OberBuilt 8 Channel Wideband 02 Controller

Comprehensive User's Manual

Overview:

The OberBuilt WB8m system is designed to operate eight wideband oxygen sensors which are typically used to monitor the air/fuel ratio in the individual cylinders of an engine. The unit is programmed to report the air/fuel ratio as lambda or the exact stoichiometric value for any fuel can be configured. The unit sends this data back to the Engine Controller or Data Acquisition system via CAN bus. The CAN bus protocol can be custom configured for just about any system. The unit is configured to work with a variety of different oxygen sensors. Wiring harnesses are included for easy plug and play installation of the oxygen sensors.

The OberBuilt 8 Channel Wideband Controller must be programmed for it to function properly. This is primarily to make sure the specific wideband oxygen sensor used is correct as well as the correct CAN bus protocol entered. **Do not connect the wideband oxygen sensors to the unit until it has been programmed.**

The WB8m controller is programmed via Wi-Fi. The unit must initially be connected directly to a laptop/PC via Wi-Fi for configuration. After this, it may continue to be connected directly to the laptop, or it can be set up to be connected to a Wi-Fi network. The software is used to update firmware on the unit, make programming changes, and when using the monitoring and logging functions on the unit.

Currently supported wideband oxygen sensors are:

- Bosch LSU4.9
- Walker 250-25001 – Preferred for leaded and methanol fuel

Warnings:

- Do not connect either of the wideband band oxygen sensor harnesses or the main power and grounds to the controller until the controller has been fully configured properly
- Do not modify the oxygen sensor harnesses
- Use ONLY the oxygen sensors specified by OberBuilt. Do NOT use non-OEM sensors.

Kit Contents:

- WB8m Controller
- Terminated 4 Channel Wideband Oxygen Sensor Harness Channels 1-4
- Terminated 4 Channel Wideband Oxygen Sensor Harness Channels 5-8
- Switched Power/Ground/CANbus Cable terminated at controller end
- High Current Power and Ground Screws and Covers

User Supplied Component

The user will need to supply the following components:

- Wide band Oxygen sensors
- Wideband Sensor Mounting Bungs
- Connector/Pins to connect CANbus wiring to their specific system
- Wiring and ring terminals (10 gauge recommended) for high current power and ground supply
- Mounting hardware (1/4" diameter). Rubber isolators are recommended

Controller Mounting

The mounting holes are designed for up to a ¼" diameter fastener. It is always recommended to use a rubber isolation mount when installing the unit. Do not overtighten the fasteners on the mounting ears. Just as with any electronic device, it is recommended to keep the controller as far away from noisy/high voltage sources as possible.

Wiring Installation

WARNING – Do NOT connect the wideband oxygen sensor harness or high current power and ground lugs until the unit is programmed.

The harnesses included for the wideband oxygen sensors are plug and play. The two harnesses are keyed differently (Channels 1-4 have three keys and 5-8 are a four key connector).

The main power (red) and ground (black) connectors supply power and ground for the oxygen sensors. A 10 gauge wire (no smaller) is to be used. Make sure the power is run through a fused source with a 25-30 Amp fuse.

The 5 pin M12-CAN connector contains four wires: CAN Hi and Low, switched power and ground. This must be connected to the proper connection on the controller which is the one located under the "Built" in the OberBuilt logo. The ground wire should be connected to a clean ground source (not to any dirty/high voltage ground connections). The switched power wire is used to turn the unit on. When switched power is applied, the unit will turn on, and the oxygen sensors will be heated and draw current. The unit will turn off when the switch power is turned off. It is advised to connect this wire to a switch or use an output out of the ECU that only turns the sensors on once the engine is started so that the battery is not run down.

Proper CAN Cable Installation Location

White Wire – Switched Power

Black Wire – Clean ground source

Brown Wire – CAN Hi

Orange Wire – CAN Lo

LED Operation

At power on, each channel LED will flash rapidly (for approximately 3 seconds) to indicate the sensor type configured as follows:

Color	Description
	GREY – channel set to disabled
	BLUE – Bosch 4.9
	GREEN – Walker 250-25001
	YELLOW – reserved for future
	RED – reserved for future
	PURPLE – reserved for future
	CYAN – reserved for future

After the rapid flashing, the controller will enter operational mode with the LEDs indicating as follows:

Color	Description
	GREY – channel set to disabled
	YELLOW/PURPLE ALTERNATING – main power is off
	ORANGE – channel is heating
	GREEN – channel is active
	YELLOW – channel is uncalibrated (likely due to temperature out of spec)
	RED – channel is open circuit (broken wire or damaged/disconnected sensor?)

