calibration, one at 0% throttle and one at 100% throttle. Click Go in the TPS section and follow the on-screen instructions to calibrate the TPS. Note: For drive by wire applications, the engine may need to be running in order to open the throttle plate to 100%. Quickly blip the throttle to 100% and click the ok button.

Gauges Window:

To aid in tuning, the FIC software has a gauges window that gives real-time reference to the engines operating conditions. See Figure 30.

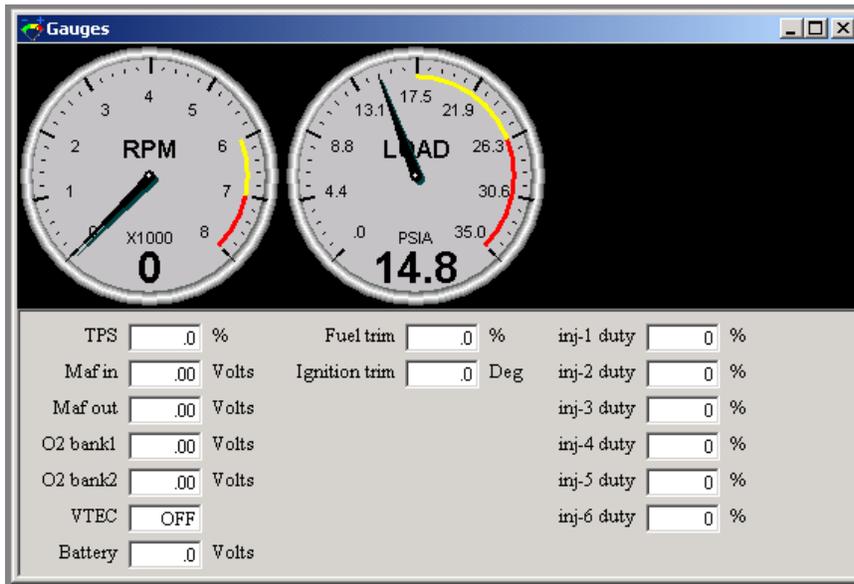


Figure 30. F/IC Gauges Window

The gauges window contains a user configurable tachometer and pressure gauge, along with real-time displays of TPS, MAF volts, O2 volts, VTEC status, Battery volts, Fuel Trim, and Ignition trim. Each gauge has an overload alarm, yellow highlight, red highlight, and full-scale settings. To configure a gauge, place the cursor over the gauge and double click the left mouse button. A pink needle will appear. Move the cursor over the needle, hold the left mouse button and drag the needle to the desired value. Double clicking on the left mouse button will move the gauge to the next configurable setting.

Date Logging:

There are two types of logging available with the FIC, internal and PC logging. In both modes of logging, the parameters that appear in the Gauges window are logged.

Internal Logging:

The FIC contains an onboard 64KB logger. The sampling rate and on conditions for the onboard logger are set in the FIC Logger section of the setup window. The sampling rate can be set from 5mS to 1275mS. Sampling every 5mS will give 5 seconds of data. Sampling every 1275mS will give 20 minutes of data. In order to start internal logging, all the on conditions must be met and the Logger Trigger Input must be grounded. The Logger Trigger Input is the white wire that comes from pin 13 on the 22-pin connector. The text "LOG IN" is stamped on the wire. To download data from the internal logger, go to Logger>Download FIC and save the file to the PC. Logged files are saved as delimited text files.

PC Logging:

The FIC software allows you to log data to your PC while connected to the FIC. The sampling rate and file size are determined by the available memory and processor speed of the PC. To start PC logging, go to Logger>PC Logger Start. To stop PC logging go to Logger> PC Logger Stop, give the file a name and save it. Logged files are saved as delimited text files.

Appendix

Oxygen Sensor theory.

Wide-band:

A wide-band sensor works by servo operation between a measuring cell (Nernst cell) and an oxygen pumping cell. These two cells are contained in the O₂ sensor where the exhaust gas is sampled by a chamber connecting the two cells. The controller in the car will change the current applied to the pump cell in an attempt to keep the Nernst cell voltage at a predetermined level. The current that is needed to maintain this balance is the indication of AFR that the ECU uses.

When the FIC is used to modify the signal from a wideband sensor the connection is made to the Nernst cell. Because the Nernst cell acts like a variable voltage source with a predictable impedance the FIC can modify the current from the Nernst cell to effect a change to the AFR.

