

Recording Air/Fuel Ratio using an Innovate Motorsports LC-1 Wideband Sensor with a Traqmate GPS Data Acquisition System

Traqmate Sensor Unit



Traqmate Display Unit



Traqmate TraqData



The Innovate Motorsports LC-1 is perfect for use in conjunction with the Traqmate TraqData analog input device because it scales the Air/Fuel ratio to a linear 0-5V signal.

Setting up the LC-1 is the toughest part of the project. First, identify the components.

LC-1 Cable Module



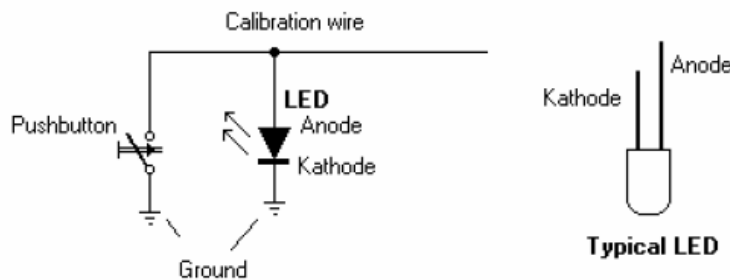
LC-1 Oxygen Sensor



The other cable you will need is the programming cable that has a stereo sub-mini jack on one end and a DB-9 serial plug on the other.

The LC-1 Cable Module has many wires which can be confusing. For this application you will be using the following:

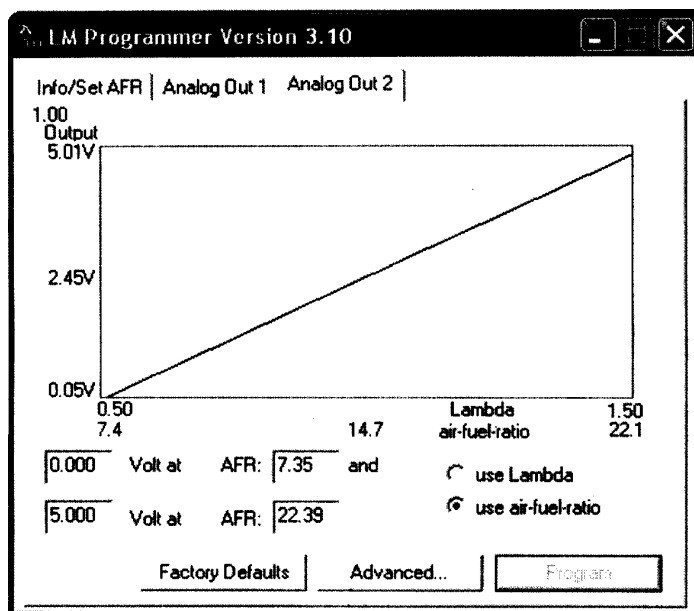
- Red – Connect to switched 12V power via a 5A fuse
- Blue – (Heater Ground) Connect to Ground via good size wire
- White – (System Ground) Connect to GND on Traqmate TraqData
- Green – (System Ground) Connect to GND on Traqmate TraqData
- Yellow – Analog Out 1 – no connect – terminate
- Brown – Analog Out 2 – connect to Traqmate Analog 0
- Black – Calibration Wire – connect to momentary switch
- Momentary Switch – Connect between Black wire and GND
- LED – Connect between Black wire and GND as shown



To start, we must reprogram the LC-1 to use a 0-5V output. To do this you will need a PC with an RS-232 serial port or a USB-Serial adapter cable.

Install the LC-1 Software. Plug the programming cable into the PC and the mating connector on the LC-1 Cable Module and verify the LC-1 configuration software can connect to the LC-1.