Oxygen Sensor Mounting

Oxygen sensors should be mounted such that they don't accumulate condensation when the engine is not running. The sensors should be pointed up with a minimum of a 10 degree angle from horizontal. Sensors ideally should be at least 12" from the cylinder head port so that the sensor does not overheat. Keep them about 10-12" from the collector merge as well to help reduce reversion from other cylinders. Sensors ideally will have a minimum of 18" before the exist of the exhaust. Shorter distances can compromise readings when not at wide open throttle.

Communicating/Programming the Controller

The unit as-received needs to be programmed for use. Programming is performed by connecting any device with a web browser (i.e. laptop, PC, tablet, phone, etc.) via Wi-Fi communications with the controller.

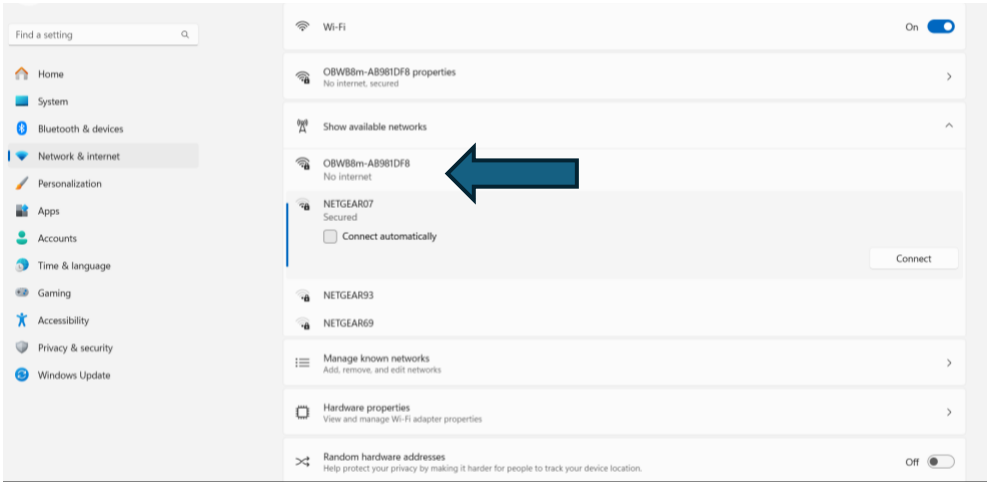
To connect, the switched power and ground need to be supplied to the unit (white and black small gauge wires in the CAN/Power cable. The large gauge power and ground connections do not have to be connected to communicate with the unit. Note, the proper connector on the unit to connect to is the one under the "Built" in the OberBuilt logo.

A laptop/PC can connect directly with Wi-Fi to the OBWB8m controller (meaning no network Wi-Fi is needed). When this done, the laptop's Wi-Fi connection will be tied to the controller and can't be used to connect to a Wi-Fi network (unless the laptop has multiple Wi-Fi connections or connected via Ethernet). After the unit is programmed for the first time, the unit can be configured such that the OBWB8m controller connects to a network Wi-Fi connection, allowing the laptop can be connected to both the Wi-Fi network as well as the OBWB8m controller. This is explained below, but for the first time connection, a direct laptop to controller Wi-Fi connection must occur. To do this, you must disconnect any WiFi connections, such as to your internet network, at this time.

First time connection:

