

# Four Channel Bosch LSU4 Wide Band UEGO Controller

Part Number 220-VM-AF4-1234

## Module Configuration Setup:

Module Type: AF\_MODULE

Serial Number: 841-844

Output Units:  Lambda  A/F Gasoline  A/F Methanol  \_\_\_\_\_

### Channel #1:

Channel Name: A/F Cyl 1

Sample Rate: 50/sec

### Channel #2:

Channel Name: A/F Cyl 2

Sample Rate: 50/sec

### Channel #3:

Channel Name: A/F Cyl 3

Sample Rate: 50/sec

### Channel #4:

Channel Name: A/F Cyl 4

Sample Rate: 50/sec

## Module Installation:

Mount the controller in a location that does not expose the module to excessive heat, moisture and vibration. Plug the blue connector in to your data loggers V-Net system. This module is compatible with all V-Series data loggers except the V50 record/playback module.

WIRE COLOR	WIRE FUNCTION	MINIMUM WIRE GAUGE REQ.
RED WIRE	12V TO 18V MAIN SUPPLY POWER	16
BLACK	MAIN SUPPLY GROUND	16
ORANGE	SWITCHED POWER	none

### Heater Power Connection

The **red** and **black** wires, exiting the rear of the housing, supplies the main power for the sensor heaters and controller once they are switched on. The **orange** wire, exiting the rear of the housing, turns on the power for the sensor heaters and controller. The controller can draw up to 6-8 amps when all four heaters

are running. This requires that you make certain all of your power and ground connections are solid and all wiring is at least 16 gauge. Connect the **black** wire to a solid chassis ground and the **red** wire to constant 12-18 volt power. It is highly recommended that you connect the **red** wire power on the switched side of the vehicles master power safety switch. **Do not** run the main power wires (red and black) through an on/off switch. Connect the **orange** wire to switched 12-18 volt power to turn on/off the main power to the AF4 controller. The air fuel controller and sensor heaters will turn on when power is applied to the orange wire.

### IMPORTANT!!

The sensor heaters will turn on and draw up to 6-8 amps of current anytime the power is applied to the orange wire.

## Sensor Installation

We recommend installing the sensors in individual cylinder tubes. Mounting the sensor in the collector is not recommended since oxygen can pass back over the sensor during overlap causing lean readings, particularly at low engine RPM. Weld the sensor bung approximately 12 inches from the header flange. Mounting the sensor too close to the exhaust valve can cause the sensor to overheat. To avoid sensor damage from condensation, do not mount the sensor on the bottom of the exhaust tube. Each sensor has been calibrated at the factory to a specific channel in the controller. Plug each sensor into the appropriate wire harness according to the label on each sensor. If the sensors get mixed up or you need to replace a sensor, you will need to recalibrate the controller as described later in this manual. Each cable will be labeled with the intended cylinder number.

### IMPORTANT!!

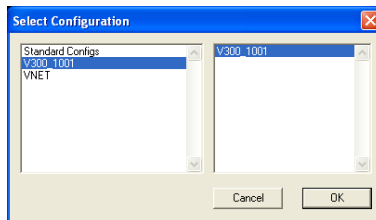
Do not run the motor for an extended period of time without having the power turned on to the controller. Running the motor without the sensor heater turned on can damage the sensor. If you are not using the sensors remove them from the pipe and use the plug provided with each sensor.

## Software Setup and Module Configuration

You must have DataLink II version 3.0a or higher installed in your PC. This module has been factory configured as described in the setup box located at the top of this page. If you purchased this module as an upgrade to an existing system, you will need to update your car configuration file before you will be able to access the information from this module. Please refer to the setup instructions below. If this module was purchased with a complete data logger system from Racepak and it is not an upgrade to an existing system, no further setup is required and you do not need to perform the steps below. However, it is highly recommended that you read through all of the instructions to familiarize yourself with the software setup procedure.

Before you can use this module as an upgrade to an existing V series data logger you will need to update the logger configuration file in your PC by following the steps below.

1. Connect your PC to your data logger via the serial interface cable that was provided with your data logger.
2. Turn the power on to the data logger and the air/fuel sensor controller.
3. Start the DataLink program on your PC.
4. Open the data logger configuration file by selecting **Open Car Configuration** under **File** from the menu bar. The following dialog box will appear.

