

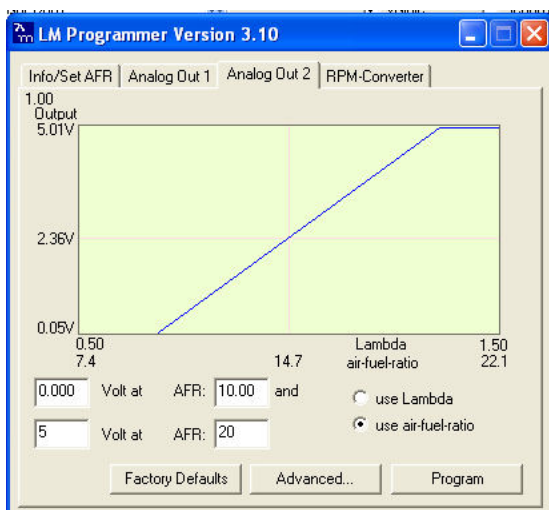
How to datalog Wide Band O2 from an LM-1 through an Autoprom Using a 1227727 ECM (1227730) and bin \$8D

This is just one of the many ways to datalog wide band O2 (WBO2) data using the Innovate LM-1. This setup is for a 1227727 ecm and bin \$8D only. However, you may be able to adapt this information for use in other ecms and programs.

Equipment/Software used:

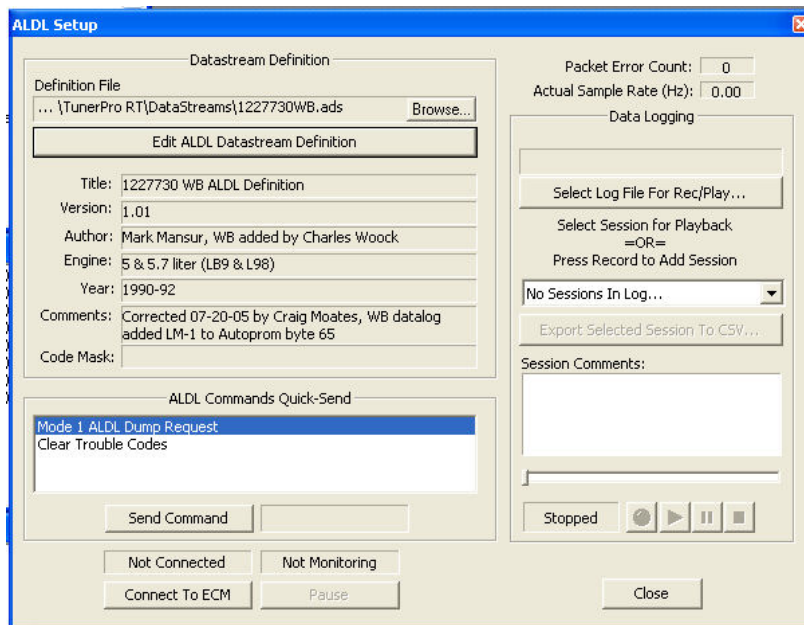
1. Innovate LM-1 Digital Air/Fuel Ratio Meter
2. LM Programmer (comes with LM-1)
3. Autoprom (APU1) From Craig Moates at Moates.net
4. Tuner Pro From Tunerpro.net (comes with the Autoprom)
5. APADC A/D Connector From Craig Moates at Moates.net

1. Open the LM Programmer software that came with the LM-1 and go to "Analog Output 2". Select "Use air fuel ratio" and make the changes shown below and click the "Program" button.



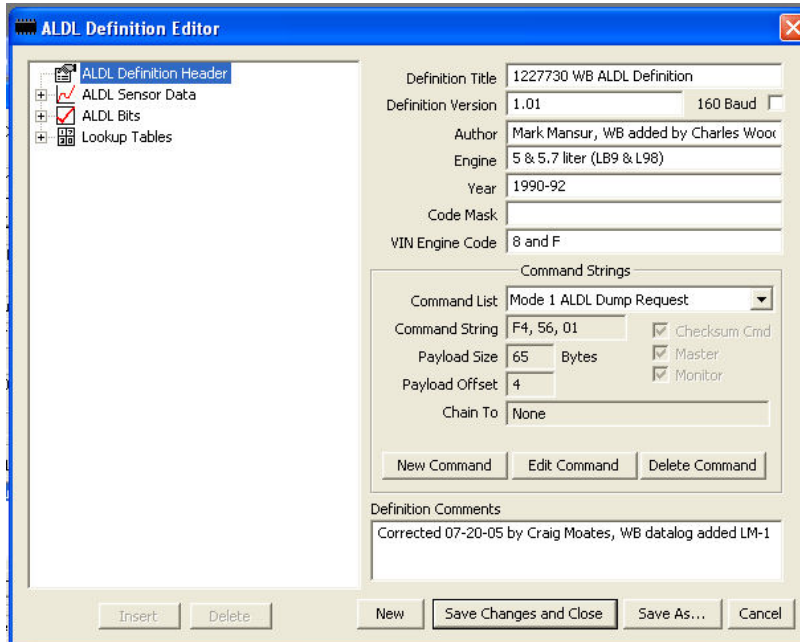
These values make the following formula true $AFR = v * 2 + 10$, where v is volts more on this later. You can use other values but you will have to change the formula to match... You may notice that the LM Programmer rounds off some of the numbers if you close and reopen the program. This is OK.

2. Now you need to edit the ALDL definition file. This is necessary so the data has a place to go when you are datalogging. Open Tunerpro and go to ALDL setup found in the Tools menu (see below).

