Outdoor 12V Meshtastic / MeshCORE/ APRS node

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Version 1.2. 22.10.25

Thank you for purchasing the Outdoor 12V Meshtastic/MeshCORE (EU868 / US915) or APRS (EU433) node. Below is a short user guide to help you get started with.

To get the latest version of this guide, please scan the the QR code in the top left corner using your phone's camera.

The Outdoor 12V Meshtastic/MeshCORE/APRS nodes uses a LoRa Wi-Fi 32 (V3) Single Board Computer (SBC) from Heltec Automation – EU433/EU868/US915 (Meshtastic/MeshCORE) or EU433 (APRS). At the heart of the Wi-Fi LoRa 32(V3) SBC is a 32bit ESP32 microprocessor with integrated Bluetooth and Wi-Fi; and Semtech SX1262 LoRa modem.

To learn more about the Wi-Fi LoRa 32(V3) SBC from Heltec, please scan the the QR code above using your phone's camera.

Hardware: Meshtastic, MeshCORE and APRS

Like all PCBs, the LoRa Wi-Fi 32(V3) SBC inside your 12V Meshtastic/MeshCORE/APRS node is not designed for outdoor use (i.e. it's not waterproof), and so in order for it to operate in harsh conditions it is housed in a waterproof IP67 outdoor case.

With all things radio, height, the type of antenna, and minimising cables losses are key to getting good range – both for transmit and receive. Although LoRa is great for Long Range, low power communications (it uses something called Spread Spectrum to achieve this), even it is useless if the antenna is poor, the equipment being used is at ground level (where there are lots of things like building in the way to attenuate the signal), or if a substantial proportion of the RF signal is lost between the equipment generating the signal (e.g. the Heltec LoRa board) and the antenna. This is particularly true at the UHF frequencies that Meshtastic/MeshCORE and APRS uses (866MHz and 433MHz respectively).

The best way to overcome these losses and hence maximise range, is to mount the electronics generating (and receiving) the RF signal as close to the antenna as possible (so that losses in any RF cables are as small as possible), use a antenna with some gain, and mount the complete assembly as heigh as possible. For this reason the 12V outdoor node you have purchased has been designed so that the electronics generating (and receiving) the RF signal are co-located with a +5.5dBi gain antenna, in the same IP67 enclosure. The electronics are contained inside the IP67 enclosure, and the antenna is mounted on the outside, with a short length of coaxial cable (10cm) between them. This way the RF feeder losses are kept to an absolute minimum, and the gain of the antenna extends the range. The complete unit (IP67 case, electronics and +5.5dBi gain antenna) can then be mounted in an elevated location using the external 1.5" (38mm) mounting brackets – typically to a standard 38mm aluminium mast or satellite mounting bracket. Mounting brackets are not supplied with your 12V Meshtastic/MeshCORE/APRS node, but are readily available from many online retailers. Just make sure the diameter of the pole that you want to mount your 12V Meshtastic/MeshCORE/APRS node is 38mm in diameter, such this one from CPC in the UK:

<p align="center">Blake SAT7 Elbow Mount 1.5"</p>

Obviously once you have mounted your 12V Meshtastic/MeshCORE/APRS unit in a elevated location, it will need some power; and this why the unit is shipped with a ten meter 12V power cable as shown below:

The ten meter 12V cable supplied with your 12V Meshtastic/MeshCORE/APRS node comes with a SP13 connector on one end, and a 2.1mm x 5.5mm socket on the other. The SP13 connector is waterproof (IP68) and should be plugged into your 12V outdoor Meshtastic/MeshCORE/APRS node (remember to tighten up the blue plastic nut or it will pull out). At the other end of the 12V power cable is a 2.1mm x 5.5mm DC jack socket which is not waterproof (i.e. it should only be used indoors) and should be plugged into a standard main (230V/110v to 12V DC adapter).

You will probably have such an adapter lying around at home, in a draw or cupboard (I certainly do), but if not, one can be sourced cheaply from many online retailers, such as Amazon, CPC, Pi-hut etc. Please ensure it has a 5.5mm x 2.1mm connector (Jack) on the end, has 12V DC out (**not** 5V, 9V or 24V), and is capable of sourcing over 1.5A. Something like this is ideal:

Mains 100-250V to DC 12V 2A Main power supply

If you purchased the 12V "Meshtastic/MeshCORE" 868MHz version. it will come pre-installed with the latest version of Meshtastic (version 2.6.11 – as of 21/10/25); but it is also compatible with MeshCORE (see details below). If you purchased the 12V "APRS" version (433MHz), it will come with latest version of APRS iGate software from Richard Gunzman (CA2RXU).