Narrow-band 0-1vdc Nernst type:

A narrow-band Nernst sensor produces a voltage that represent partial pressure of oxygen left in the exhaust after combustion. This voltage will switch very rapidly as the AFR moves in ether direction off of stoich (about 14.7:1). The cars controller manages this by dithering about stoich. The FIC can override this signal with a programmable square-wave to keep the car ECU from seeing other changes that are being made to the fuel injectors or MAF.

F/IC Specs

Processor: Dual 16bit 32mips processors.

Logger:

Internal: 64 KB, 10ms max sample rate,

PC: 10ms fixed sample rate.

Pressure: 2psia - 40psia +/- .5psia resolution .1psia

MAF: 0vdc - 6vdc Input, 0vdc – 6vdc Output, overload protected

Power: 8-15vdc

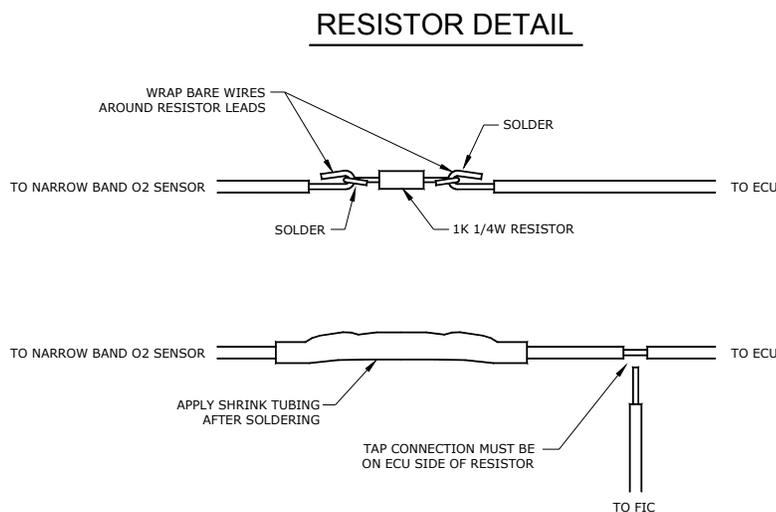
Log switch: GND to activate

VTEC: High-side driver, 6 amps max, overload protected

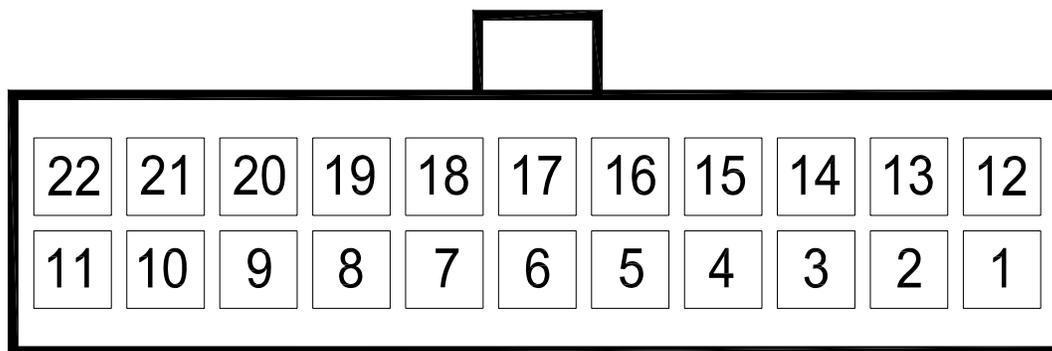
Injectors: 1.7 amps max, overload protected

