

# ANTIHUNTER DIGINODE 2.4GHZ WIFI/BLE NODE V4

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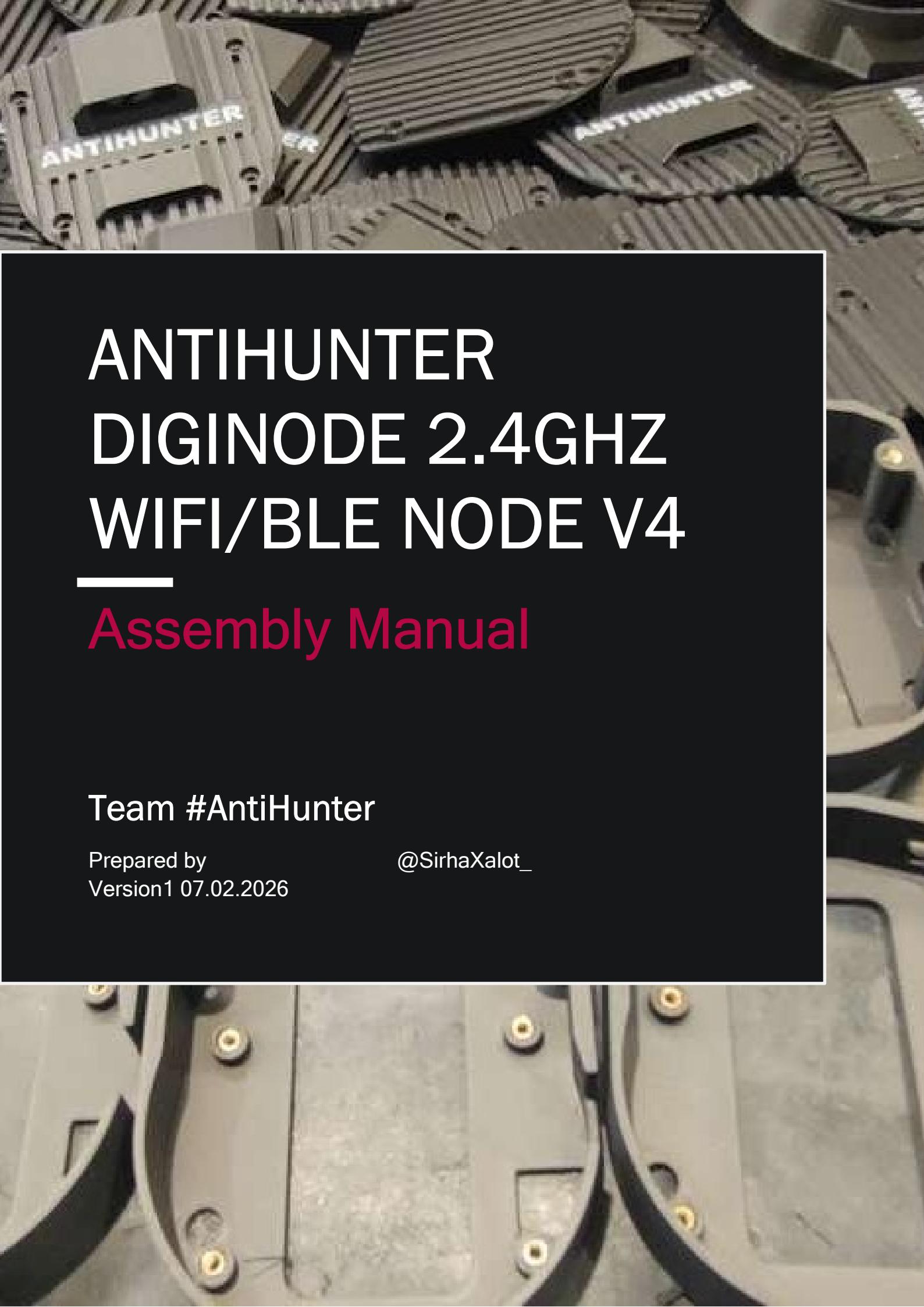
## Assembly Manual

Team #AntiHunter

Prepared by

@SirhaXalot\_

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# Assembly manual

## 1. INTRODUCTION

The ANTIHUNTER DIGINODE is a modular, multi-radio node intended for experimentation, logging, and field deployment.

It integrates:

- WiFi & Bluetooth
- LoRa long-range radio
- GPS positioning
- Real-Time Clock (RTC)
- SD card data logging
- Tamper / vibration sensing
- Optional active cooling
- Battery-backed UPS with regulated 5 V output

This manual describes the complete hardware assembly, including soldering, SD card preparation, connector installation, and 3D-printed enclosure assembly.

This guide is written for hobbyists and makers and assumes basic soldering experience.

### Important notice

This device is not factory waterproof. Any resistance to moisture or environmental exposure depends

## 2. REQUIRED TOOLS & MATERIALS

### Tools

- Temperature-controlled soldering iron
- Fine solder (lead or lead-free)
- Flux (recommended)
- Tweezers
- Small Phillips/hex screwdrivers
- Heat-resistant work surface

### Materials

- Super glue or epoxy (for enclosure bonding)
- Optional silicone sealant or grease (for improved sealing)

### 3. PARTS OVERVIEW

#### 3.1 Electronic Modules

- ESP32 module - XIAO ESP32-S3
- LoRa module - Heltec T114 *or* Heltec V3
- RTC module - DS3231
- SD card module - HNX
- GPS module - ATGM336H
- Tamper sensor - normally-closed vibration sensor

##### 3.1.1 Main PCB

AntiHunter PCB (DIGI2.4GhzWiFi/BLE NODE V4)

#### 3.2 Connectors & Controls

- JST connector - switch input
- JST connector - regulated 5 V power input
- JST connector - fan output
- JST connector - thermal switch input
- SMA chassis connectors:
  - GPS antenna - SMA female
  - LoRa antenna - SMA male
  - WiFi / BLE antenna - SMA female
- SMA-to-U.FL (IPX) pigtail cables
- Rocker power switch with rubber protective cover
- 40Degree Celsius normally open switch (Optional)

#### 3.3 Enclosure Components

The enclosure consists of four main 3D-printed parts:

- Main PCB housing
- Battery / UPS housing (dual 18650)
- Front cover (optional hidden fan)
- Back cover

#### 3.4 Antennas

- Lora antenna (omni directional)
- 2.4Ghz antenna for WiFi and BLE (omni directional)
- GPS Antenna (Helix) - HA-3011A or similar

**NOTE:** Antenna cables and antennas must be the same type and length when building multiple nodes, this will ensure proper performance for experimental triangulation and similar dependent functions of the node.

Heat under operations, you may experience the ESP32 module run on a high temperature, this is usually normal depending on operational modes. The GPS module can get hot as well while searching for satellites.

## 4. **⚠ POWER INPUT WARNING ⚠ - READ BEFORE APPLYING POWER**

Regulated 5 V Input Only to the PCB

The DIGINODE PCB must only be powered from a regulated 5 V DC source.

**!! Do not connect batteries directly !!**

**!! Do not exceed 5 V !!**

**!! Do not use unregulated power sources !!**

Applying incorrect voltage can permanently damage the PCB and connected modules.