Software (868MHz): Installing MeshCORE

As mentioned above, the 868MHz version (aka as the "HF" version) of the Heltec Wi-Fi LoRa V3 board installed inside your 12V "Meshtastic/MeshCORE" unit is supported by both Meshtastic and MeshCORE. Meshtastic comes installed by default (unless you requested otherwise during purchase) but you can easily upgrade it to MeshCORE (version 1.9.0 – as of 21/10/25) if you so wish. Please refer to the MeshCORE documentation for full details on how to do this, using the MeshCORE web flash utility - which you can find here:

MeshCORE firmware web flasher

In summary, to flash MeshCORE, you will first need to remove the Heltec LoRa Wi-Fi (V3) board from the IP67 case and plug it into a Windows or Linux PC using a USB-A to USB-C cable. I recommend taking a photograph of it before you do this, so you can consult the photograph when it is time to put it back – so you don't get it the wrong way around!

With the Heltec LoRa Wi-Fi V3 board plugged in your Windows or Linux PC, it should power up running Meshtastic. Next go to the MeshCORE firmware web flasher link above and select "Heltec V3" as shown below:
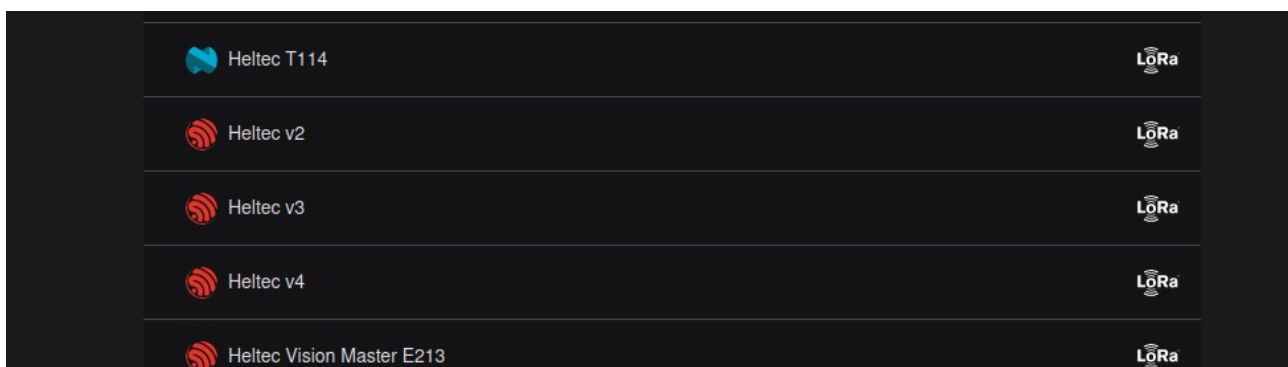
You next need to decide what "role" or mode you want it to operate in. At this stage I recommend reading the MeshCORE documentation to understand what the various "roles" are.

The options are as show below (left):
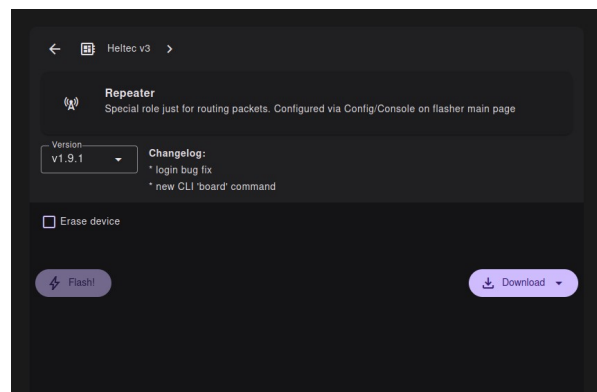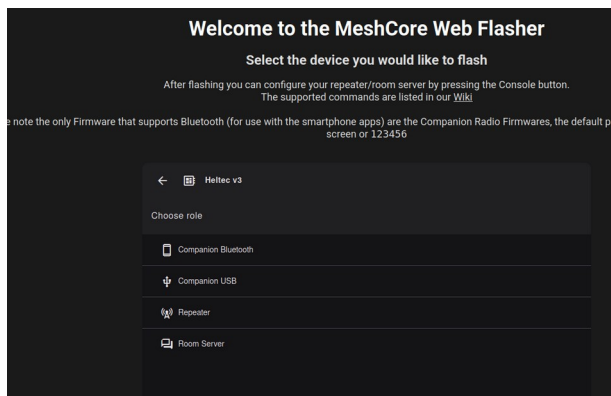
Next you should be presented with a page which looks similar to the one above (right). It will recommend the latest firmware (v1.9.1 – as of 21/10/25) and then invite you to "Flash!" the firmware. Before you do this I recommend selecting "Erase device" to ensure that Meshtastic is erased completely before it attempts to install MeshCORE. If you don't do this, "Loading …" will be display on the OLED forever.