O₂ : 0vdc - 4.95vdc,

Size: 5.5"L x 4.6"W x 1.4"H

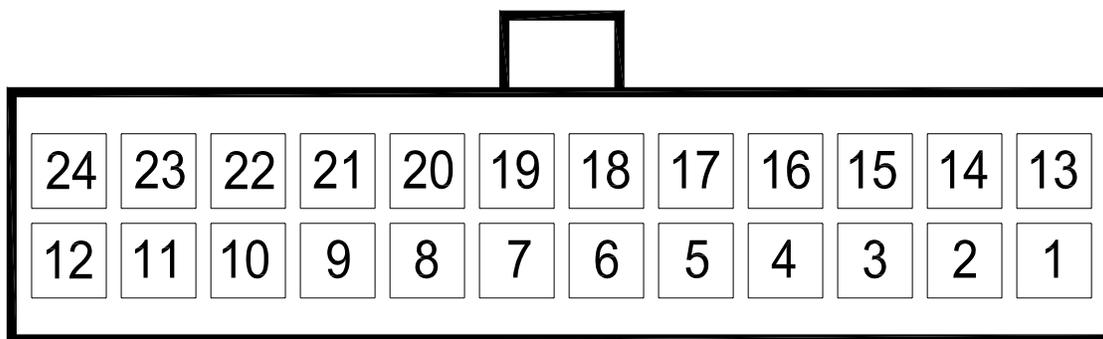


Pin	Name	Wire Color	Wire Marking	Intercept/Tap
1	Fuel injector 1 input	Dk Blue	INJ 1 IN	Intercept
2	Hall style sensor Cam 2 output	Yellow	CAM2 HALO +	Intercept
3	Hall style sensor Cam 1 output	Yellow	CAM1 HALO +	Intercept
4	Power GND	Black	PWR GND	Tap
5	Signal GND	Black	SIG GND	Tap
6	TPS input	White	TPS +	Tap
7	Hall style sensor Crank input	Green	CRK HALI +	Intercept
8	Mag style Crank sensor negative input	Green	CRK MAGI -	Intercept
9	Mag style sensor Cam 2 positive output	Yellow	CAM2 MAGO +	Intercept
10	Mag style sensor Crank negative output	Green	CRK MAGO -	Intercept
11	Mag style sensor Cam 1 negative output	Yellow	CAM1 MAGO -	Intercept
12	Fuel injector 2 input	Dk Blue	INJ 2 IN	Intercept
13	Logger trigger input	White	LOG IN	NA
14	Hall style Crank sensor output	Green	CRK HALO +	Intercept
15	Power GND	Black	PWR GND	Tap
16	Ignition power	Red	IGN PWR	Tap
17	Not Used	Not Used	Not Used	Not Used
18	Not Used	Not Used	Not Used	Not Used
19	Mag style crank sensor positive input	Green	CRK MAGI +	Intercept
20	Mag style Cam 2 sensor negative output	Yellow	CAM2 MAGO -	Intercept
21	Mag style Crank sensor positive output	Green	CRK MAGO +	Intercept
22	Mag style Cam 1 sensor positive output	Yellow	CAM1 MAGO +	Intercept



LOOKING AT WIRE SIDE OF CABLE CONNECTOR

Pin	Name	Wire Color	Wire Marking	Intercept/Tap
1	Bank 2 oxygen sensor modifier	Pink	O22 +	Tap
2	Not used	Not used	Not used	Not Used
3	Not used	Not used	Not used	Not Used
4	Hall style Cam 2 sensor input	Yellow	CAM2 HALI +	Intercept
5	Mag style Cam 2 sensor positive input	Yellow	CAM2 MAGI +	Intercept
6	Not Used	Not Used	Not Used	Not Used
7	Mag Style Cam 2 sensor negative input	Yellow	CAM2 MAGI -	Intercept
8	Hall style Cam 1 sensor input	Yellow	CAM1 HALI +	Intercept
9	Mag style Cam 1 sensor positive input	Yellow	CAM1 MAGI +	Intercept
10	Mag style Cam 1 sensor negative input	Yellow	CAM1 MAGI -	Intercept
11	Fuel injector 5 input	Dk Blue	INJ 5 IN	Intercept
12	Fuel injector 3 input	Dk Blue	INJ 3 IN	Intercept
13	Banks 1 oxygen sensor modifier	Pink	O21 +	Tap
14	MAF signal input	Dk Blue	MAF IN +	Intercept
15	MAF signal output	Black	MAF OUT +	Intercept
16	VTEC output	White	VTEC OUT	Intercept
17	Fuel injector 6 output	Dk Blue	INJ 6 OUT	Intercept
18	Fuel injector 5 output	Dk Blue	INJ 5 OUT	Intercept
19	Fuel injector 4 output	Dk Blue	INJ 4 OUT	Intercept
20	Fuel injector 3 output	Dk Blue	INJ 3 OUT	Intercept
21	Fuel injector 2 output	Dk Blue	INJ 2 OUT	Intercept
22	Fuel injector 1 output	Dk Blue	INJ 1 OUT	Intercept
23	Fuel injector 6 input	Dk Blue	INJ 6 IN	Intercept
24	Fuel injector 4 input	Dk Blue	INJ 4 IN	Intercept



LOOKING AT WIRE SIDE OF CABLE CONNECTOR

AEM Electronics 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. 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 EMS 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.