**Voltages under 4.5V will result in stability issues.**

Typical Power demand is between 160mA (idle) and 600mA (Active)

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### Using the PCB Outside the Enclosure

If the PCB is used without the enclosure and UPS module:

- A regulated 5 V supply is mandatory
- Acceptable sources include:
  - USB-C power adapters
  - Bench power supplies set to 5.0 V on 5V input of the PCB
  - Proper DC-DC regulators set to 5 V

Direct connection to unregulated power sources such as Li-ion cells, battery packs, or automotive power can destroy the board or its individual components.

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### Using the PCB Inside the Enclosure

When assembled inside the enclosure with the UPS battery module:

- The UPS provides regulated 5 V
- Batteries are never connected directly to the PCB

This is the recommended configuration.

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### Batteries:

TIP, use brand new 18650 cells with as high capacity as possible for the longest operational time.

Make sure to use the same brand and capacity batteries, do not mix brands, new and old. The batteries should be balanced before they are used in this device

## 5. SOLDERING PREPARATION (IMPORTANT)

Before mounting any module onto the main PCB:

All pin headers must be soldered to the modules first.

This ensures proper alignment and reliable solder joints.

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### Step 1 - Solder Pin Headers to All Modules

For each module:

1. Insert pin headers
2. Ensure pins are perpendicular
3. Solder one pin
4. Verify alignment
5. Solder remaining pins

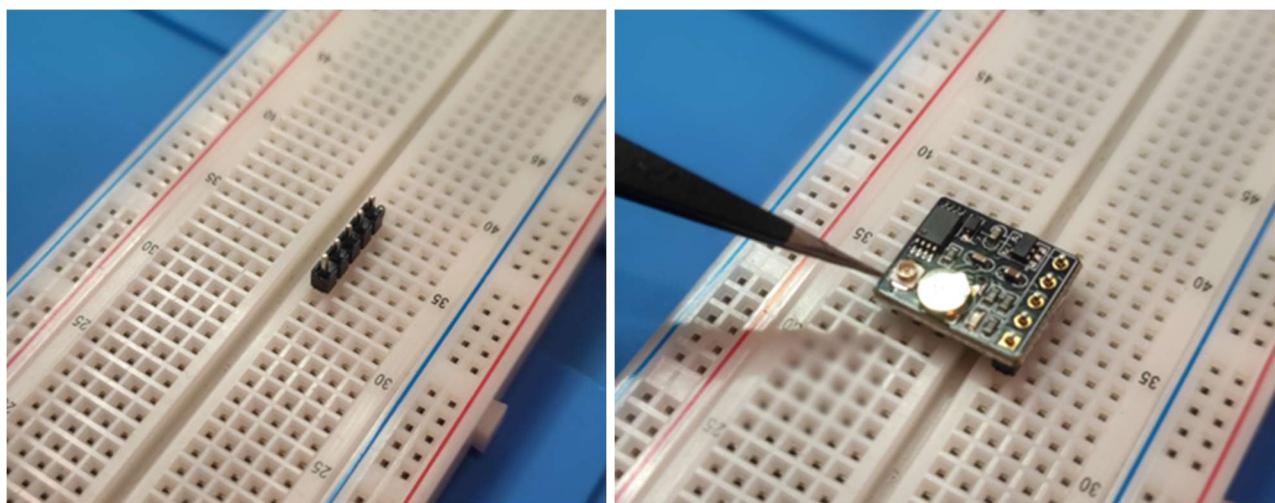
Repeat for:

- ESP32 module
- LoRa module
- RTC module
- SD card module
- GPS module
- Tamper sensor

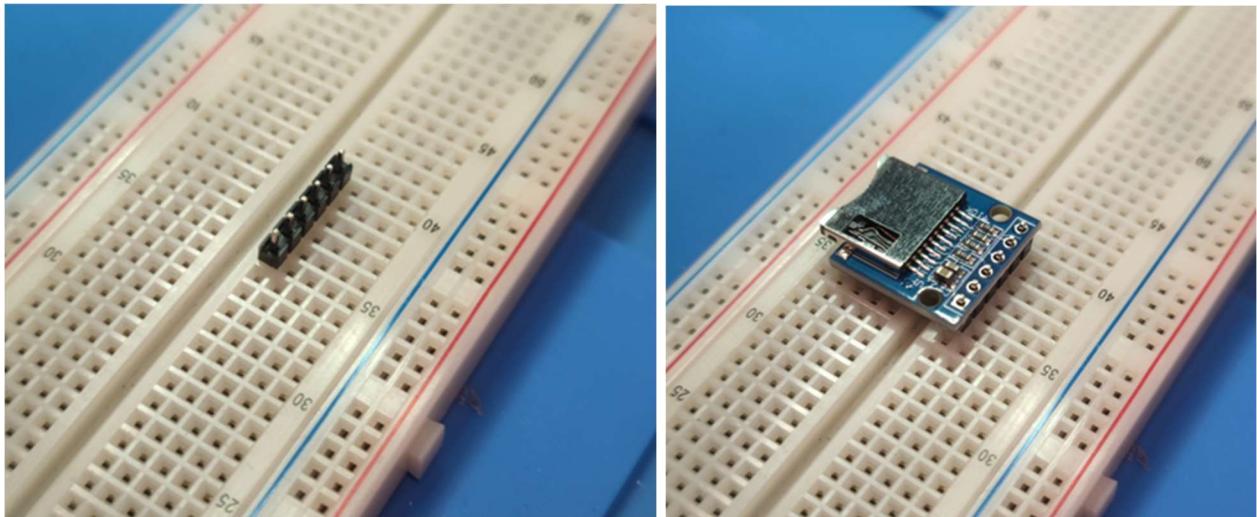
TIP: Use a bad/defective breadboard to hold the pins aligned vertically.

Examples:

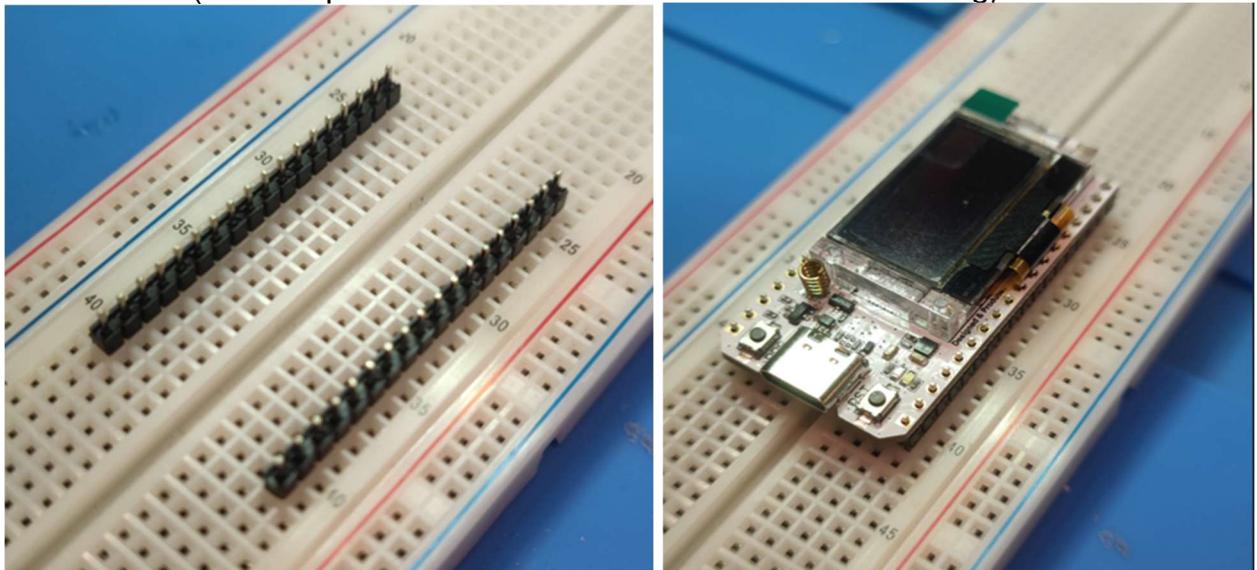
GPS Module,  make sure the antenna IPX connector is facing upwards.