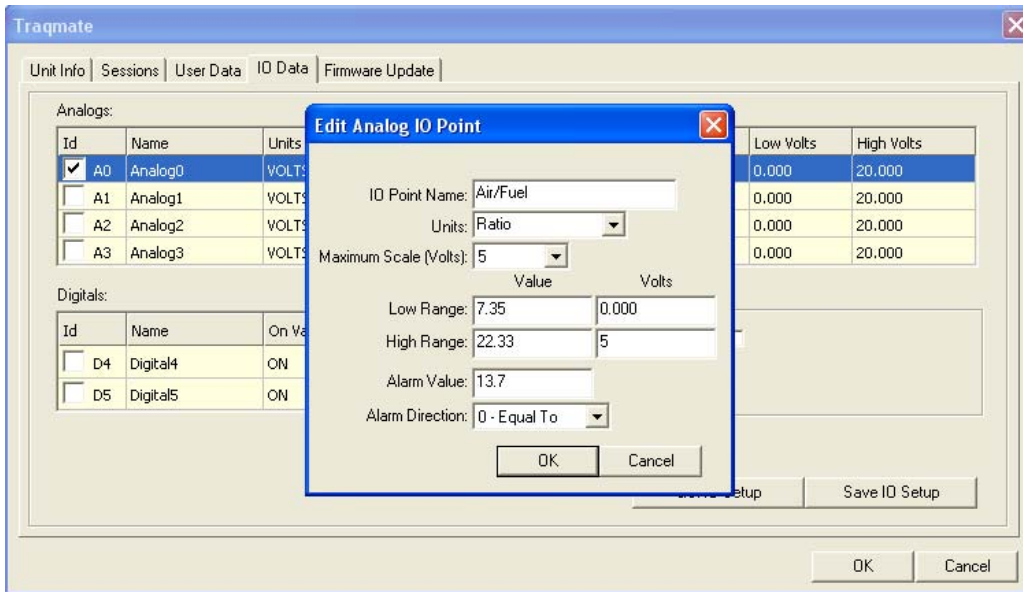
Change the settings on the LC-1 to create a 0-5V signal on Output 2 as shown here.



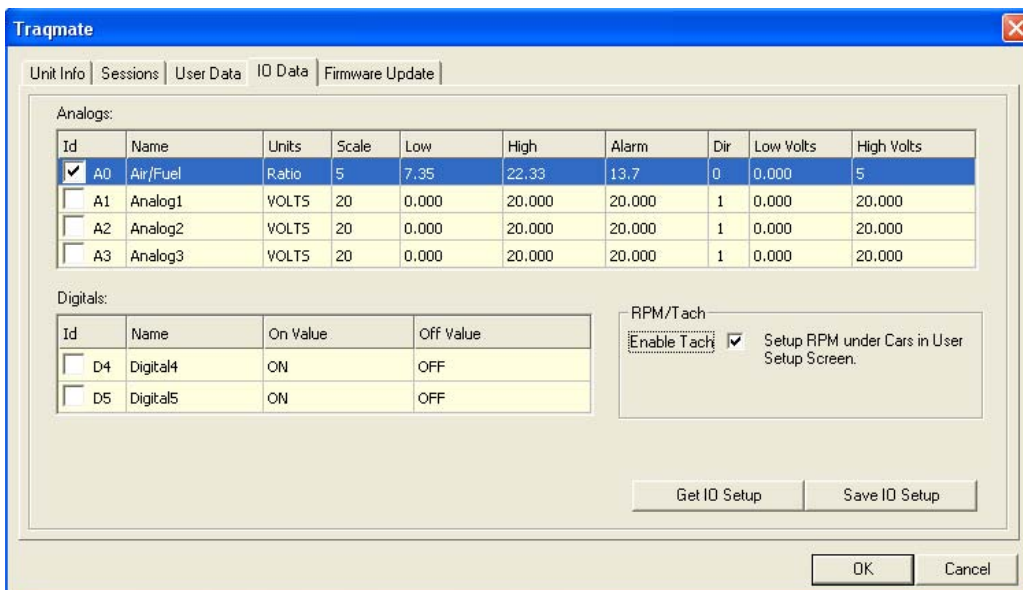
Disconnect the LC-1 from the PC.

Now program the Traqmate to display and record the LC-1 data as Air/Fuel Ratio. Connect the Traqmate to the PC and connect using the Traqview program. Note: You must be running version 1.20 or higher of both Traqview and the Traqmate firmware.

