

v2 Heltec e290 Blackout Comms Link - DIY



The Heltec Vision e290 is an excellent base platform for a Blackout Comms link. You can choose whether to build a standard node (with or without GPS) or even add an Acconeer XM125 pulsed radar presence/proximity sensor. You will need to 3D print an enclosure, or come up with your own enclosure.

What it Can Do

- Full Blackout Comms link: secure packet caching, display, and more.
- Track & share location
- Detect motion / distance and optionally notify your cluster
- Report last motion



3D Printable Enclosure

Search "blackout comms" at [printables.com](https://www.printables.com)



Required Components

- [Heltec Vision e290](#)
- [3.7 LiPo Battery](#) + [JST/PH2.0 Adapter](#)
- [Antenna & SMA Connector](#)
- [M2 Screws](#), [nuts](#), & [knurled nuts](#)
- [On/Off Switch](#)

Time Source and/or GNSS

- [Adafruit DS3231 RTC](#)
- DFRobot [TELO157](#) or [1103](#)

Optional

- [Sparkfun Pulsed Coherent Radar](#) & [M2 screws](#)

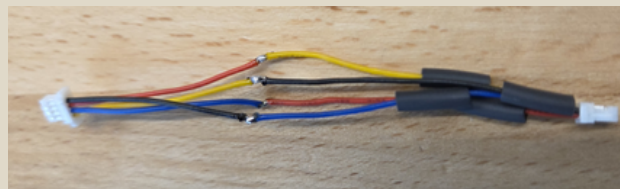
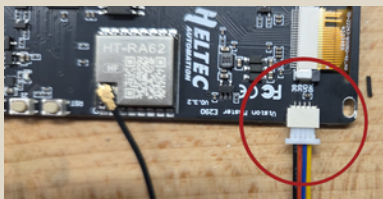


Build Summary

This build takes about 60 minutes. Once you have your chosen components, the build is essentially creating a Qwiic adapter for the e290, plugging all the components together in a chain, connecting a battery, and inserting into a case.

1. Build a Qwiic / Heltec Adapter

Heltec's plug port will physically fit a Qwiic plug, but the wiring/pins are not compatible. Make an adapter as shown.



Cut and rewire a standard Qwiic wire:

Black → Blue
Red → Yellow
Blue → Red
Yellow → Black

2. Choose the Link's Components

Basic Link

Fully functional comms link, not dependent on GPS: [e290](#) + [DS3231](#)

GPS Enabled

Fully functional link, regularly/securely shares its location. Uses more current (shorter battery life)

[e290](#) + [either DFR]

– OR –

[e290](#) + [either DFR] + [DS3231](#)

Realtime Clock



[Adafruit DS3231](#)

GPS/GNSS

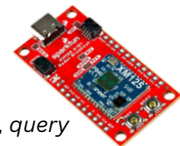


DFRobot [TELO157](#) or [1103](#)

3. Optional - Add Sensor

These are optional components you may or may not choose to add.

Proximity Sensor [Sparkfun Pulsed Coherent Radar](#)



Be notified of motion, query last motion/distance

3. Install Faceplate Onto Heltec, Connect RTC & Pigtail



Notice which end of the qwiic adapter you created is plugged directly to the heltec! If you have it backwards, the attached components will not work, and may get extremely hot (or worse)!

Don't forget to remove the Heltec's screen cover sticker.

Be careful attaching the pigtail to the heltec, as the adapter is very easy to bend if you don't have them properly aligned.



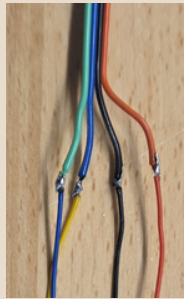
Note: If you choose a DFRobot component, see the last page of this guide.



This can be dangerous, do not attempt unless you understand electronics!

Additional DFRobot GNSS Steps

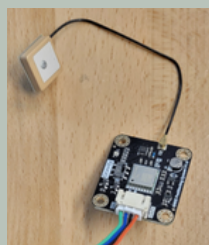
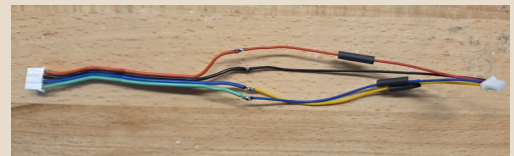
If you have chosen to use one of the DFRobot GNSS modules, there is an additional step required to modify the DFRobot cable into a Qwiic adapter, by soldering 4 wires as shown below:



Create a DFRobot / Qwiic Adapter

Create an adapter wire that will allow the DFR cables to attach directly to any Stemma/Qwiic plug. I heat-shrink wrap the connections (they must be insulated). This one there is no pre-made adapter I could find, because the ground/vcc seem to be reversed.

