Instruction Manual

Quick Guide for Interfacing with Innovate LC-2 Air/Fuel Ratio Sensor Controller

Version 1.1 (Feb, 2019)

⚠ ***Warning:*** **Please consult the manual of the LC-2 Air/Fuel Ratio (Lambda) Sensor Controller before proceed.**

Auber's SYL-1813 gauge can work with Innovate LC-2 or LC-1 controller to display air/fuel ratio (AFR). This quick guide will show you how to wire and setup with SYL-1813 gauge with LC-2 controller.

A. Wiring

Before you start wiring the LC-2 and SYL-1813 gauge, please consult the manuals of Innovate LC-2 sensor controller and Auber's SYL-1813 respectively to identify the correct wires and pins for this application.

1) Connect the pin 1 of SYL-1813 to +12VDC source, and connect pin 2 to the battery ground.

2) The LC-2 has 4 stripped wires, red (+12VDC), black (ground), yellow (analog output 1), and brown (analog output 2). Please follow the LC-2 manual to connect the red wire and black wire to 12VDC source and battery ground respective. You can also connect the red wire to pin 1 and connect black wire to pin 2 for power.

3) Connect the yellow wire, Analog Output 1, from the LC-2 sensor to the pin 9 of SYL-1813 gauge. The pin 9 is the positive of voltage signal input. (Please note that on the LC-1 sensor, it is the brown wire, Analog Output 2, has output between 0V to 5V. If you have LC-1 sensor, please connect the brown wire to pin 9.)

4) Jump a wire from pin 6 (gauge signal ground) of the gauge to pin 2 (battery ground).

Please see Figure 1 for a schematic wiring diagram.

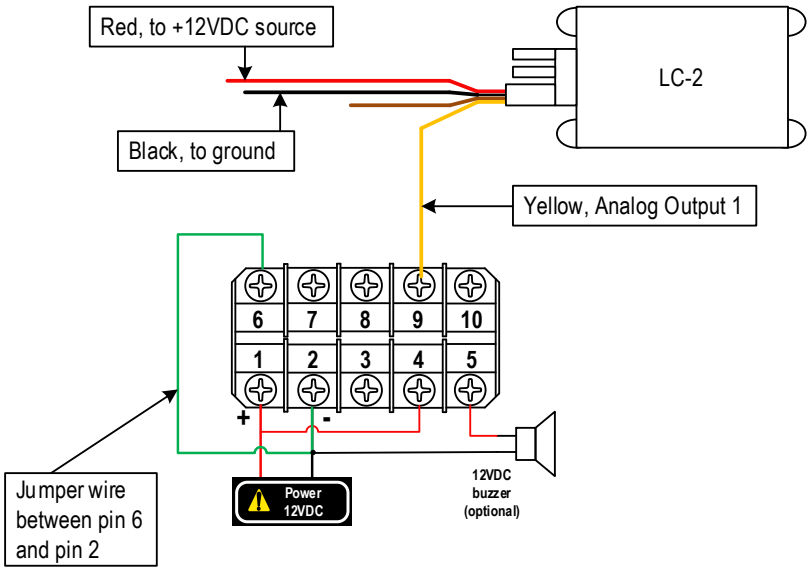

Figure 1. Connect the SYL-1813 and LC-2 Sensor Controller together.

B. Configure the SYL-1813 Gauge

There are a few parameters need to be changed in order to read the LC-2 sensor.

1) Under the access code 0089. The parameter **Inty**, **dot**, **PuL**, and **PuH** in this menu need to be changed. To access this menu, press the SET key shortly, enter the code 0089, then press the SET key again to enter the parameter setting mode.

- Change the sensor input type INTY ("InEY") to read 5V analog signal. To read the analog signal from LC-2 sensor, the gauge's sensor input type need to be set to "5V" on SYL-1813 (displayed as "5u") or set to "0-5V" on SYL-2813 (displayed as "0-5u").
- Change display resolution DOT ("doE) to 2. The default resolution of the meter is set to 0.01. This is also the commonly used resolution for AFR or Lambda. If that is not the resolution you want to use, you can change the setting for dot. Otherwise, just leave it as is.