Select the IO Data screen, click on A0 and enter the following information.



yielding



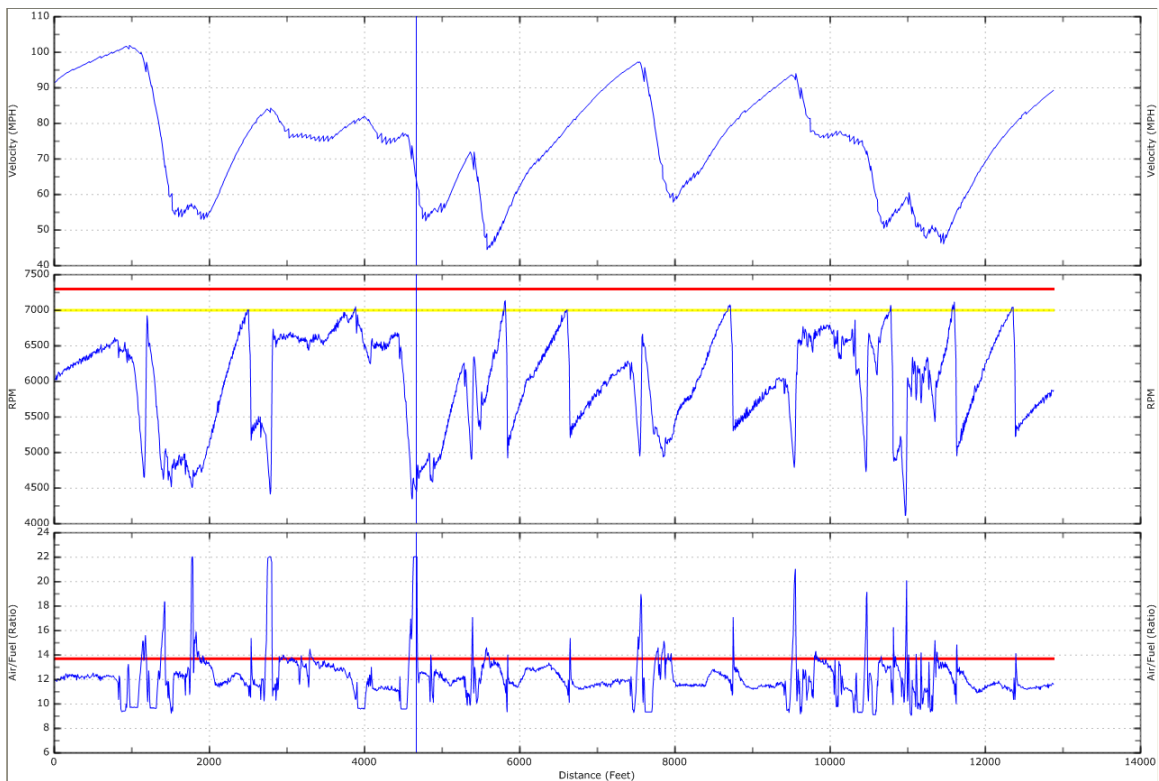
Click on Save IO Setup to save that into the Traqmate. Also check to ensure that the RPM is properly programmed (Enable Tach is set and Number of Cylinders is set). Traqmate recommends recording at 20Hz.

You should be able to view the Air/Fuel on the display if you have a Traqmate Complete by selecting Record Data/Gauges. The value is only valid under engine load.

Next weld in a bung or clamp the O2 sensor into the tailpipe as described in LC-1 instructions. In many cars you can route the LC-1 cables into the car by cutting a slot in the shifter boot.

Power up the LC-1 before screwing the O2 sensor into place to provide a free-air calibration. The LED will blink during warmup and calibration as described in the LC-1 instructions. When that process is complete, install the O2 sensor in the bung or the tailpipe clamp.

Now turn on the ignition and allow the LED to stop flashing (heating the O2 sensor element) before recording with Traqmate. Take a drive and record some data.



When you are finished you will see a picture much like this. The top graph is Velocity vs. Distance, the center graph is RPM vs. Distance and the bottom is Air/Fuel Ratio vs. Distance.

Note that the Air/Fuel only is accurate under load. The cursor is showing a throttle lift during a down-shift.

Traqview will draw a reference line, shown here at an Air/Fuel Ratio of 13.7. This particular vehicle is running quite rich at high RPM.