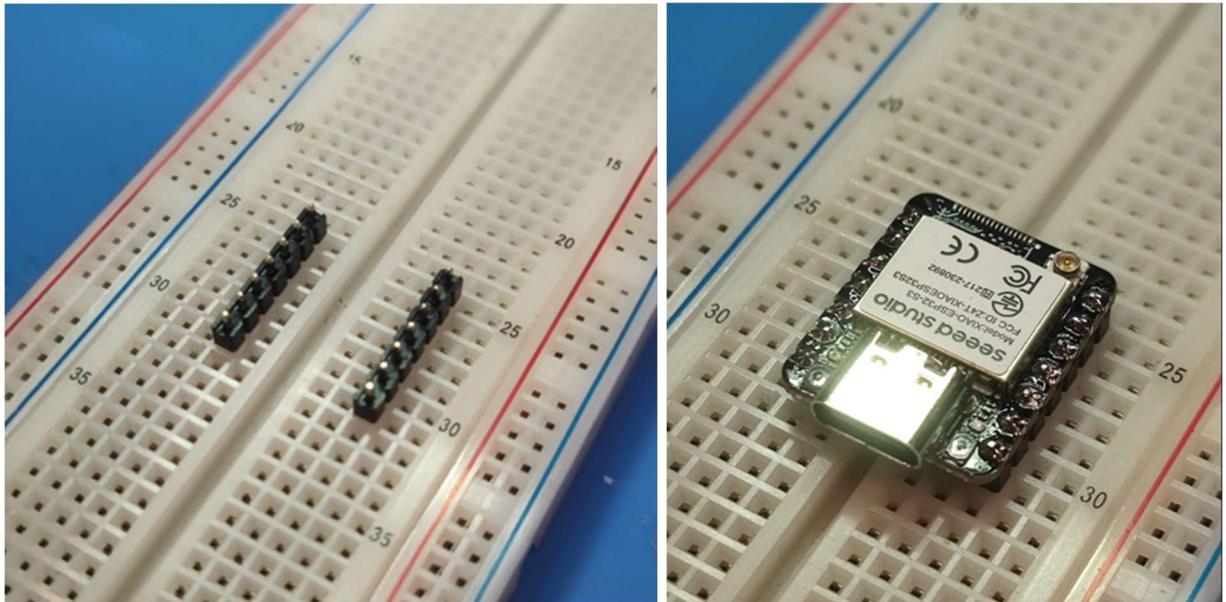
SDCard module



Lora module (TIP: it is possible to remove the screen before soldering)



ESP module



## Step 2 - Solder Modules to the Main PCB

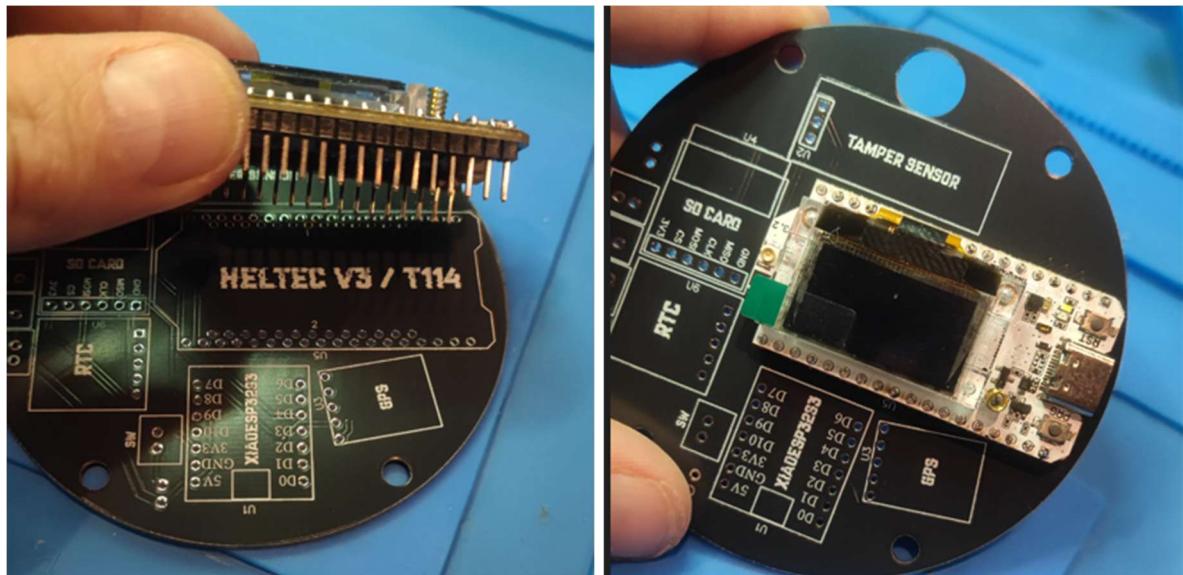
1. Insert each module into its labeled PCB footprint
2. Match orientation using the silkscreen
3. Solder all pins on the backside of the PCB one module and connector at the time

Notes:

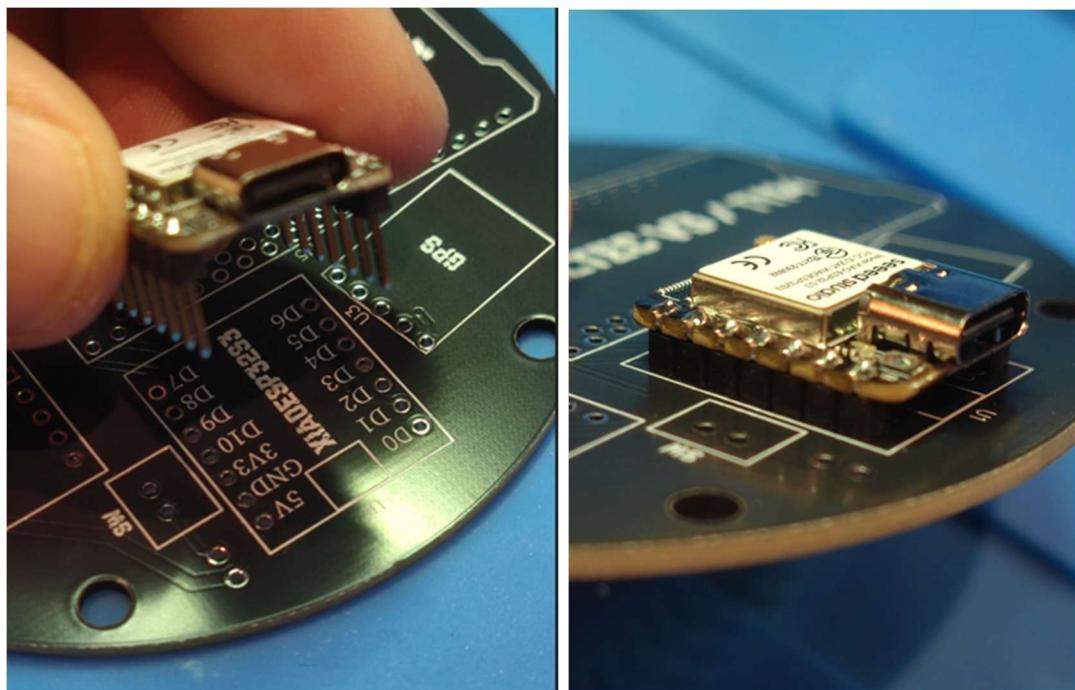
- The PCB supports either Heltec T114 or Heltec V3
- Never force misaligned pins this will damage the VIA's in the PCB