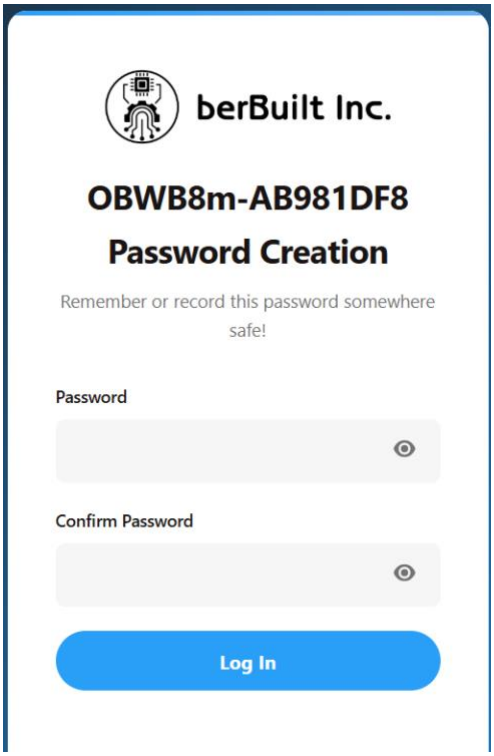
1. Power the unit (again, just switched power and ground are needed)
2. Go to the laptop Wi-Fi settings. Left click on the in the taskbar at the bottom of your screen if using Windows. (for Mac users select at the top of your screen and select "other networks") Alternately you can do a search for "Wi-Fi Settings" and select "Show Available Networks – This will bring up the image below. In either case, you should see the OBWB8m controller's Wi-Fi network name. It will show up as

“OBWB8m-########”. The number after the unit (i.e. OBWB8m-**1234ABCD**) will be the SSID (Service Set Identifier), which is unique to every OBWB8m controller. Record this number on a piece of paper.



3. Choose the OBWB8m in the Wi-Fi selections and select “Connect”. The first time you connect to a specific unit, it will ask for a password. Enter “**mypassword**”. This password will always be used and can’t be changed.
4. Once you are connected it will say “No internet, secured”.
5. Next open any web browser (Safari, Chrome, etc.)
6. In the browser enter the devices Wi-Fi network name with “**.local**” (i.e. “**obwb8m-1234abcd.local**”)

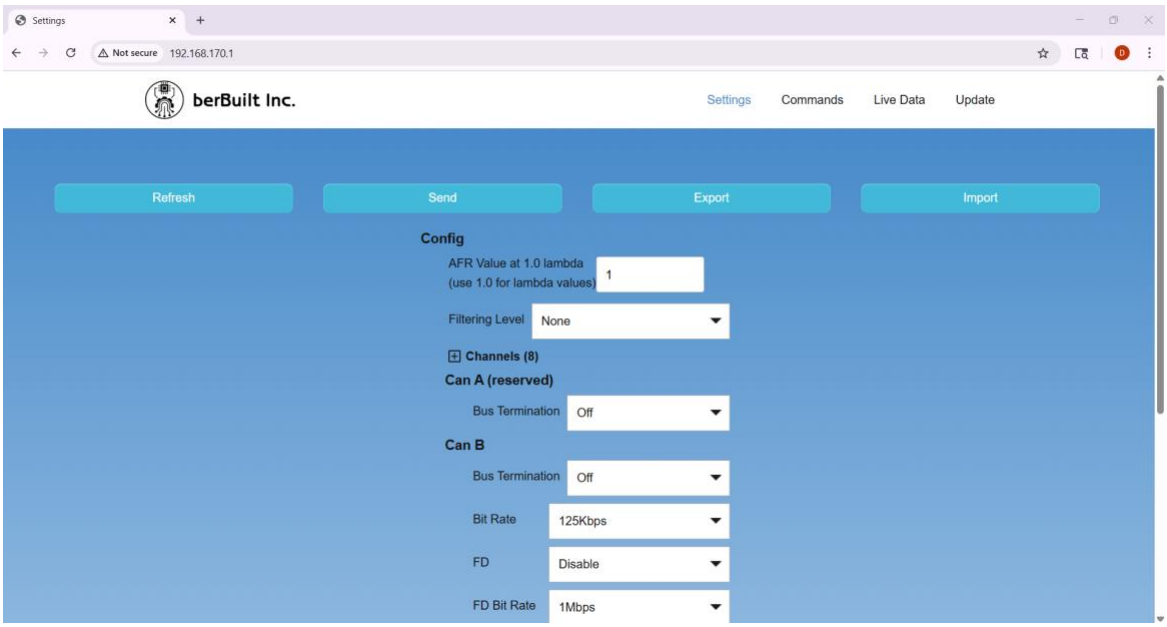
   Note: If you are having trouble connecting check for any applications or settings restricting network or website traffic. Some virus protection software may enable some WiFi settings that need to be changed or disabled.



