

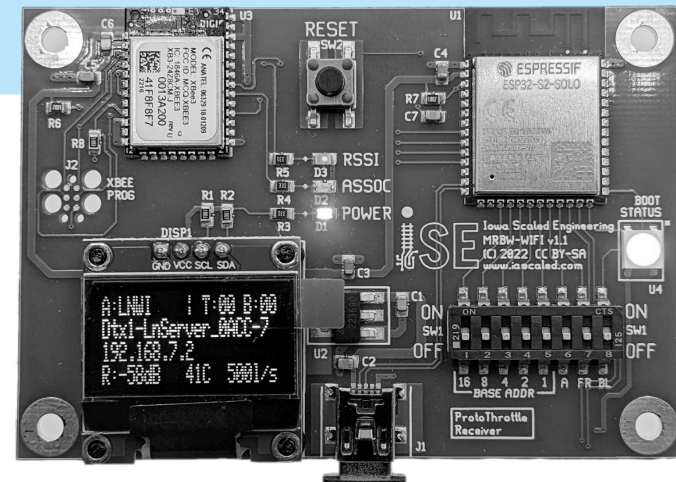


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[www.iascaled.com](http://www.iascaled.com)

# ProtoThrottle™

Realistic Control Stand Throttle



Receiver for WiFi Systems



IOWA SCALED ENGINEERING – ELECTRONICS MADE EASY

[www.protothrottle.com](http://www.protothrottle.com)



## Getting Started

For most users, getting started will just be a matter of powering up the unit using the included USB cable and power supply. If you need to change your base address from the default of zero, set the DIP switches to match what you have configured in your ProtoThrottle.

The new receiver will find Digitrax LNWIs, MRC WiFi modules, and ESU CabControl systems automatically and attach to them with no user intervention.

If your LNWI has a password, or you're attaching to a network to connect to a JMRI WiThrottle server, you'll need to use a text editor to set a few values in the config.txt file. Plug the USB cable into your computer instead and see the instructions under "WiFi / Network Configuration".

Like almost all Iowa Scaled Engineering products, the MRBW-WIFI is open source hardware and software. All of our hardware design files and source code, including both the receiver firmware and instructions on how to build CircuitPython for the MRBW-WIFI, are available on our Github account at:

**<https://github.com/iowaScaledEngineering/mrbw-wifi>**

We would like to very much acknowledge the folks that develop Micropython and Adafruit and their work on CircuitPython for the Espressif ESP32-S2 family. The firmware for the MRBW-WIFI is a lightly modified form of CircuitPython 7.

Without all of their hard work on this hugely valuable piece of open source software, development of a replacement for the old WiFi receiver would have taken much longer since I would have had to start over.

**<https://micropython.org/>**

**<https://circuitpython.org/>**

## Notes

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## Boot Status LED

On the right side of the board above the switches is a large, multi-color LED that is used to communicate status of the board at a glance, and in places where the board isn't able to use the main screen to communicate.

During normal operation, the light will be red if the device hasn't found a wireless network to join, yellow once it's found the network but hasn't found the command station / withrottle server, and green once it's happily connected.

## Firmware Updates

From time to time, we'll release firmware updates to add new functionality or fix bugs in the receiver. In order to update, you'll download the file from our website, plug the receiver into your computer, and save the mrbwifi-X\_Y\_Z.bin file to the drive that comes up. Then briefly push the reset button. The receiver will reboot and should turn the Boot Status LED to cyan (light blue) for 15-30 seconds while it verifies the firmware file. It will then turn purple to indicate that it's writing the new firmware to the disk. When it completes successfully, it will delete the firmware update .bin file from the drive and reboot, and you should see the new version number on the boot screen.

## Factory Reset

If you ever get in a state where your receiver will not boot or where you need to get back to factory configuration, set the "FR" switch to on and briefly push the reset button. Your receiver will reboot and should start blinking a dark blue on the boot status LED for 10 seconds. During the blinking interval, if you change your mind you can flip the FR switch back off or pull the power safely. After 10 seconds of blinking, the LED will go solid dark blue as it wipes the disk and sets itself back to factory default firmware. DO NOT POWER OFF OR OTHERWISE TOUCH THE RECEIVER UNTIL THE LED GOES OUT OR STARTS BLINKING AGAIN, then unplug and set the FR switch off again.