Examples:

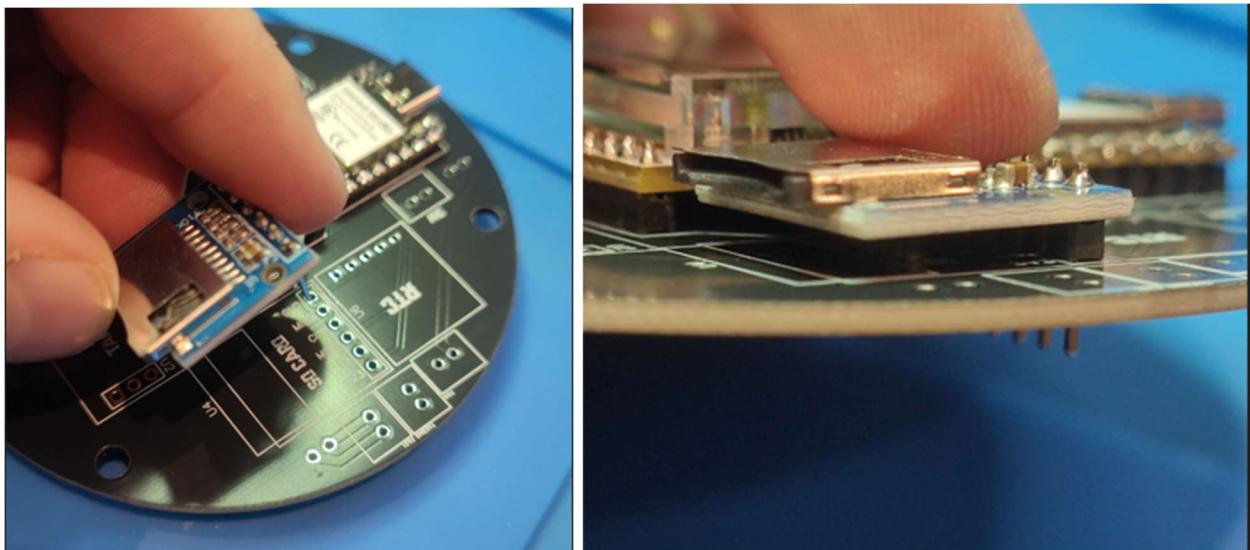
Lora module



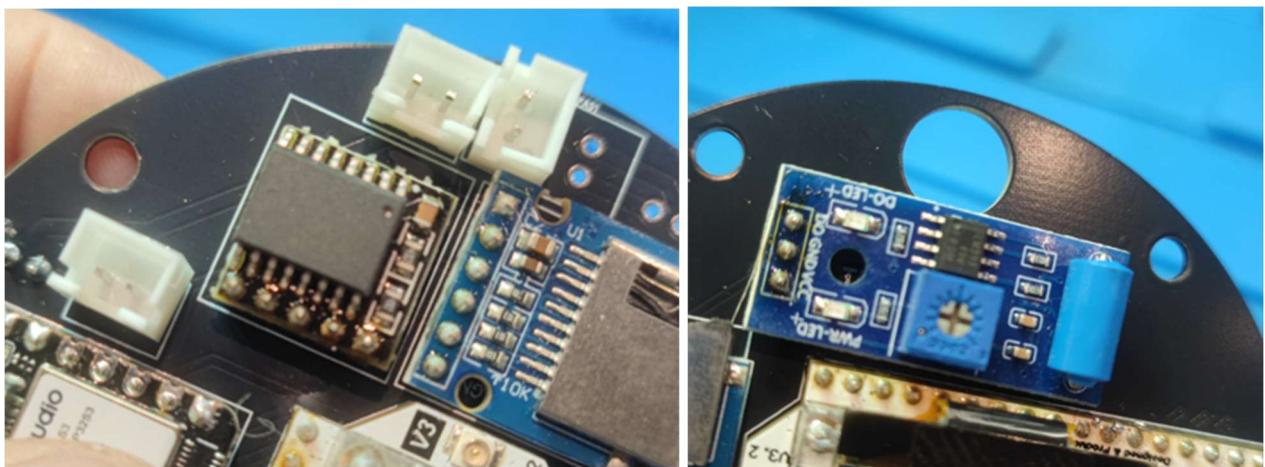
ESP module



## SDcard module

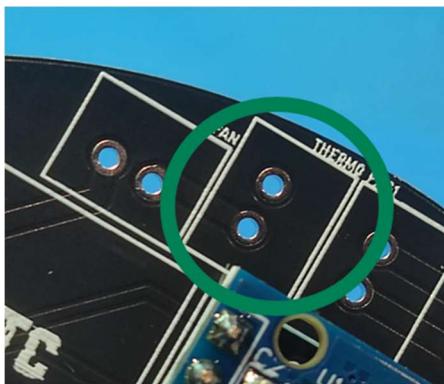


## RTC clock and Tamper Sensor module



NOTE: the JST connector location called PAS (both sides of the pcb) is not used.

When a Thermal switch is used it is connected to the THERMO JST connector, if the thermal switch only comes with bare wires you can remove/not use the JST connector and rather solder the wires directly to the location called THERMO.



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### Step 3 - Solder JST Connectors