7. Next, you'll be asked to create the password above as well. You can create any password you like, **however do not forget it**. If you are not worried about security you can make it "**mypassword**" as well for now, this can be changed later. This password will be specific to a single unit. This way others cannot log into the unit without knowledge of this password. In case of a forgotten password you will have to request a private unique password from OberBuilt (select "Forgot Password" in the login screen).

   If you want to change this password after it has been set, there is a "Change Password" option at the bottom of the software.

8. When it connects, you should see the "Settings" screen (below). At this point you are ready to program the unit.



Menus and Pages

Settings Menu

Refresh – Brings in the "calibration" that is in the unit into the laptop. Make sure you hit this when you open the software if you want to pull the calibration out of the controller every time. When in doubt that you have the calibration in the controller, just hit "Refresh".

Send – Sends the "calibration" that is in the laptop to the OBWB8m controller. Do this after you have made any changes.

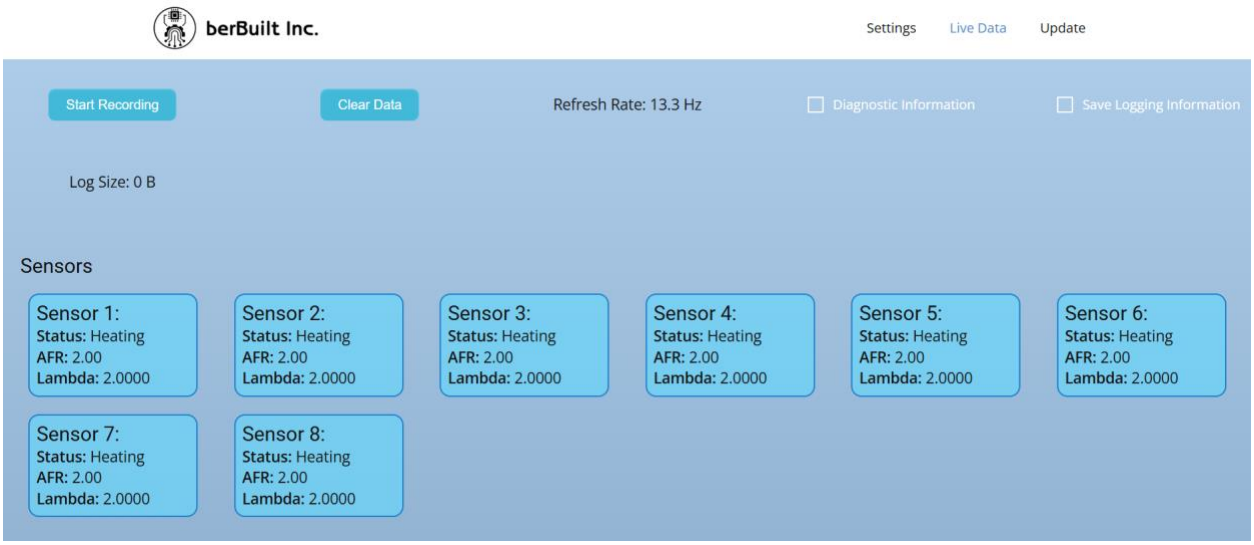
Export – Exports a calibration from the controller so that it can be saved to the hard drive. The file will be exported to the "Downloads" directory as a .json file. You can copy it elsewhere as well as do a "Rename" to change the name after it is downloaded.

Import – Opens a saved calibration that can be sent to the controller or edited. (You would "Import" then "Send" it to the controller.

