ESP-R8-POE-3C QUICK START GUIDE
For setting up with Homeassistant and ESPHome

Requirements:

1. TCP/IPv4 network.

2. Existing Homeassistant server with ESPHome add-on running on the same network on which you intend to install the ESP-R8-POE-3C board.

3. PC/Mac device or Android/iOS mobile device with WiFi.

4. IEEE 802.3at PoE-capable network switch or 12 volt DC power supply capable of supplying 2 amps.

5. USB-serial programming module in case manual flashing of firmware is required.

WiFi Setup:

Attach the included WiFi antenna to the antenna connector before powering on the board. It it NOT recommended to run the WiFi radio without an attached antenna. Doing so can cause damage to the radio due to overheating.
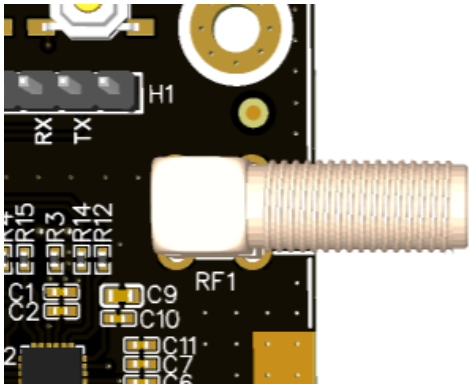

While observing correct polarity, insert the included CR1220 battery into the battery socket to ensure proper functioning of the DS1307 real time clock IC.
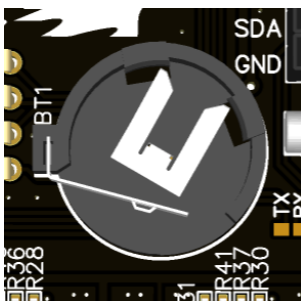
Plug an Ethernet patch cord from a PoE switch into the onboard RJ45 jack, or alternatively, power the board via the 12 volt DC-in terminal.
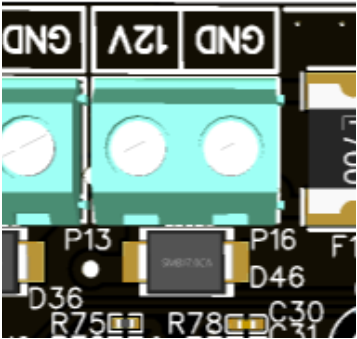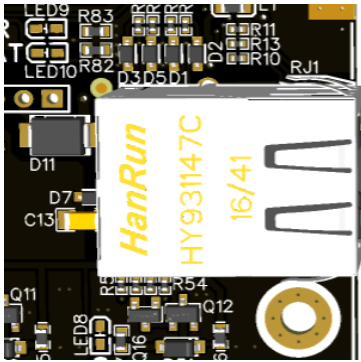
The board comes preloaded with the ESPHome firmware. Wait about 30 seconds for the ESP-R8-POE-3C to boot, and then use your PC/Mac or mobile device to connect to the WiFi SSID "ESP-R8-POE-3C" using password "password". Ignore any alerts or warnings about limited Internet access. After connecting, if one doesn't already load on its own, launch a web browser and go to the URL "http://192.168.4.1".
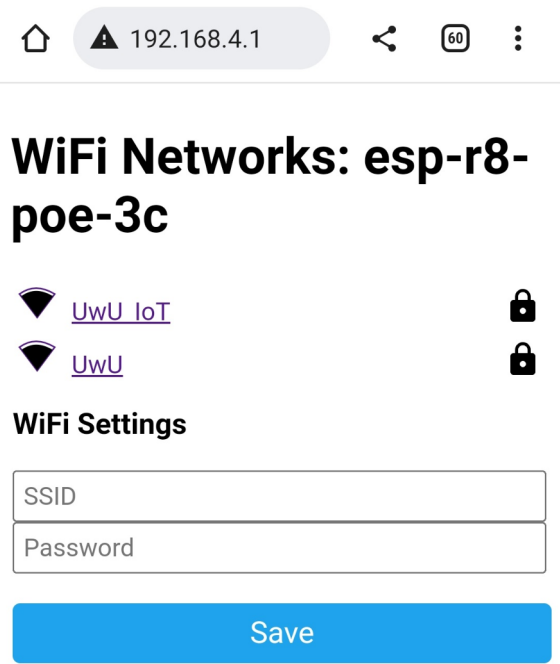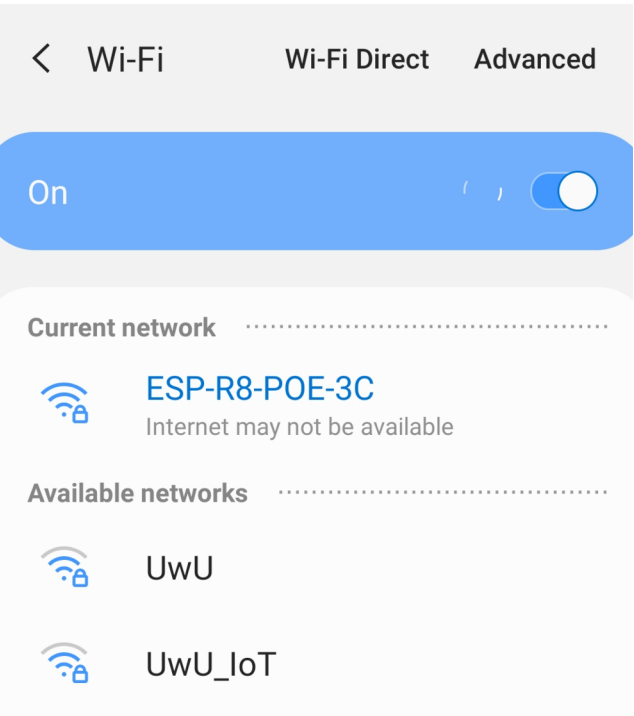
Select your WiFi network, enter your network password, and click/touch "Save". If all goes well, you will see the following message:

> The ESP will now try to connect to the network...
> Please give it some time to connect.
> Note: Copy the changed network to your YAML file - the next OTA update will overwrite these settings.

The board should now be connected to your network.

OTA update:

The web interface for the initial WiFi setup also allows you to directly upload your own firmware file or one generated by ESPHome. A sample YAML configuration file can be found at https://github.com/DanielLCopeland/ESP-R8-POE-3C.

Choose File | No file chosen

Update

Manual Flashing:

You will need to connect a USB-serial module to the H1 programming header on the ESP-R8-POE-3C board. To put the board into bootloader mode and ready to accept firmware, hold down both "EN" and "BOOT" buttons at the same time, release the "EN" button while keeping the "BOOT" button held, and after about one second, release the "BOOT" button. You will have to provide a power source to the board while programming, as it will not draw power through the programming module. "RX" on the board connects to "TX" on the module, and vice-versa for the other two. Ensure the module is set up for 3.3 volt operation.
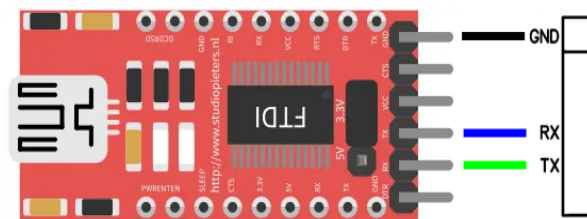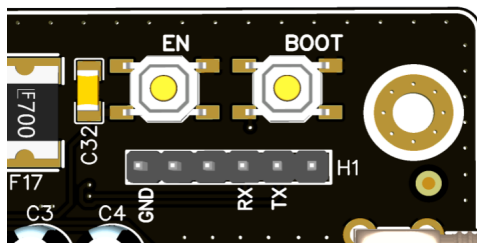
Reference diagram:
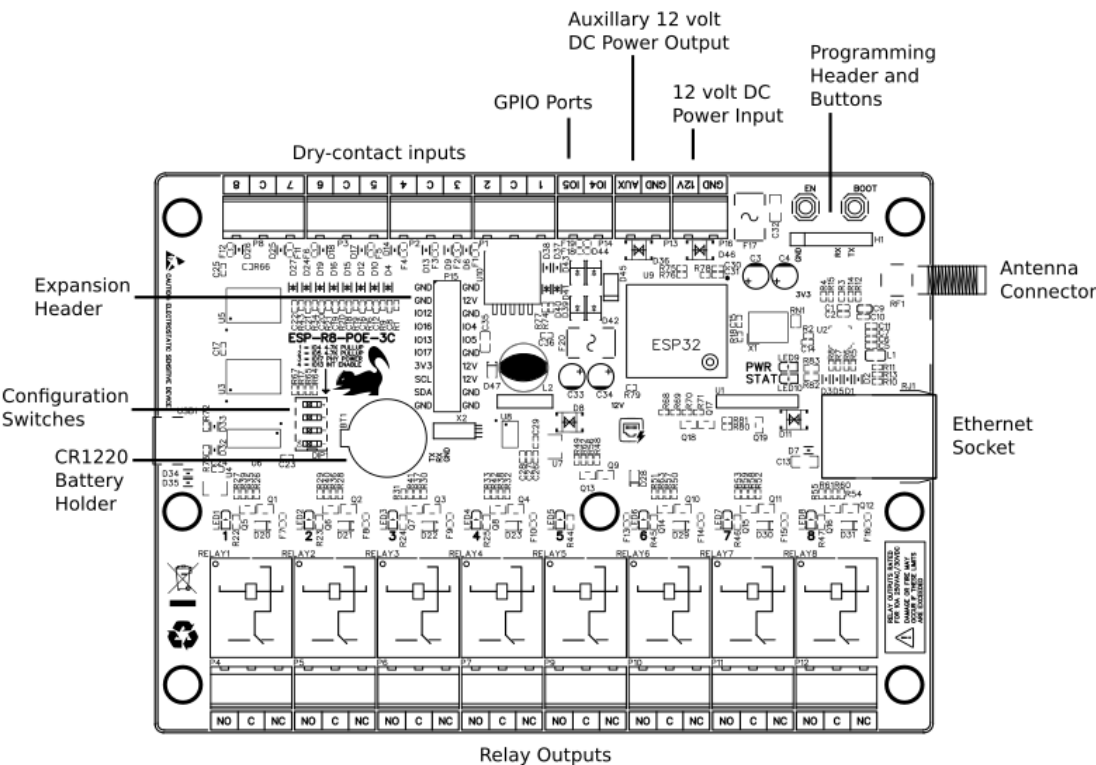