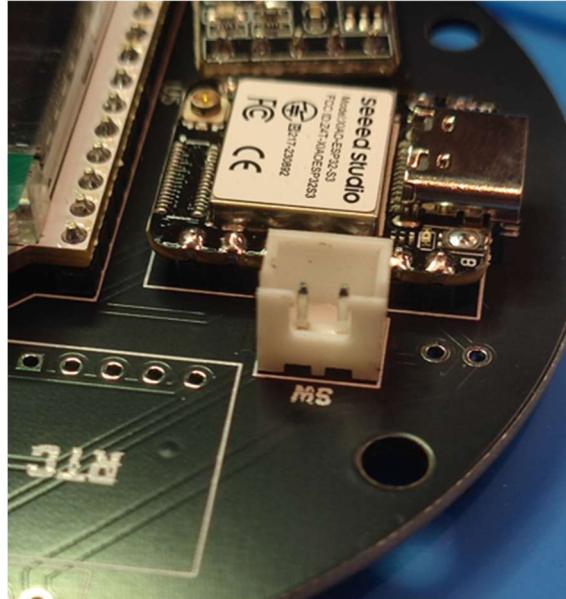
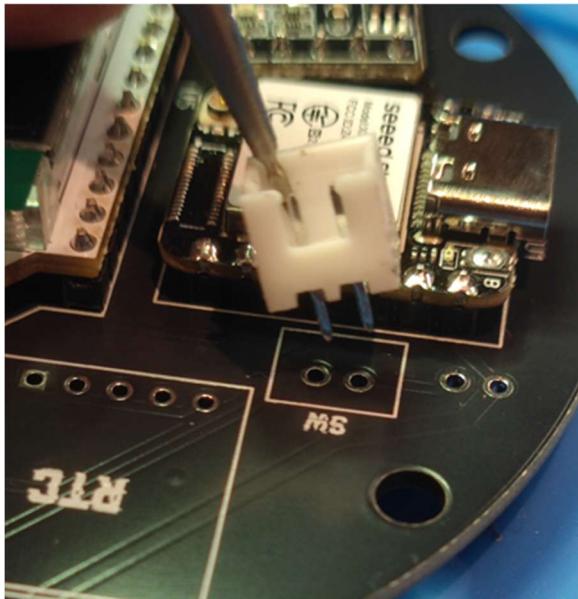
Solder the following JST connectors to the PCB:

- Switch input
- Regulated 5 V power input
- Fan output
- Thermal switch input

⚠ Double-check polarity on all power-related connectors.

**WRONG**

Confirm that the JST connector is mounted correctly within the silkscreen, inserting it wrong will result in the JST connector being outside the silkscreen and polarity will be wrong.



## 9. SD CARD REQUIREMENT & INSTALLATION (CRITICAL)

Supported SD Card

The DIGINODE requires a micro SD card with:

- Capacity: Max 16 GB
- File system: FAT32

Avoid:

**Larger cards**

**exFAT or NTFS formatted cards**

They will not function correctly.

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SD Card Preparation

1. Format the card to FAT / FAT32
  2. Ensure the card is empty
  3. Safely eject from your computer
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Installation Timing (Very Important)

The SD card must be inserted before the PCB is mounted into the main housing.

Once mounted, the SD slot is not easily accessible without disassembly.

Correct sequence:

1. SD module soldered
2. SD card formatted
3. SD card inserted and verified
4. PCB mounted into enclosure

SDcard status can be verified in firmware after flashing the ESP32.

For additional information on firmware and SD card visit firmware repository

<https://github.com/lukeswitz/AntiHunter>

## 10. 3D-PRINTED ENCLOSURE PREPARATION

⚠ Follow this order

### 10.1 INSTALL THREADED INSERTS (FIRST)

Battery / UPS Housing

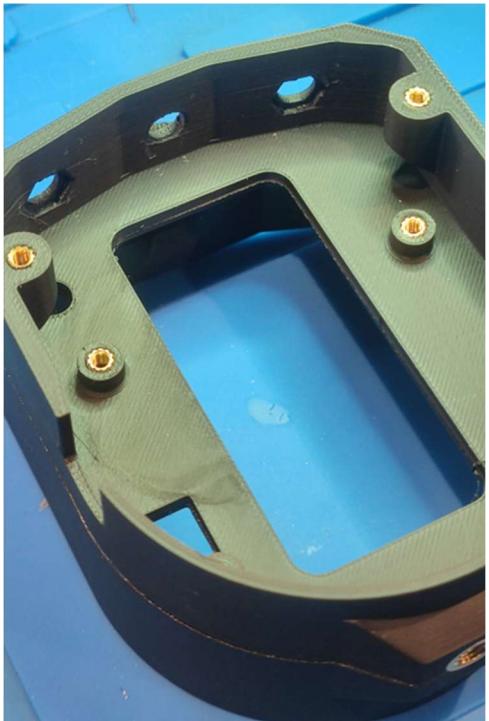
- 4× M2 inserts - UPS module
- 4× M3 inserts - battery housing cover

Main PCB Housing

- 4× M3 inserts - PCB mounting
- 4× M3 inserts - front cover

Additional

- 1× threaded insert - camera / tripod mount



Main housing side



UPS/Battery housing



Bonded together

### 10.2 BOND MAIN HOUSING AND BATTERY HOUSING (SECOND)

1. Dry-fit and verify orientation
2. Apply glue or epoxy to mating surfaces
3. Join housings
4. Clamp or hold until fully cured

⚠ Permanent bond - verify alignment before gluing

### 10.3 OPTIONAL SEALING

Optional TPU seals may be used.  
Additional sealing may be added with:

- Silicone sealant
- Silicone grease
- Petroleum jelly

⚠ No waterproof or IP rating is claimed.

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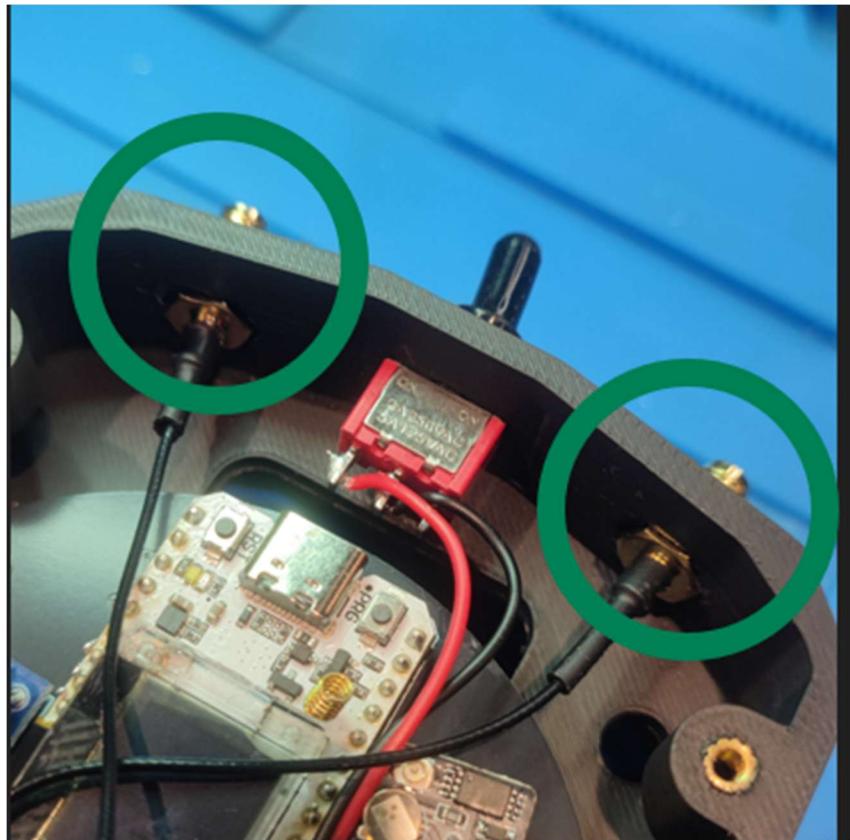
## 11. STEP 4 - INSTALL SMA ANTENNA CONNECTORS & POWER SWITCH

All external connectors must be installed before electronics are mounted.