Live Data

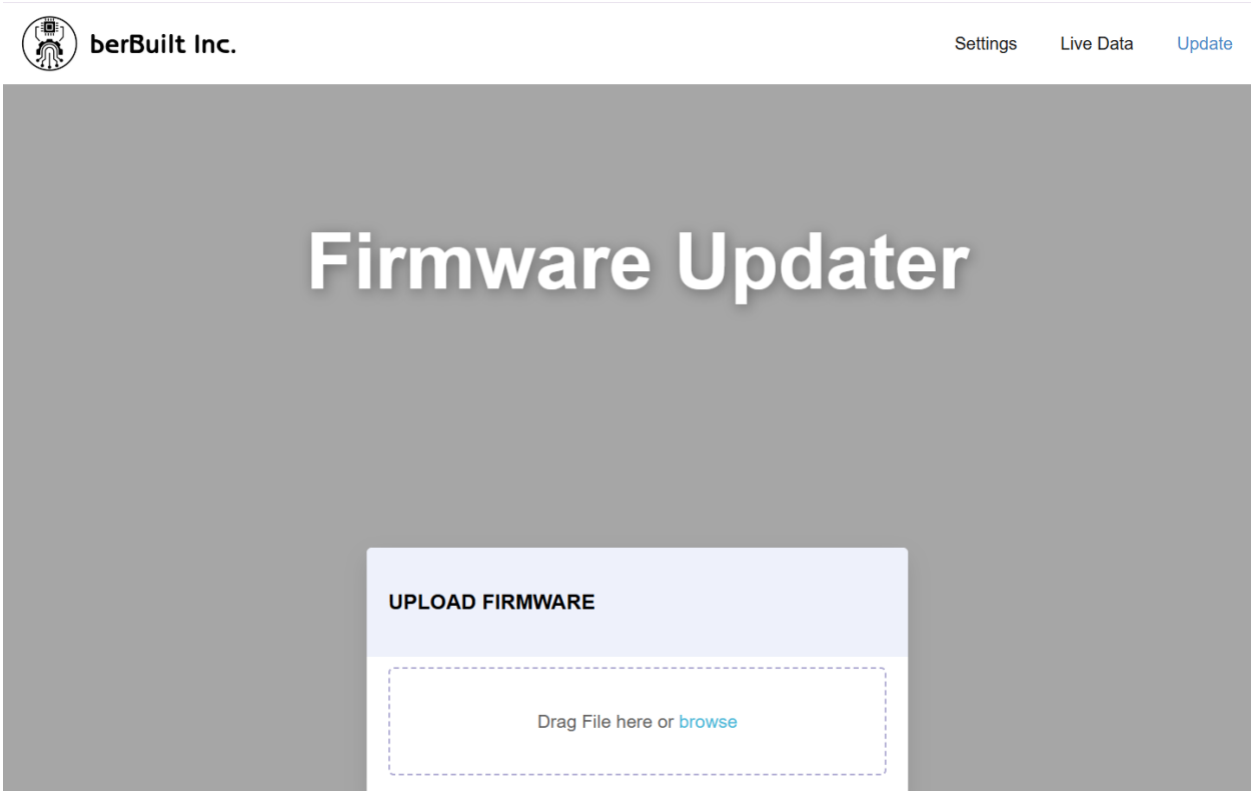
This area shows data for each channel as well as a strip chart in Lambda or AFR. You can also record data to an .csv file. To record data you must select the "Save Logging Information" check box. To add extra diagnostic information, you must check the "Diagnostic Information" checkbox as well (in most cases you will only need to do this if the

factory requests a “diagnostic log”). To start logging, select the “Start Recording” and then the “Stop Recording” tab. To just view the live data with no logging, make sure both checkboxes are NOT checked, and hit the “Start Recording” tab. This will start the flow of data.