## Switch Configuration

There are eight switches located to the right of the screen. Moving the switch up (away from the edge of the board with the USB connector) turned it "ON", and moving the switch down (towards the edge) turns it "OFF".

Switch	Function
BASE ADDR 16, 8, 4, 2, 1	Set the radio base address of this receiver for the ProtoThrottle. Add the value(s) of the switches that are in the ON position to get the address. Program this value into the ProtoThrottle using the COMM CFG – BASE ADR menu. The base address should not be the same on any receivers within radio range of each other. Example: If you want base address 5, set switch 1 and 4 to "on".
A	Reserved for future use.
FR	Factory Reset – If this switch is ON when the unit is powered up (or when the reset button is pressed), the boot status light will start blinking a dark blue for 10 seconds. At the end of this, the light will go solid blue and the unit will reset itself to factory firmware. If the light is solid blue, you <b>MUST</b> wait until it goes out or starts blinking again to power off the unit, or the firmware will be corrupted.
BL	Bootloader – <b>LEAVE THIS SWITCH OFF</b> While you won't break anything by turning it on, if you turn this switch on, the ESP32-S2 will come up in Espressif bootloader mode. This is useful if you want to load completely new base firmware, or if your unit is so messed up you can't communicate with it.

## WiFi / Network Configuration

For systems using ESU CabControl, Digitrax LNWI or MRC WiFi wireless systems in their default configuration, no configuration changes should be needed. The receiver should automatically find your network and connect to it.

If you are using a JMRI WiThrottle server, have a password on your LNWI, or other more complex configuration, some adjustments may be needed.

Plug the ProtoThrottle WiFi Receiver into your computer and it should appear as a drive. On it, you should see a file called "config.txt". Open it with a basic

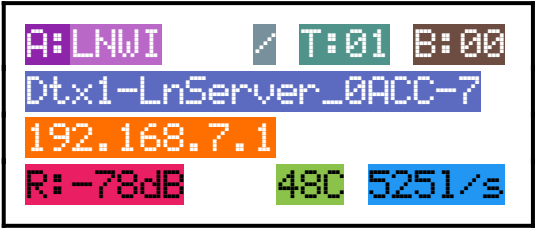
text editor (Notepad, Notepad++, TextEdit, etc.), make appropriate changes, and then save it again. Saving the file will cause the receiver to restart, reloading your changes.

The file has a simple key = value format per line – no quotes or anything else are needed or wanted. The keys and values are case sensitive, however, and must be typed accurately. Any line without a value will be ignored.

Key	Value(s)	Usage
mode	lnwi withrottle esu	Configure which type of server to attach to. Lnwi is specifically for Digitrax LNWi's that have a non-standard WiThrottle protocol implementation. All other WiThrottle-compatible servers should use withrottle. esu is for ESU CabControl systems.  If this option is specified without specifying ssid and password, it will limit network automatic discovery to only those types of servers (LNWi's and ESUs, primarily)
ssid	(your wireless network name)	Used to tell the receiver which WiFi network to attach to. If you specify this, please also specify mode and password.
password	(your wireless network password)	Your WiFi network password. Leave blank for open/unsecured networks.
serverIP	(server IP address)	To save time searching for your WiThrottle server on a network, a specific server IP or address can be specified here.
serverPort	(server port)	Normally the server port will be assumed from the server type. However, if you want to run your WiThrottle or ESU server on a non-standard port, it can be specified here.

## Main Screen

In order to show you a variety of status information, the receiver has a small OLED screen on board. While the actual screen is just black and white, the various fields are color highlighted to help explain them.



Element	Meaning
A:	Command station discovery method. A=automatic, C=from config.txt
LNWI	Command station type. LNWI, ESU, WTHR, or NONE
⌄	Spinner – will spin every second to confirm the receiver is still operating
T:01	Number of throttles actively connected to the receiver
B:00	Base address selected via the switches to the right of the screen
Dtx1-Ln...	Network SSID the receiver is attached to, or (Searching...) if it hasn't yet found a network
192.168.7.1	IP address of the receiver or (Not Connected) if no server has been found
R:-78dB	WiFi signal strength. The more negative the number, the less signal strength
48C	Current temperature of the receiver CPU
5251/s	Loops per second – how fast the software is running and processing incoming requests from the command station and the throttle