Orientation Standard (Mandatory)

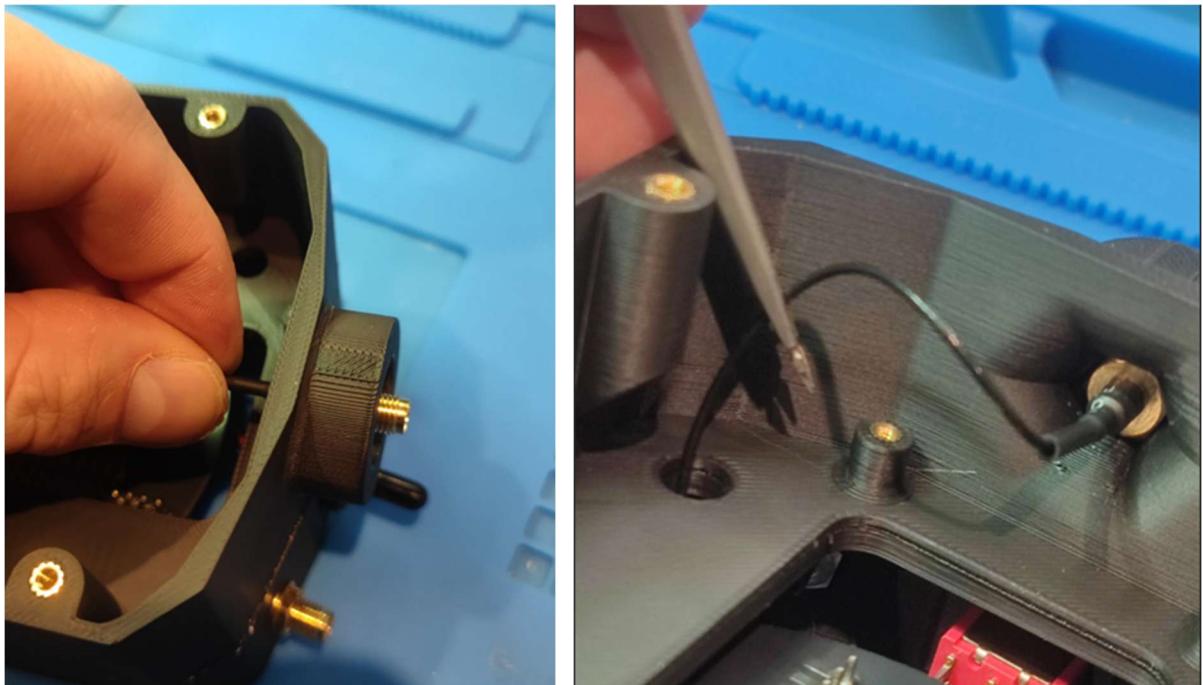
For all assembled nodes:

- LoRa antenna → right
- WiFi / BLE antenna → left
- Power switch → centered between SMA connectors



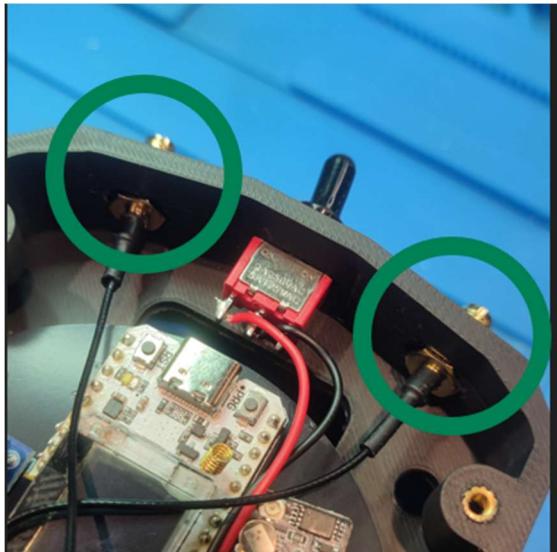
## 11.1 GPS SMA (BATTERY HOUSING)

- Install SMA female GPS connector into the battery housing
- Secure with washer and nut from outside



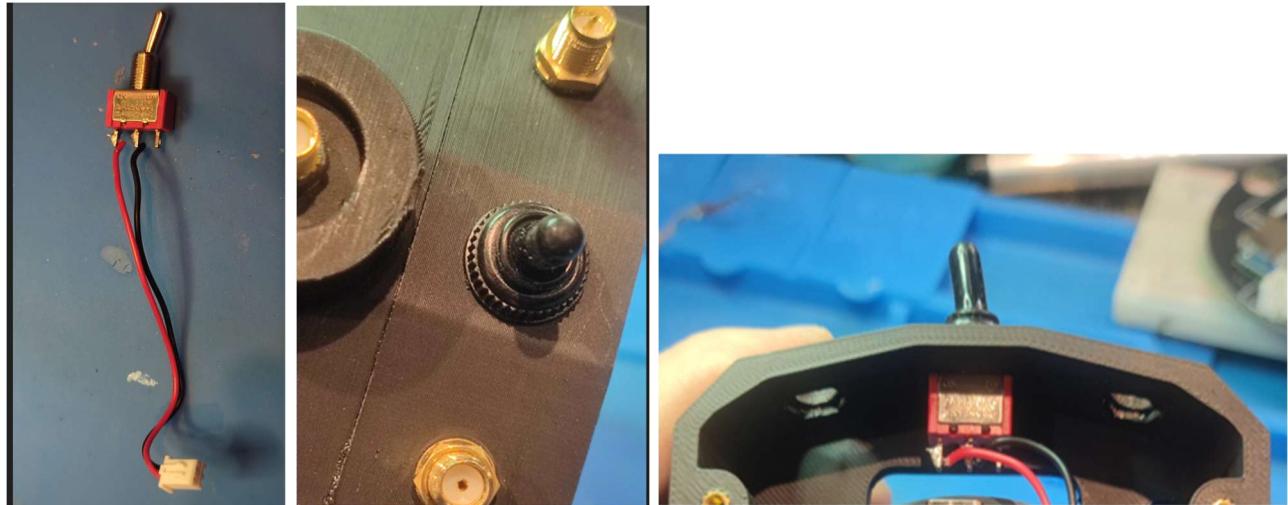
## 11.2 LORA & WIFI SMA (MAIN HOUSING)

- Install WiFi SMA (female) on the left
- Install LoRa SMA (male) on the right
- Secure with washer and nut



### 11.3 POWER ROCKER SWITCH

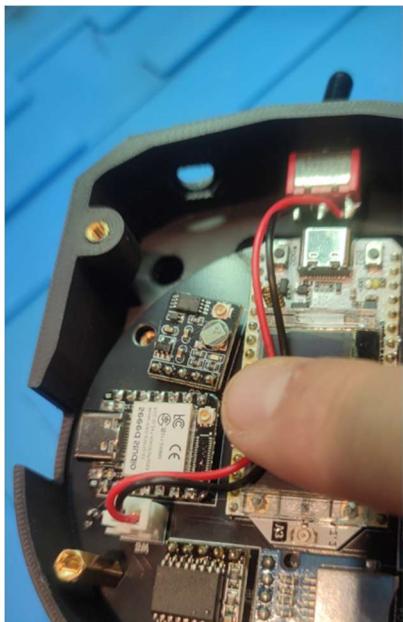
- Press switch into cutout between SMA connectors
- Install rubber cover onto switch
- Ensure smooth operation



## 12. STEP 5 - MOUNT PCB & CONNECT POWER AND RF PIGTAILS (CRITICAL)

### 12.1 Position PCB

- Place PCB into main housing
- Align mounting holes
- Connect power cables from power switch to JST marked SW on the PCB
- Insert 15mm M3 standoffs to the two lower holes (to hold the lower part of the front cover)