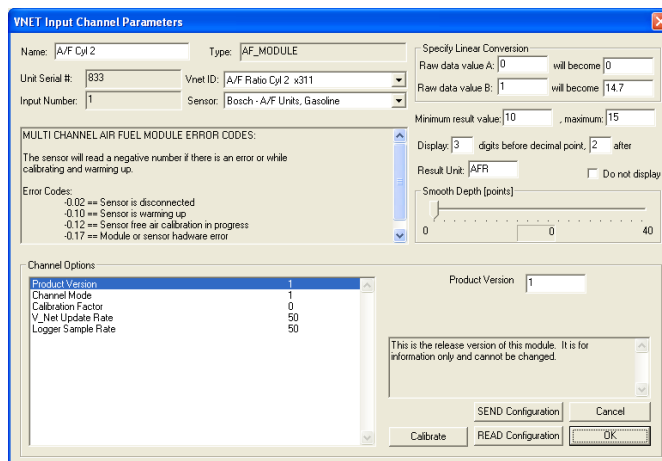


5. Select the configuration that contains your logger type and serial number. Example: V300\_1001
6. Left click on **Edit** from the menu bar then select **Read VNET Config**.
7. A message box will appear and you should see data scrolling down. When finished you should see a message stating **DEVICES READ SUCCESSFULLY**, click on the OK button. If you get any error messages check the serial cable and power connections and try again.
8. Save the updated configuration file by left clicking **File** on the menu bar and selecting **Save**.

You should now see four new channel buttons added to the configuration file representing this module. The buttons will be labeled "A/F Cyl 1", "A/F Cyl 2", "A/F Cyl 3" and "A/F Cyl 4".

### Changing the Module Setup:

The default parameters should work fine for most applications. If you need to edit the setup parameters on this module, position the mouse cursor over the button of the channel you wish to modify and click the right mouse button. The VNET Input Channel Parameters dialog box will be displayed.



### Setting the Sensor Type:

This module can be programmed to output the air/fuel ratio in the following units.

- Lambda (fuel independent)
- AFR for gasoline
- AFR for methanol
- Custom units (use for fuels not listed)

To change the output units, left click on the drop down arrow button next the the box labeled 'Sensor' then make your selections. If you select the 'A/F Units, Custom' sensor type for a fuel other than gasoline or methanol, you will need to enter the fuels stoichiometric air fuel ratio value in the 'Raw data value B' 'will become' box. You will also need to enter the minimum and maximum result values. When you have fishished making all changes you must send the updated configuration to the module by following the instructions in the **Sending the Configuration to the module** section below.

### Setting the Sample Rates

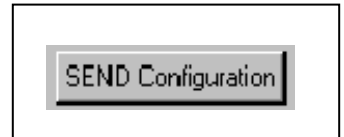
The factory default sample rate is set to the maximum of 50 samples per second. If you wish to lower the sample rate to attain longer recording times, simply change the 'V\_Net Update Rate' and 'Logger Sample Rate' to the disired value. The 'V\_Net Update Rate' should be set to value which is equal to or greater than the 'Logger Sample Rate'. When you have fishished making all changes you must send the updated configuration to the module by following the instructions in the **Sending the Configuration to the module** section below.

### Setting the Channel Mode

If you are not going to use a sensor with one of the channels, for instance you have a four channel controller but are using only three sensors, you should set the channel mode for the unused channel to **Disabled**. If you do not disable the channel the LED indicator on the control box will flash an error indicating the sensor heater is not present. When a channel is disabled the LED indicator on the control box will ignore all errors on that channel. Also, the recorded data will display a error code value of -0.17 to indicate the channel is disabled.

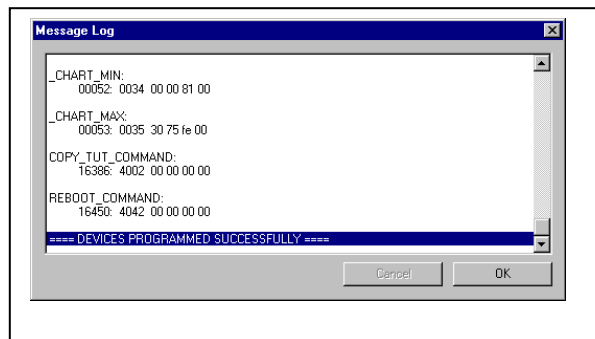
### Sending the Configuration to the module:

When you have finished editing the configuration on your PC, you will need to send the information to the sensor module. Be sure the serial interface cable is connected to your data logger and power is applied to the system. To send the information position the mouse cursor over the **Send Configuration** button and click the left mouse button. The progress box as shown below will be displayed.



When finished sending the message "**Device Programmed Successfully**" should be displayed at the bottom of the progress box. If you receive an error message, turn power to the system off and then back on and repeat the send configuration process. If problems persist contact RacePak.

Save the configuration file to disk and update the Module Configuration Setup Box on the front of this worksheet with the new setup configuration.



## Operation:

The sensor heaters require approximately 45 seconds to warm-up. You must turn the power on to the controller early enough that the sensors have time to warm-up. While the sensors are warming up they will output a data value of  $-0.10$ . If you get this value during the run this means you need to turn the power on earlier.

