T-Beam Build Guide (TTGO/LilyGO)

Overview

The TTGO/LilyGO T-Beam is one of the most popular all-in-one LoRa mesh boards available. A single PCB integrates an **ESP32 microcontroller**, an **SX1262 LoRa radio**, a **GPS module**, and an **18650 Li-ion cell holder** with onboard charging - making it an excellent starting point for a portable or fixed mesh node.

Versions & Variants

- **T-Beam v1.1** - The most common variant. Uses the AXP192 power management IC. The radio fitted varies by production run: many v1.1 boards historically shipped with the SX1276/SX1278, while later units use the SX1262 — **confirm the radio from the chip markings on your board before flashing**, since the wrong firmware variant will not work. (Per the LILYGO GitHub hardware repository; the later v1.2 revision uses the AXP2101 PMIC.) Available in 868 MHz (EU) and 915 MHz (US/AU) versions.
- **T-Beam Supreme** - Upgraded to ESP32-S3 with the **SX1262 radio** (the SX1268 is the ~470 MHz China-band variant, not the part on the Supreme). More processing power and improved RF performance. Uses AXP2101 PMIC. Confirm the exact radio on your board revision before flashing.
- **T-Beam M8N vs M10 GPS** - Refers to the GPS module fitted. The M10 (ublox M10) acquires faster and has better cold-start performance. Check the board revision markings or product listing to confirm which GPS module your unit has.

Bill of Materials

- T-Beam board (select your frequency band: 868 or 915 MHz)
- 18650 Li-ion cell, 2500 mAh or greater, up to ~3500 mAh for current high-capacity cells (e.g. Samsung 25R, LG MH1, Panasonic NCR18650B). **Use a flat-top, unprotected cell**

— button-top and protected cells are physically longer and will not fit the onboard holder.
- SMA antenna matched to your frequency band
- USB-C or Micro-USB cable (varies by board version) for flashing and charging
- Optional: IP67 waterproof enclosure (Hammond 1554 series or equivalent — note only the polycarbonate 1554 is rated IP67/68; the ABS version is ~IP66), cable gland for SMA pigtail

Flashing Meshtastic Firmware

1. Open **Chrome or Edge** (Web Serial API is required - Firefox is not supported).
2. Navigate to flasher.meshtastic.org.
3. Connect the T-Beam to your computer via USB.
4. In the flasher, select the device family: **TTGO T-Beam**. Choose the correct sub-variant (v1.1, Supreme, etc.) if prompted.
5. Click **Flash**. The flasher will erase and write firmware automatically. Do not disconnect during the process.
6. Once flashing completes, the device will reboot. Use the Meshtastic app (Android/iOS) or the web client at client.meshtastic.org to complete initial configuration (region, node name, channel).

Flashing MeshCore Firmware

1. Navigate to flasher.meshcore.io (the canonical MeshCore flasher run by the MeshCore core team) in Chrome or Edge.
2. Connect the T-Beam via USB.
3. Select **T-Beam** from the device list, then choose the firmware role - typically **Repeater** for a fixed infrastructure node.
4. Click **Flash** and wait for completion.
5. Configure the node using the MeshCore companion app or serial console.

Critical Gotcha: Power Management IC Mismatch

The T-Beam uses a Power Management IC (PMIC) to control battery charging and power rails. The T-Beam v1.1 uses the **AXP192**, while the T-Beam Supreme uses the **AXP2101**. Firmware must include drivers for the correct PMIC.

Matching firmware to your exact board variant matters in two ways. **Wrong radio variant:** the radio (and often the screen) will not come up at all. **Wrong PMIC variant:** the board may boot and appear to work but exhibit power-management problems such as failing to charge the battery. Always confirm your board hardware revision before selecting firmware. The revision is usually silkscreened on the PCB (look for "V1.1", "SUPREME", etc.). Both Meshtastic and MeshCore flashers list variants - match the label carefully.

Outdoor Deployment Tips

- Use an **IP67-rated enclosure** - Hammond 1554 series polycarbonate boxes are widely used and available in sizes that fit the T-Beam comfortably (only the polycarbonate variant carries the IP67/68 rating; the ABS version is ~IP66). Bud Industries and Fibox TEMPO are good alternatives.
- Drill a hole for an SMA bulkhead connector or a waterproof SMA pigtail using a cable gland rated IP68. The antenna should mount outside the enclosure.
- Add a silica gel desiccant pack inside the enclosure to absorb moisture. Replace annually. Consider a Gore-Tex breather vent to equalise pressure without admitting moisture.
- Avoid mounting in direct sun if possible - in a dark, sealed plastic enclosure in direct summer sun the internal temperature can exceed 70°C (lighter/white enclosures run considerably cooler). Use a UV-resistant box and shade the enclosure where feasible.

Power Notes: Extended Battery Capacity

The T-Beam's onboard 18650 holder limits you to a single cell (~3,000 - 3,500 mAh maximum with a current high-capacity cell). For permanent fixed installations requiring multi-day autonomy or solar charging:

- The T-Beam exposes battery pads (B+ and B-) accessible on the PCB.
- You can connect an external **LiFePO4** battery pack, but you **must not simply wire the LiFePO4 cell to the B+/B- pads** — the onboard AXP charger is configured for the Li-ion voltage curve and will charge to 4.2V, overcharging a LiFePO4 cell. Instead, charge the LiFePO4 pack with a dedicated LiFePO4-rated charge controller and feed the board from a regulated supply (e.g. through the 5V/USB input) rather than connecting the cell to the onboard charger. Simply attaching LiFePO4 to the battery pads still lets the AXP charge it to 4.2V, so that path must be avoided.

- An alternative is to power the board through the 5V input pin with a regulated supply from a solar charge controller, bypassing battery charging entirely.
- For simpler builds, a large-capacity Li-ion power bank with pass-through charging can be used to power the USB input.
- **Cell sourcing and cold-weather note:** use a quality 18650 from a reputable source (counterfeit cells are common and a fire risk), insert it with correct polarity, and do not rely on onboard charging below 0°C — no lithium chemistry (Li-ion or LiFePO4) should be charged below 0°C without a charger that has a low-temperature charge cutoff.

Revision #7
Created 2026-05-03 04:09:02 UTC by Mesh America Admin
Updated 2026-06-13 16:17:03 UTC by Mesh America Admin