## 12.2 Connect SMA U.FL / IPX Pigtailed

Before securing the PCB:

1. Identify each SMA pigtails
2. Align pigtails connector over matching PCB RF socket
3. Press straight down until it clicks

- ⚠ Do not press at an angle
- ⚠ Do not force the connector
- ⚠ Damage is permanent if misaligned

GPS Antenna



LORA Antenna



WiFi/BT Antenna

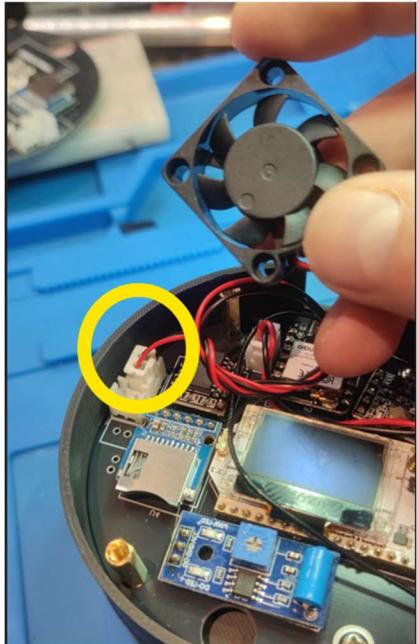


### 12.3 Secure PCB

1. Lower PCB fully into position
  2. Secure with M3 screws
  3. Do not overtighten
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### 13. Step 6 - Install Covers and Optional Fan

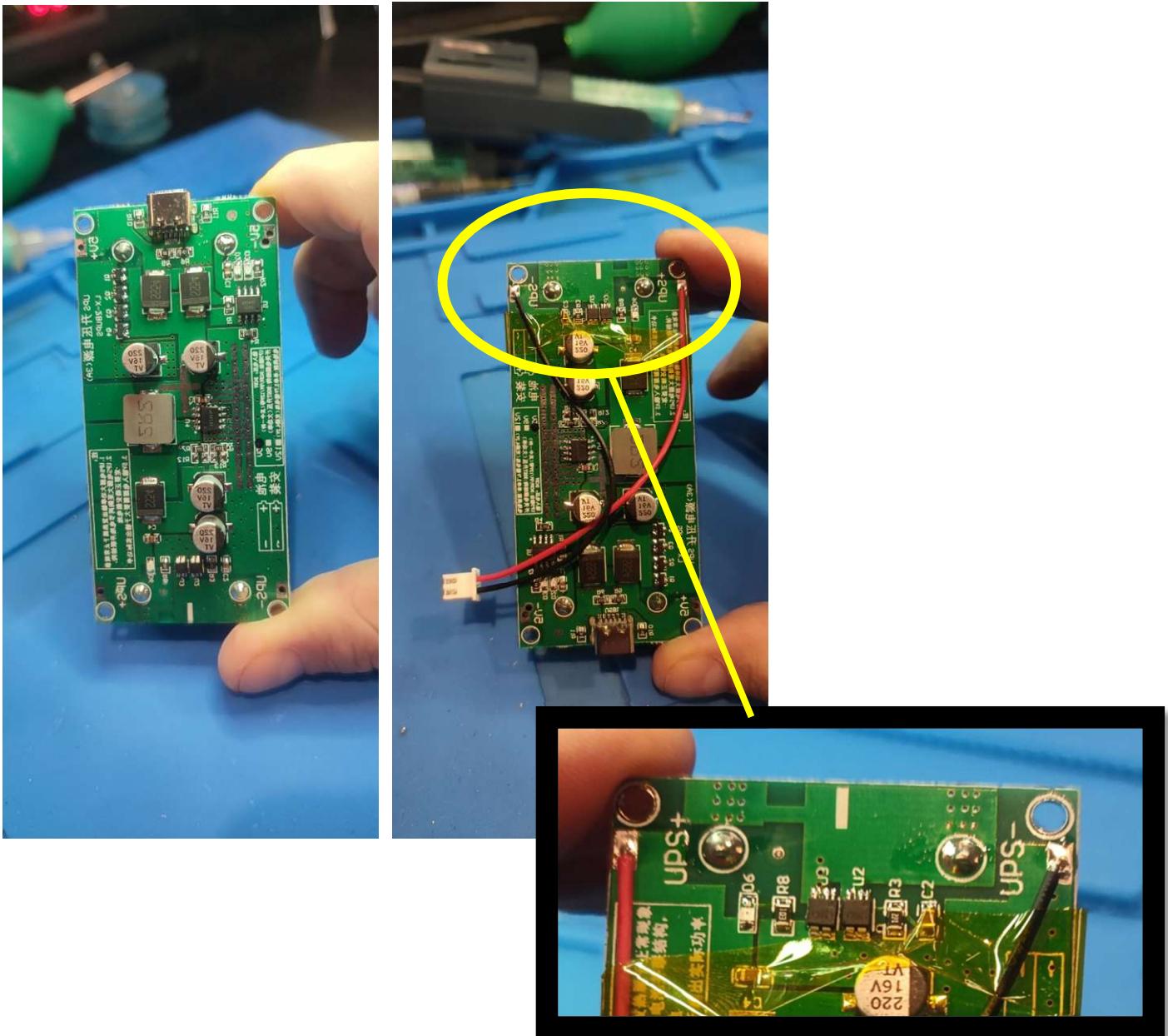
1. Install optional fan into front cover
2. Connect fan to JST fan output
3. Secure with screws