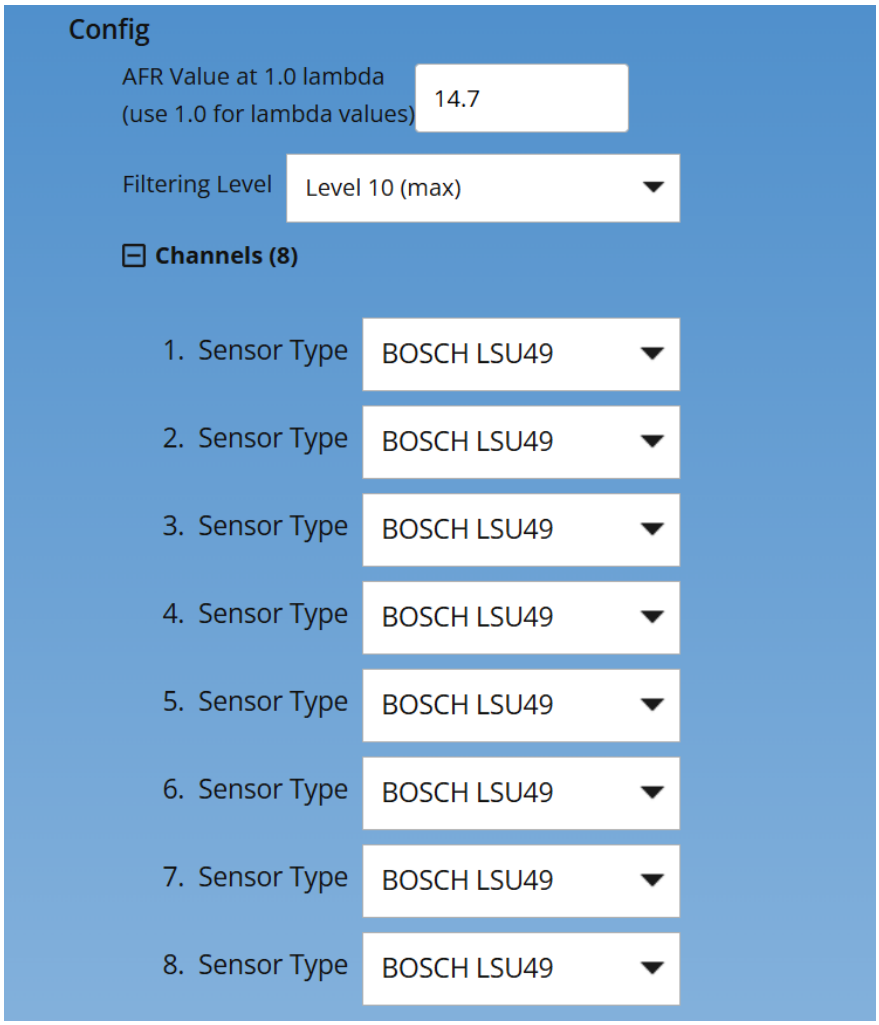
Update

This area is used to update the unit’s firmware. Once selected simply drag the firmware file (it will be a .fw file) into the window and follow the steps. The firmware version can be seen at the bottom of the screen.



Settings Details

The following is information on programming the unit.



Note, the information on this screen is mostly hidden, to view items click on the  to drill down into lower levels of information.

AFR Value at 1.0 Lambda: Put in the stoichiometric value for the fuel you are using (14.7 for gasoline, 9.7 for E85, 6.4 for methanol, etc.). To use Lambda enter 1.0, this will output the AFR in Lambda.

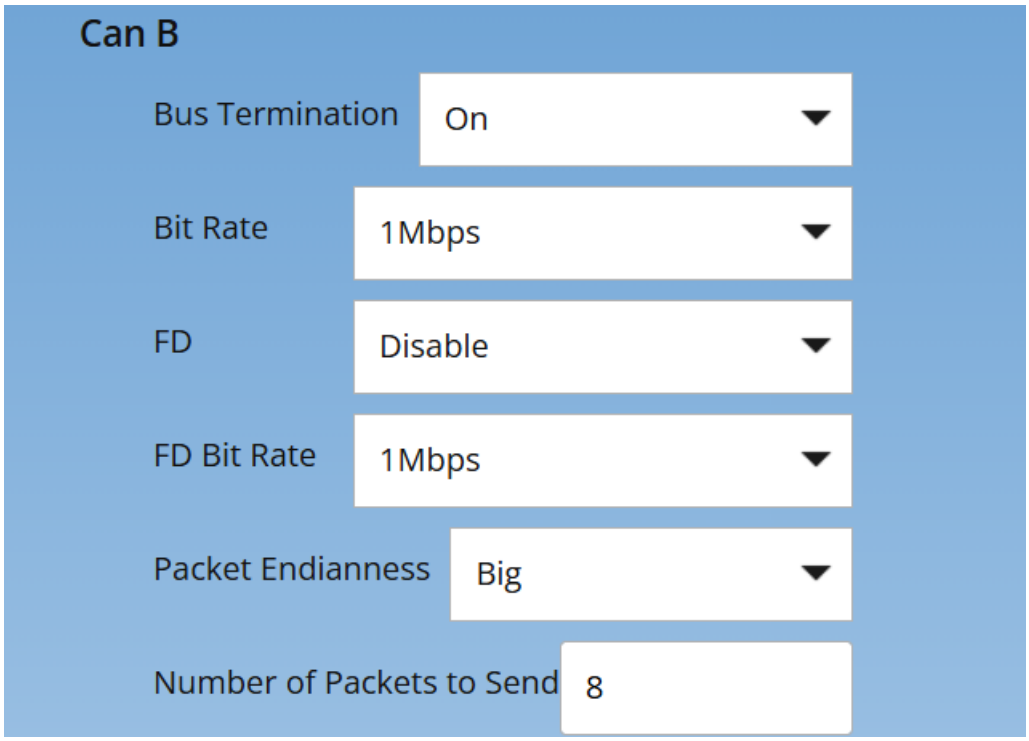
Filtering Level: Use this to filter the AFR readings sent out on CAN. Choose from "none", or 1 (minimum) to 10 (maximum). A value of 5-10 is recommended for most applications.