Ethernet:

The ESP-R8-POE-3C includes a LAN8720 Ethernet PHY allowing for 10/100 hardwired networking. The PHY uses RMII mode for communication with the ESP32 and also uses a dedicated external 50Mhz crystal. The PHY is available on address 1 and is wired to the ESP32 as follows:

ESP32	LAN8720
Pin 11 (GPIO 26)	Pin 7 (RXD1/MODE1)
Pin 10 (GPIO 25)	Pin 8 (RXD0MODE0)
Pin 12 (GPIO 27)	Pin 11 (CRS_DV/MODE2)
Pin 30 (GPIO 18)	Pin 12 (MDIO)
Pin 37 (GPIO 23)	Pin 13 (MDC)
Pin 25 (GPIO 0)	Pin 14 (nINT/REFCLKO)
Pin 33 (GPIO 21)	Pin 16 (TXEN)
Pin 31 (GPIO 19)	Pin 17 (TXD0)
Pin 36 (GPIO 22)	Pin 18 (TXD1)
Pin 28 (GPIO 17)	50Mhz crystal enable pin (PHY_POWER). This pin must be pulled high for the crystal to oscillate. There is a pulldown resistor on this pin to give it a default low state which disables the PHY. Connection to this pin is also controlled by configuration switch 3.

Configuration switches:
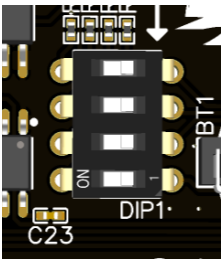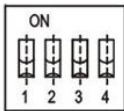
Switch 1 (IO4 4.7K PULLLUP):	On = enables GPIO4 onboard 4.7k pullup resistor. Off = disconnects resistor.
Switch 2 (IO5 4.7K PULLUP):	On = enables GPIO5 onboard 4.7k pullup resistor. Off = disconnects resistor.
Switch 3 (PHY POWER):	On = connects GPIO17 to 50Mhz crystal enable pin. Off = disconnects GPIO17 for other uses.
Switch 4 (INT ENABLE):	On = connects interrupt output of PCF8574 input expander to GPIO13. Off = disconnects GPIO13 for other uses.

Expansion header:

GND: Ground connection.		GND: Ground connection.
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IO12: ESP32 GPIO12 pin.		GND: Ground connection.
IO16: ESP32 GPIO16 pin.		IO4: ESP32 GPIO4 pin with built in pullup.
IO13: ESP32 GPIO13 pin/PCF8574 INT.		IO5: ESP32 GPIO5 pin with built in pullup.
IO17: ESP32 GPIO17 pin/PHY POWER.		GND: Ground connection.
3V3: 3.3 volt DC power.		12V: 12 volt DC power.
SCL: ESP32 GPIO 33 /I^{2}C bus clock line.		12V: 12 volt DC power.
SDA: ESP32 GPIO 32 /I^{2}C bus data line.		GND: Ground connection.
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Auxiliary output:

The ESP-R8-POE-3C includes a fused 700mA 12 volt DC output terminal to power external devices such as alarm sensors, sirens, contactors, etc.

Onboard I^{2}C devices:

The I2C bus is connected to ESP32 pin 8 (GPIO 32) for SDA and pin 9 (GPIO 33) for SCL signals.

U3

IC: PCF8574
Device Type: GPIO Expander
Address: 0x23
Purpose: Controls the 8 relay channels. An output going low will turn that output's relay on, and a high signal will turn it off (inverted logic, this is to prevent relay chatter when the ESP32 starts up). The relay output terminals are labeled NO (Normally Open), C (Common), and NC (Normally Closed).

U5

IC: PCF8574
Device Type: GPIO Expander
Address: 0x25
Purpose: Monitors the 8 dry-contact input channels. These inputs are normally pulled up to 3.3 volts, and a short across an input and a "C" terminal will register a digital low signal on that input.

U8

IC: DS1307
Device Type: Real Time Clock
Address: 0x68
Purpose: Keeps track of the time and date. CR1220 Coin cell battery must be installed for this device to function.

License and Disclaimers:

The ESP-R8-POE-3C is open source hardware. Schematics and board layout are licensed under the Creative Commons Attribution-ShareAlike 4.0 International license (CC BY-SA 4.0). The full text of this license may be found at: https://creativecommons.org/licenses/by-sa/4.0/legalcode.

The full schematics, BOM, board layout, and this document may be found at https://github.com/DanielLCopeland/ESP-R8-POE-3C.