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 SX1262 radio and the AXP192 power management IC. Available in 868 MHz (EU) and 915 MHz (US/AU) versions.
- **T-Beam Supreme** - Upgraded to ESP32-S3 and SX1268 radio. More processing power and improved RF performance. Uses AXP2101 PMIC.
- **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 (e.g. Samsung 25R, LG MH1, Panasonic NCR18650B)
- 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), 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 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.

If you flash the wrong firmware variant, the board will appear to work but the battery will not charge. 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. 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 - internal temperatures can exceed 70°C in sealed plastic enclosures in summer. 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 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 via these pads, but you **must bypass the onboard charging circuit** and use a dedicated LiFePO4 charge controller, as the onboard charger is configured for Li-ion voltage curves and will overcharge a LiFePO4 cell.
- 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.

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