Channels (8): This is where you MUST select the 02 sensor being used. Not selecting this properly will damage the 02 sensor. Make sure you set all eight channels.

CAN A: This is reserved for future CAN bus add-ons.

CAN B: This is the CAN channel used to send data to the ECU/data acquisition system. This is the connector below the "Built" on the unit.

Can B Parameters:



Bus Termination: This can be set to ON or OFF. This should only be set to ON when the OBWB8m controller is the last device serial chain of CAN devices and there is no external terminator present.

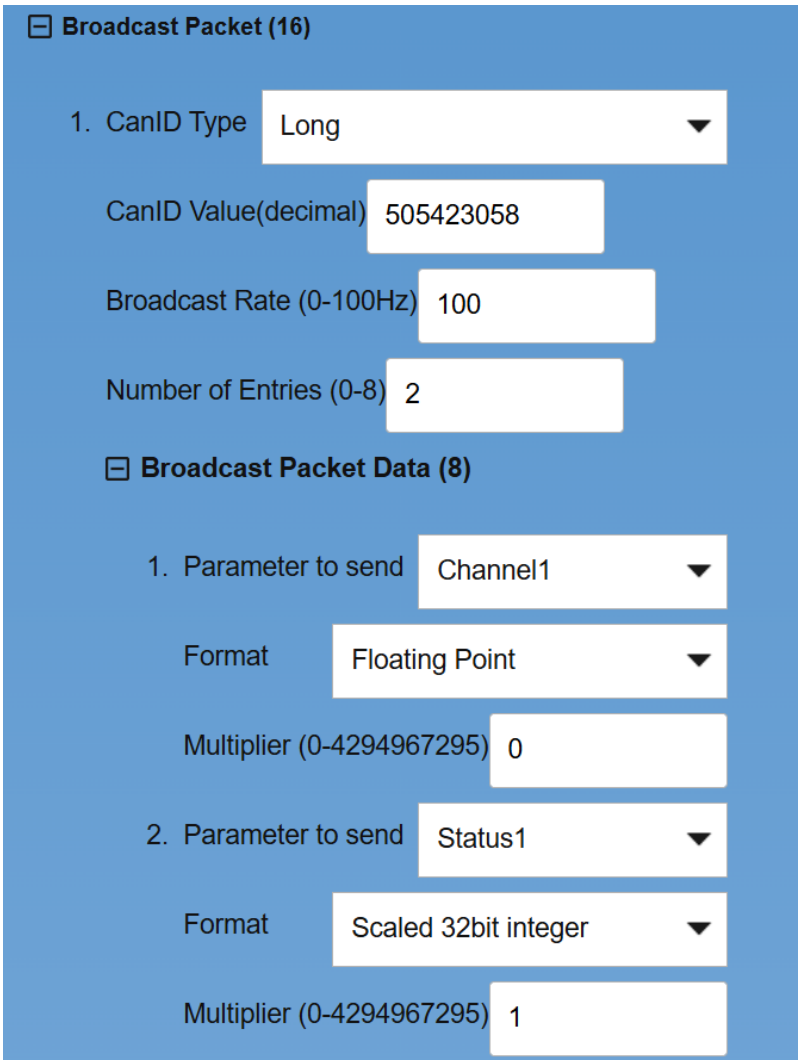
Set the following appropriately for your CAN network:

Bit Rate, FD, FD Bit Rate,Packet Endianness

Number of Packets to Send – This should be set to the number of sensors/channels used. For example it would be 8 with an eight sensors on an eight cylinder engine.