When you click "Flash!" (remember "Erase device" selected) the MeshCORE web flash utility will ask what "serial" port it should be using to communicate with the Heltec LoRa Wi-Fi V3 board. Just select the one that has "CP2102 UART to USB bridge" written next to it, and then click "Connect". It should then start flashing MeshCORE on to your Heltec LoRa Wi-Fi (V3) board like so:
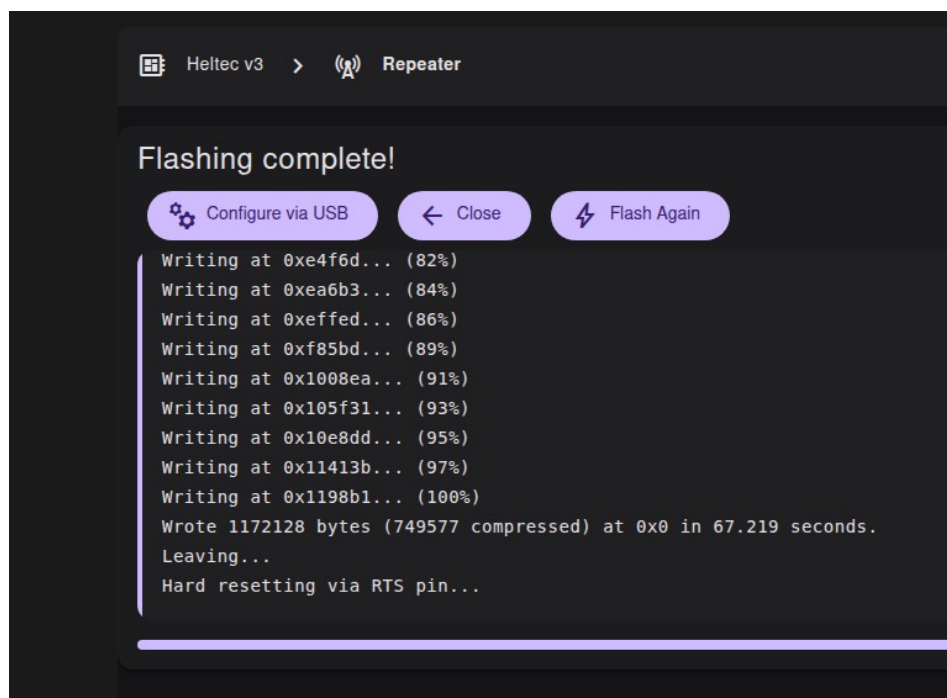
You will know when the flashing process is complete, when you see "Hard resetting via RTS pin" displayed in the terminal window. Also, depending on what "role" you selected, you will see information being displayed on the OLED display. For example, in the "Companion Bluetooth" or "Companion USB" roles, when the flashing process is complete you should see "MESHCORE v1.9.0" pop up on the OLED display, followed by a Pin number.
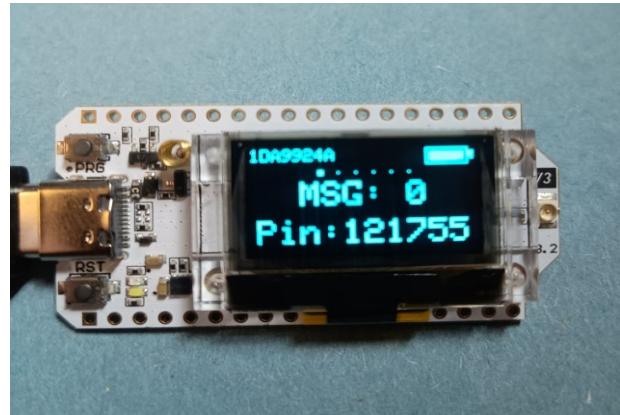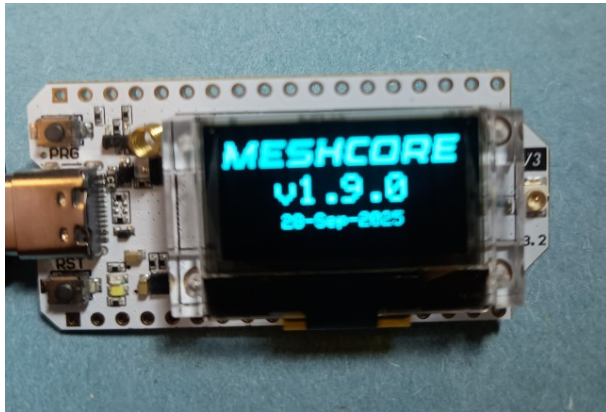
Flashing the firmware is now complete, so you can now re-install the Heltec LoRa Wi-Fi V3 board into the carrier PCB in the IP67 case. Here is a picture of the unpopulated PCB showing the silk-screen of the Heltec board before components were fitted:
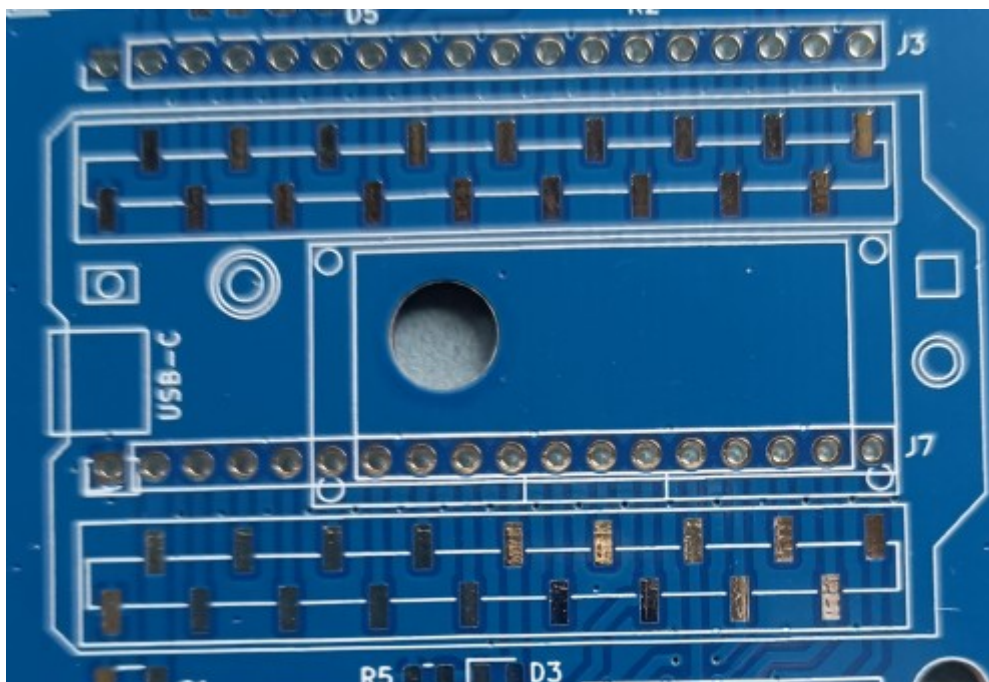
Observe that in this version (PBA0073 v1.2), on one side (left here) there is a USB-C symbol etched on to the PCB silk-screen layer. Use the USB-C symbol to orientate the Heltec LoRa Wi-Fi V3 board when re-installing it, and make sure all 18 upper, and all 18 lower pins are inserted correctly. On some other versions of the board (e.g. PBA0068 v1.1), the Heltec LoRa Wi-Fi V3 board was the other way around (USB-C to the right) so use the photograph you took before removing it to make sure you put it back correctly. Use the USB-C symbol to guide you.