- Set the display scale, PuL ("PuL") and PuH ("PuH"). These two parameters determine what the meter should display when input signal is at 0V and at the 5V. Most oxygen sensor does not output higher than 4.5V. You need to extend the factory provided data to find out what is the supposed APR or Lambda value at 0V and 5V, assuming the output is linear to the full 0V - 5V range. To display AFR from the LC-2 sensor, we need to set PuL = 7.35 and PuH = 22.39 according to the LC-2 manual. (Please see Appendix 1 for how to calculate these values if the AFR values at 0 and 5V are not provided.)

Once you finished setting these parameters, find "END" in the menu list, and press the SET key to exit this menu. The details can be found in section D.1 of the instruction manual of SYL-1813.

2) Change the alarm settings under the access code 0001.

To set the alarm reply to pull in at 17 and drop off at 16.9, use the access code 0001 to enter the alarm setting menu, set AH1 = 17.00 and AL1 = 16.90. The detail can be found in section D.2 of the instruction manual.

Table 1. Configure parameters on SYL-1813 gauge to read LC-2 sensor.

Code	Parameter	Default Value	New Value
0089	Inty	K	5V
	DOT	00.00	00.00
	PuL	00.00	07.35
	PuH	03.15	22.39
0001	AH1	900	17.00
	AL1	800	16.90

3) Access the peak-holding function under access code 0037.

The peak-holding function is to record and display the maximum value. To check the peak value from the last run or display the value in the peak-holding mode continuously, press the ">" key shortly. The MAX (MIN) indicator will lit up, indicating that the display is in the peak mode. Press ">" again to return to the normal operating mode. Press and hold the "Λ" key for 3 second will clear the memory of the peak value. The gauge can also record the minimum value and the time when the peak values are recorded. To access these features, please refer to the section D.3 in the manual for details.

C. Appendix 1.

The manual of LC-2 sensor has specified that for the Analog Output 1, 0 V output is for an AFR of 7.35 and 5.0 V output is for an AFR 22.39. And the manual of LC-1 sensor has specified that for the Analog Output 2, 0 V output is for an AFR of 7.35 and 5.0 V output is for an AFR 22.39. So, there is no need to calculate the PuL and PuH values, simply use 7.35 for PuL and 22.39 for PuH.

Method to determine the scaling parameters for air/fuel ratio sensor.

An air/fuel ration sensor has specified in the installation guide to set the voltage vs AFR relationship as the following:

0.88333 Volts at AFR: 10, or Lambda 0.68;

4.21667 Volts at AFR: 20, or Lambda: 1.36.

Note, the Lambda is for Gasoline engine, based on stoichiometric ratio = 14.7

Displaying in AFR

We assume the AFR is linear in the entire 0 – 5 V range. It can be described as

$A = aV + b$

where, A is the air fuel ratio (AFR), V is the voltage signal, a and b are constants.

From the data above, we have

$10 = a*0.88333 + b$

$20 = a*4.21667 + b$

So, we can find that $a = 10 / (4.21667 - 0.88333) = 3.00$, and $b = 7.35$.

Then we have

A = 3*V + 7.35

Therefore, when V = 0, A = 7.35. When V = 5, A = 22.35

So, PuL = 7.35 and PuH = 22.35.

Displaying in Lambda

We assume the Lambda is linear in the entire 0 – 5 V range. It can be described as

L= a*V + b

where, L is the Lambda, V is the voltage signal, a and b are constant.

For gasoline, the stoichiometric ratio is 14.7. From the data above, we can find

a = 0.68 / (4.21667 - 0.88333) = 0.20, and b = 0.50

L= 0.20*V + 0.50

Therefore, when V = 0, L = 0.50. When V = 5, L = 1.50

We set PuL = 0.50 and PuH = 1.50.

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