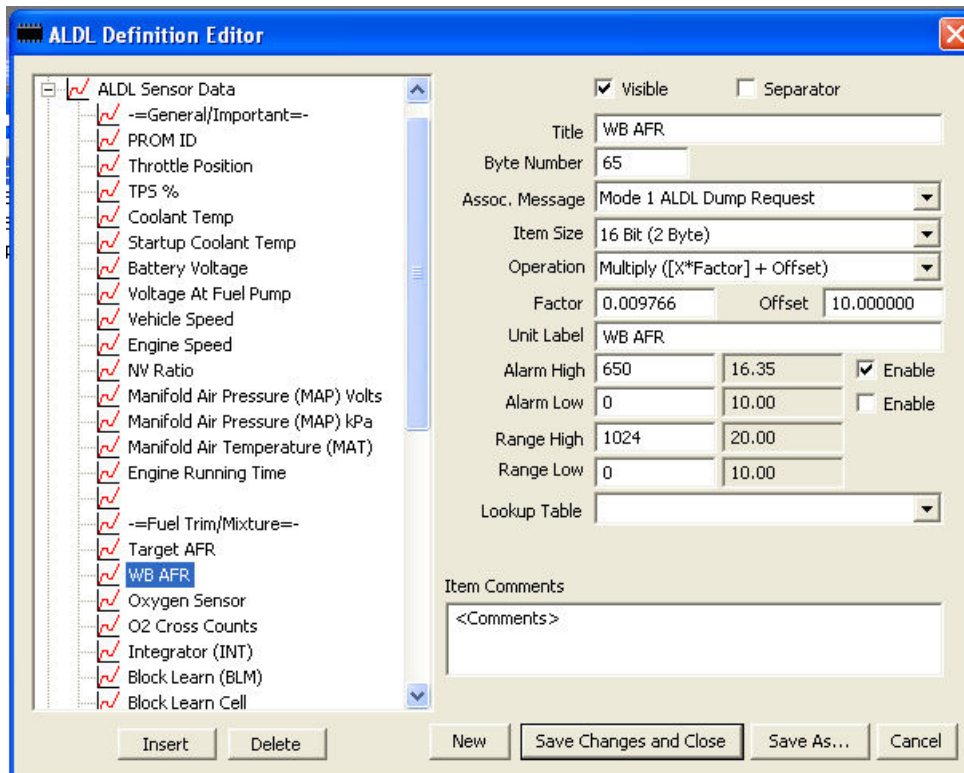


You will notice that I have already saved this ALDL definition file with a new file name. Your file name is what ever you are using. I recommend that you do a "Save As" and change the file name with the modifications. This way you can always go back to the original file and start over (this is done at the end of these instructions).

3. Click the "Edit ALDL Datastream Definition" button.



4. Click the "ALDL Sensor Data" item to expand the list. You can add the new item anywhere but I added it right under the Target AFR item. Click on Target AFR then the "Insert" button. This will add a new item. You need to populate all of the entries as shown below. However, the "Alarm High" and Enable are up to you. I set this at 16.35 AFR because I am running a race application and want to know if I get that lean. For street applications and daily drivers using highway mode you will want to set this higher. Change this by increasing the numbers in the left column. (Change the 650 to 800 or what ever you want.)



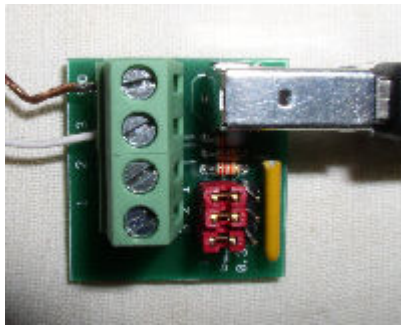
The output of the LM-1 is 0 to 5 volts. This signal goes into the Autoprom and is sent out in the ALDL stream, in two Bytes (16 bits, Byte 64 and 65), as a digital 0 to 1024 signal. So, 0 to 5 volts corresponds to 0 to 1024. The "Factor" shown in the screen shot above is $10 / 1024 = 0.009765625$, which is used since the ALDL operation allows only one factor. I typed the whole decimal shown here into that window. You can see that Tunerpro rounded it off. I don't know if it is rounded off just for display or if this rounded number is used in the calculations.

Now for a couple details regarding this window and the formula used. The actual formula is $AFR = ((\text{highrange} - \text{lowrange})/1024) * X + \text{lowrange}$, where all the stuff in parenthesis is the "factor" and X is the raw data coming in from the Autoprom. E.g. 10 to 20 AFR is ... $AFR = ((20 - 10)/1024) * X + 10$

6. Click the "Save As" button and save your new definition file. I highly recommend you change the name.

Now for the Hardware

1. The LM-1 comes with an analog output cable with bare wires on one end. One way to find the output for "Analog 2", which you setup in the first step above, is to leave your engine off and turn on the LM-1. You should get a very high AFR. This will cause the Analog 2 output voltage to be very close to 5v. Put a multimeter on the bare wire ends and find the one with 5v. Connect the two wires to the APADC board and plug the other end into the Autoprom. Leave the jumpers in the 1x gain position (shown in red in the picture below).



Trouble shooting

If you have troubles with the values being displayed in the ALDL (should be between 10 and 20), change the factor to 1 and the offset to 0 in your Wideband item definition (ALDL definition file). Turn everything on with the engine off. You should see a raw signal of 1024 coming from the Autoprom. You will notice that I have the 0 to 5 volt wire connected to the number 3 terminal. My original adapter only worked using this terminal. (Craig has since helped me with this.) So you may have to try different wire terminals on the APADC board.

You must also have a multimeter so you can check the output voltage from the LM-1. Remember 1024 corresponds to 5 volts. If you measure a little less, you'll have a little bit less than 1024 on the ALDL. Once you get this all hooked up properly, change your factor and offset back as indicated above.