If you have any concerns about re-inserting the Heltec LoRa Wi-Fi V3 board, before powering up please e-mail me.

At this stage you now need to download the MeshCORE app from the following link:

I recommend reading the instructions on the MeshCORE Wiki on how to use it properly before proceeding:

MeshCORE Wiki

Once you've read through the MeshCORE Wiki, you next need to tell the MeshCORE app how to communicate (over Bluetooth or USB) with the MeshCORE software now running on the Heltec LoRa Wi-Fi V3 board.

If you selected "Companion Bluetooth" mode/role during flashing, you next need to go into your phone settings, enable search for Bluetooth devices, and then select the MeshCORE device it discovers. You will then be promoted to enter the Pin (that is display on the OLED display of the Heltec LoRa Wi-Fi V3 board) when prompted to do so. You should now be able to use the MeshCORE app to manage your MeshCORE node.

Software (868MHz): Re-installing Meshtastic

If after doing all the above, you decide you really wanted Meshtastic after all, it too comes with a firmware web flasher utility. You can find it here:

Meshtastic firmware web flasher Utility

It uses the same "esptool.js" JavaScript tool to install firmware as MeshCORE, so the instructions for Meshtastic are almost identical for those above for MeshCORE. The only difference is Meshtastic does not have different firmware for different "roles". There is only one version of firmware and the role/mode (e.g. client, router) is configured from the Meshtastic app.

Software (433MHz) : Installing APRS

If you purchased the 12V "APRS" version (433MHz) it will come with latest version of APRS iGate software from Richard Gunzman (CA2RXU). This also has a firmware web flasher utility, which you can find here:

Richard Gunzman (CA2RXU) APRS iGate firmware web flasher utility

Best of luck, and any issue get in touch; my e-mail address is at the top of the page. However, before you do, please take the time to read the various online documentation which you can find here:

Meshtastic

MeshCORE

CA2RXU APRS iGate Firmware

73 Dave Pegler (M0JKS)