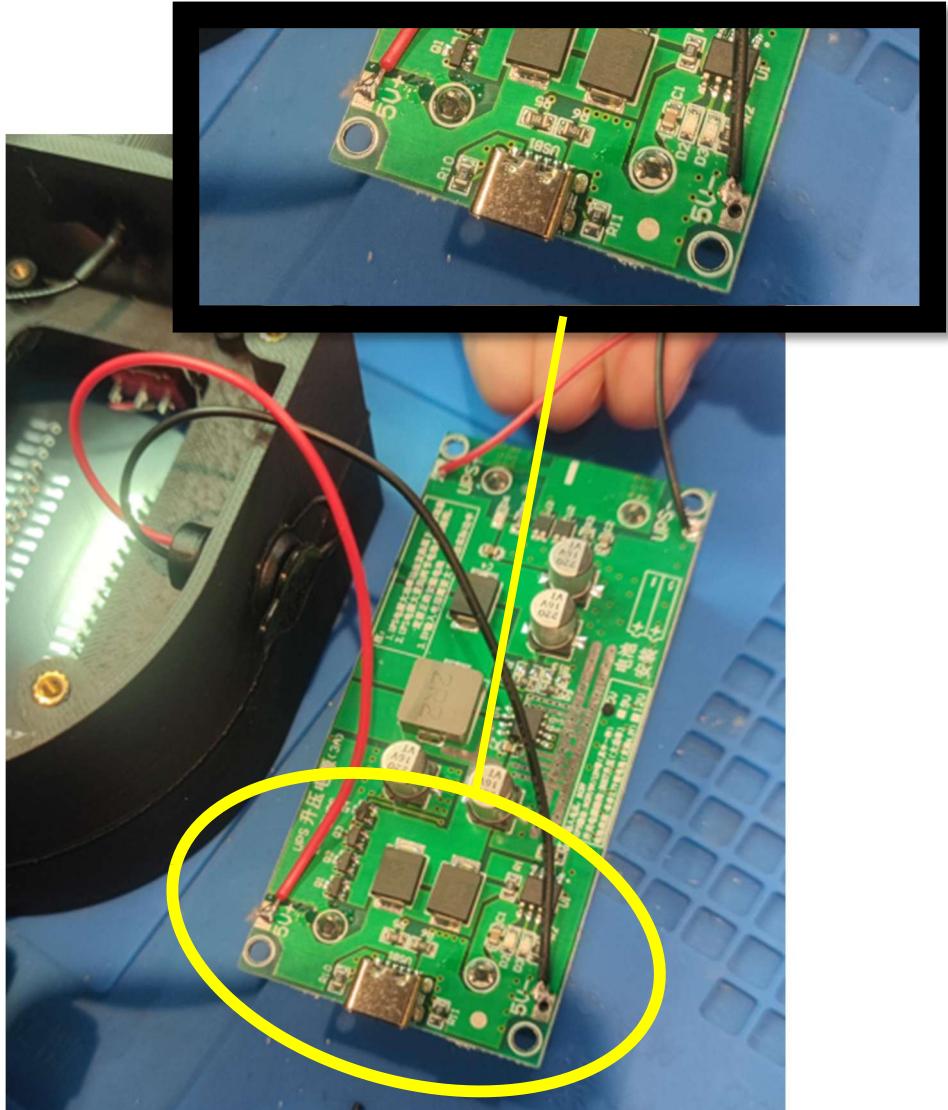
#### 14. Prepare UPS module

1. Prepare Power connector (JST plug with black and red wires)
2. Solder Power connector wires to UPS module **UPS+ (RED)** UPS-(BLACK)
3. Prepare USBC chassis mount (USBC chassis with black and red wires)
  - **IMPORTANT NOTE:** you need to thread the wires through the chassis before soldering, remember nut on the inside and waterproof cover on the outside.
4. Solder USBC wires to **5V+ (RED)** and **5V- (BLACK)**
5. Mount the UPS pcb with the usbc connector facing in the direction of the tripod mount.
  - **IMPORTANT NOTE:** if you want fast charging available use the enclosure designed for it. NEVER use both chassis input and fast charge input together.  
Fast charge input is the USBC on the UPS pcb itself.

#### Power connector wires

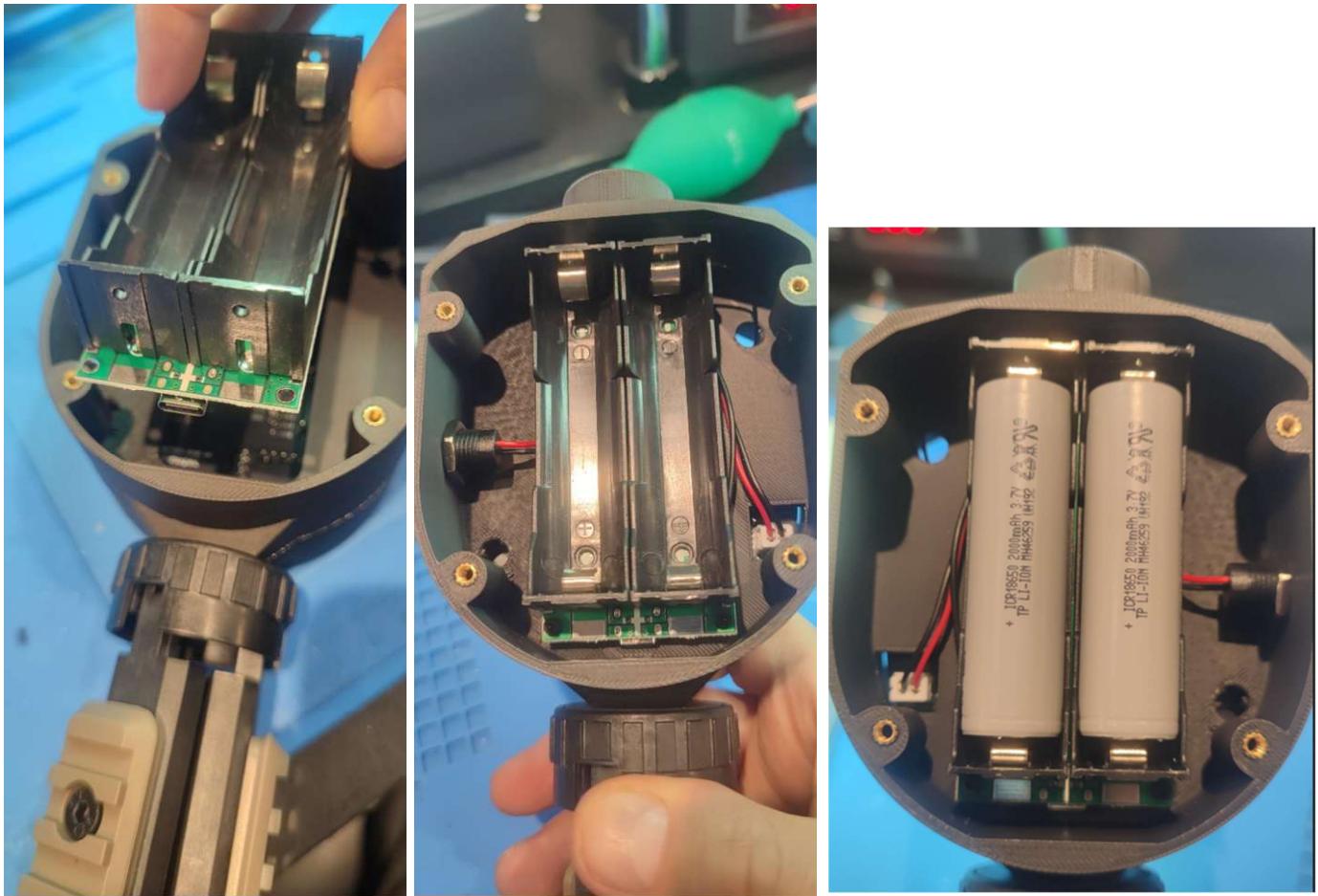


USBC chassis wires



### Install UPS module

1. Connect power connector to the main PCB and secure the UPS module to the enclosure with m2 hex screws



## 15. Final Inspection Checklist

**IMPORTANT NOTICE:** Before applying power:

- All modules soldered correctly
- No solder bridges or cold joints
- SD card installed
- All U.FL / IPX pigtailed connected
- SMA connectors tight and oriented correctly
- Power switch operates smoothly
- Antennas attached
- UPS power module connected to PCB
- Batteries are installed in the correct orientation

Apply power:

You should see lights blinking/static on the ESP, Lora Module, GPS module and Tamper sensor.

## 16. Assembly Complete

Hardware assembly of the ANTIHUNTER DIGINODE is complete.

You may now proceed with:

- Firmware flashing
- Configuration
- Deployment

Firmware and configuration manual for this specific node

<https://github.com/lukeswitz/AntiHunter>

Command multiple nodes.?

Additional software, Command & Control Center

<https://github.com/TheRealSirHaXalot/AntiHunter-Command-Control-PRO>