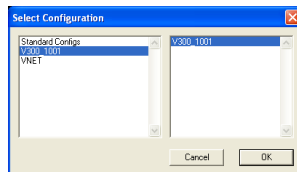
The LED on the top of the box is a status indicator. A solid LED indicates that all four sensors are ready. A flashing LED means one or more sensors are warming up or have a problem depending on how fast the LED is flashing.

- **Solid LED**  
Indicates that all four sensors are warmed up and ready.
- **Slow flashing LED (1 flash per second)**  
Indicates that one or more sensors are warming up or performing a calibration. At least one sensor is not yet ready. No action is required, the LED should go solid within a minute.
- **Fast flashing LED (5 flashes per second)**  
Indicates that one or more sensors has an error. The problem must be resolved before the air fuel sensor(s) can take data. Follow the troubleshooting instructions below.

## Free Air Calibration:

A free air calibration is also recommend to correct for changes in atmospheric pressure and sensor wear caused by leaded fuels and aging. Before starting a free air calibration, the sensor must be removed from the exhaust and exposed to open air. A free air calibration must be initiated manually by following the instructions below.

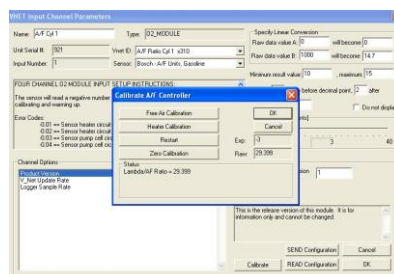
1. Connect your PC to your data logger via the serial interface cable that was provided with your data logger.
2. Turn the power on to the data logger and the air/fuel sensor controller.
3. Start the DataLink program on your PC.
4. Open the data logger configuration file by selecting **Open Car Configuration** under **File** from the menu bar. The following dialog box will appear.



5. Select the configuration that contains your logger type and serial number. Example: V300\_1001
6. Right click on the channel button of the A/F channel you wish to calibrate.



7. The VNET Channel Input Parameters dialog box will open. Click on the 'Calibrate' button in the lower right hand side of the dialog box.



8. The status of the A/F channel will be displayed at the bottom of the dialog box. Before performing a calibration, make sure the sensor is not still warming up and that there are no errors. Do not use the Heater Calibration, Restart or Zero Calibration buttons. If you have installed a new sensor in this channel perform a free air calibration. When you have finished click on the OK button to exit.

**IMPORTANT!!**

You must remove the sensor from the exhaust and expose the sensor to open air before performing a free air calibration. After removing the sensor from the exhaust, wave the sensor back and forth a few times to be sure all of the exhaust gases are purged from the sensor.

**Free Air Calibration (using a calibrate button):**

It is recommended to periodically perform a free air calibration to correct for sensor wear caused by leaded fuels and aging. Before starting a free air calibration, the sensor must be removed from the exhaust and exposed to open air. A free air calibration can be initiated by following the instructions below.

**CAUTION:** Be careful when handling sensors during/after calibration as they will be **HOT**. Ensure sensors are clear from any items as sensors may burn anything that comes in contact with them.

**NOTE:** If the CALIBRATE button is not readily accessible, you can also perform a free air calibration using the DataLink software.

- 1) Remove each sensor from the exhaust pipes and leave exposed to open air.
- 2) Turn on the controller and wait for the status LED to glow solid red.
- 3) **Press AND hold** the CALIBRATE button on the controller for at least 3 seconds. The status LED will begin to flash. This confirms the unit is ready to begin the calibration procedure.
- 4) After at least 3 seconds, **release** the button and within the next 5 seconds, **press AND release** the CALIBRATE button once again, to confirm that you want to perform a free air calibration. The status LED will flash rapidly while performing the calibration (only happens for a few seconds).
- 5) Upon successful completion of the calibration process, the status LED will glow solid red.
- 6) Calibration is finished.
- 7) Shut off all power, let sensors cool down before handling.
- 8) Re-install in exhaust pipes.

**Troubleshooting**

There are two method used to indicate that there is an error on one or more channels.

1. The channel will output a negative value to indicate an error. If the recorded data shows a negative value, the data is invalid.
2. The LED on top of the controller does not go solid after a few minutes and is flashing quickly, about 5 flashes per second. This indicates that an error has occurred on one or more channels.

<b>PROBLEM</b>	<b>RECOMMENED SOLUTION</b>
I get a negative reading on one or more channels.	A negative reading indicates an error has occurred. Look at the error code chart below to determine the exact cause of the error.
The LED on top of the controller never stops flashing.	A continuously fast flashing status LED indicates that an error has occurred on one ore more channels. Perform the calibration procedure outlined above on each channel. The status box will describe the cause of the error.
I am using the sensors with methanol and the reading are very lean.	The factory default configuration is set to output air fuel ratio units for gasoline. Follow the steps outlined in the 'Software Setup and Module Configuration' section to set the sensor type to 'A/F Units, Methanol'