Broadcast Packet Setup:

Broadcast Packet (16) – The entries below this are used to configure the CAN Packet Data



Can ID Setup

CanID Type: Standard (11 bit) or Long (29 bit)

CanID Value (decimal): Range from 0-1023 (Standard) or 0-536870911 (Long)

Broadcast Rate (0-100Hz): Broadcast Rate

Number of Entries (0-8): Number of Packets

Packet Data Setup

Parameter to Send: Select desired parameter

Format: Select as desired

Multiplier: Select as desired

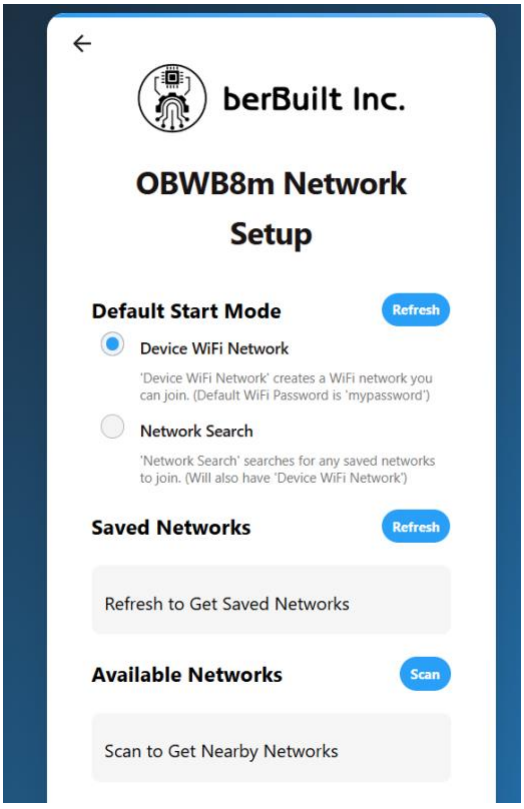
Changing Wi-Fi Setup

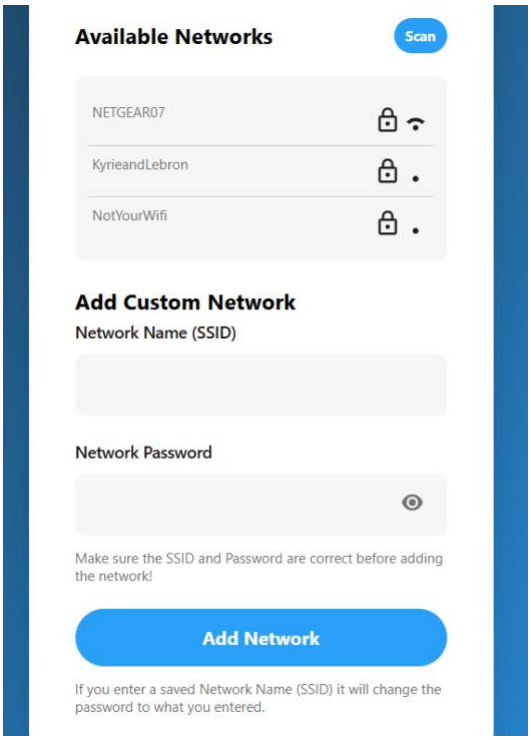
Once you perform the initial device Wi-Fi connection and password setup with a unit for the first time, you can use the software to allow for the OBWB8m to connect to a Wi-Fi network (instead of directly to a laptop). This will allow for the laptop to be connected the Wi-Fi network and the OBWB8m at the same time. Make sure the OBWB8m is getting a strong Wi-Fi signal if doing this. If the laptop has a weak signal, so will the controller and it will have problems connecting.

To configure this, at the bottom of the software in the footer area, select “Network Setup”. This will bring up the screen below. Next to “Available Networks”, select “Scan”. This will bring up all the network Wi-Fi systems detected (second image). Note the one you want to use. Next enter the network name/SSID from the Scanned networks and its password information.

This should then become one of the “Save Networks”, which can be seen by hitting the refresh button.

Finally, under “Default Start Mode”, select “Network Search”. This will automatically connect to any of the Saved Networks when you connect with the OBWB8m. Make sure you hit the “refresh” button anytime you are pulling up any of the information on this screen.




Available Networks
Scan
NETGEAR07
KyrieandLebron
NotYourWifi
Add Custom Network
Network Name (SSID)
Network Password
Make sure the SSID and Password are correct before adding the network!
Add Network
If you enter a saved Network Name (SSID) it will change the password to what you entered.