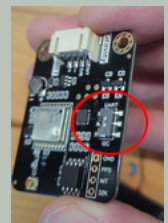
Qwiic Yellow/Ck → DFR Blue/Ck
Qwiic Blue/Data → DFR Green/Data
Qwiic Red → DFR Red
Qwiic Black → DFR Black



Prepare the DFRobot GNSS

Move the DFR's switch to **IIC**, and then use a wire cutter/clipper to clip the long plastic switch much shorter. It will just be in the way later on if you don't.

Also, attach the GPS antenna, as well as the cable you just made.



Now your DFRobot GNSS is ready to chain with the other components using this newly created adapter cable. This GNSS will be positioned as the last device in the "chain".

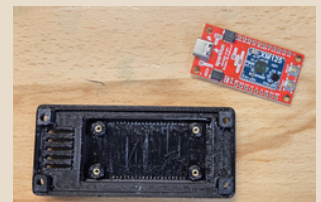
Additional Proximity Sensor Steps

If you have chosen to add an XM125, there is an additional step required to insert the sensor into the enclosure, shown below.

Insert Heat Nuts into the Enclosure Back Plate

The XM125 will be held into place on the back plate using 4 M2 knurled nuts.

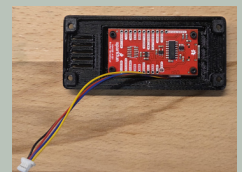
Insert those into the backplate using a soldering tip (I set it to 500 degrees), heat gun, or any other method you can use to carefully direct heat without melting the enclosure.



Add a Qwiic Cable and Mount the XM125

Notice the orientation of the sensor into the back plate.

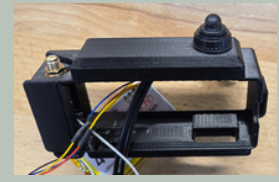
We want the radar sensor pointing out the back of the enclosure, so we can sense for motion by pointing the back of the device toward the area to monitor for presence/motion.



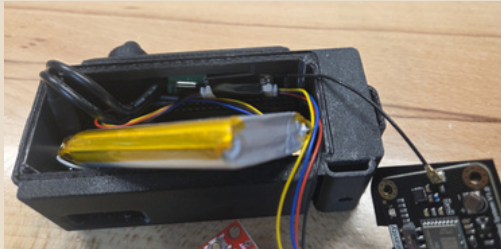
4. Install Battery and Wire In Power Switch

You may choose to do this differently. I wire a hard on/off switch between the battery positive and the Heltec's '+'.

A hard on/off switch isn't absolutely necessary, but there's no way to fully turn off the Heltec without it.

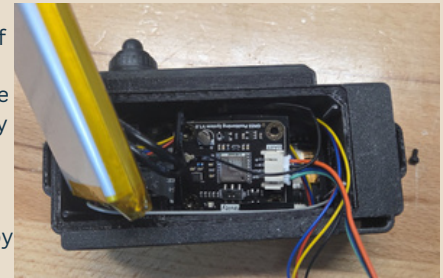


5. Insert All Components



The Realtime Clock and GPS antenna (if equipped) can be inserted into the hollow area of the enclosure's top. I use a piece of electrical tape to temporarily hold them into place.

It can be tricky to align things, but the GPS PCB goes in next, followed lastly by the battery.



Be careful not to smash or pierce the battery! You may want to use electrical tape between components, where they may come in contact with one another or with the surface of the battery. The foil layer of the battery is conductive, so it can create shorts.

6. Connect the Backplate and Add Antenna



This is tricky as well, since the M2 screws are long and can be hard to align.

If you've included an XM125 sensor, don't forget to wire that between the RTC and the GPS. The image here shows only one connection to the XM125, because in this image I didn't add GPS to this unit. However, if you've added GPS, you'll have 2 connections coming off the XM125.



7. Install Firmware

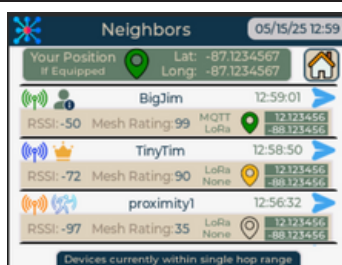
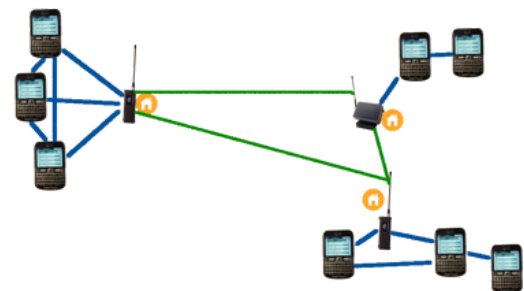
Flash the Blackout Comms firmware (free) onto the new link by following instructions on the [firmware page](https://chatters.io/firmware).



<https://chatters.io/firmware>

8. Onboard the Link

- Power up the link
- On your Root communicator, select "Settings / Cluster / Onboard New Device"
- Wait a minute or two, it should automatically join



Your cluster will automatically learn to use the new link!

Within minutes, other devices in your cluster will automatically exchange public keys with the new link, and it should show up on neighbors screens.

While existing devices are learning, it may temporarily show up as "unidentified".

