

Go Kit Building for Mesh Nodes

Introduction

A well-built mesh go kit allows rapid deployment of a fully functional LoRa mesh node in any environment - whether that is a shelter parking lot, a hilltop relay position, or the back of a command vehicle. This page covers case selection, power systems, antenna options, node hardware, and a [pre-deployment checklist](#).

Case Selection

Weatherproofing is the first priority. The two most common case families are:

- **Pelican cases** (e.g., 1510 carry-on, 1450 mid-size): High-quality latches, pressure equalization valve, pick-and-pluck foam. Manufacturer-rated waterproof (Pelican rates the Protector line IP67 with the purge valve closed — check the current spec). More expensive but very durable.
- **Apache cases** (Harbor Freight): A good budget alternative that costs substantially less than Pelican. Harbor Freight markets Apache cases as IP67-rated as well (verify the current manufacturer spec). They are similar but not identical — latch durability and warranty differ. Pre-cut foam available; customizable with aftermarket inserts. Treat any price comparison as approximate and check current pricing.

For a single-node portable kit, a mid-size case (Apache 3800 or Pelican 1450) is sufficient. For a multi-node relay kit with a larger battery, the Apache 4800 or Pelican 1510 provides adequate volume.

Power Systems

Battery Chemistry Comparison

Parameter	LiFePO4	SLA (AGM)
Energy density	Higher (lighter for same Ah)	Lower (heavy)
Cycle life	2,000+ cycles	300-500 cycles
Self-discharge	~3% per month	~5% per month
Cold weather performance	Can discharge to about -20C, but must NOT be charged below 0C (32F) unless the pack has dedicated low-temperature charging support; a BMS usually disables charging when too cold (it blocks cold charging, it does not enable it)	Degrades below 0C
Cost per Wh	Higher upfront, lower lifetime	Low upfront
Recommended use	Primary portable kit	Base-station backup

A 10 Ah, 12 V LiFePO4 battery stores 120 Wh nominal (total) capacity; at 80% depth of discharge about 96 Wh is usable. This is adequate for most single-node 12-hour deployments.

Charge Controller

If solar charging is desired, a 10-20W solar panel is sufficient for a single-node kit. Use a charge controller that is explicitly LiFePO4-compatible (correct voltage setpoints), since LiFePO4 uses a different charge curve than SLA — the older Renogy Wanderer's lithium support varies by model and firmware, so verify before relying on it. Note that a 10A controller is far larger than a 10-20W panel needs; a small lithium-aware MPPT controller may charge more efficiently for the cost. Do not use a generic PWM controller without confirming its LiFePO4 voltage support.

Power Budget Calculation

Before deployment, calculate the required battery capacity. Where possible, work the budget in watt-hours (Wh), not raw mAh, to avoid mixing voltage domains (a node runs at ~3.7-5 V while a "12 V" pack is at 12 V):

1. Measure or look up the current draw of the node hardware at full transmit and receive. These are approximate and depend heavily on configuration (light sleep, GPS state, screen); confirm against a meter or the Espressif/Semtech datasheets for your build. Typical ranges:

- T-Beam v1.1 (ESP32 + SX1276 + GPS, GPS on, no light sleep): approximately 120 mA average (idle/receive), 200 mA peak (transmit) — lower with light sleep enabled
 - RAK4631 (nRF52840 + SX1262): a few mA average with light sleep (~200 uA in deep sleep), higher in continuous receive; ~100+ mA peak during transmit. Actual average depends on sleep configuration.
2. Add loads for any accessories: OLED display ~30 mA; USB hub ~50 mA; Raspberry Pi companion ~400 mA.
 3. Calculate: mAh required = total_mA x hours divided by efficiency_factor. Use 0.85 for a new LiFePO4 pack. To compare against a 12 V pack, convert the node load to Wh and compare to the battery's Wh rather than comparing mAh figures across different voltages.
 4. Example: T-Beam (150 mA avg) + OLED (30 mA) = 180 mA x 12 h / 0.85 = **2,541 mAh minimum at the node's ~5 V rail** (roughly 13 Wh). Note that a "5 Ah 12 V" battery is about 60 Wh, so it carries well over 2x margin in energy terms — but do not read the 2,541 mAh and 5 Ah figures as a direct ratio, because they are at different voltages. Always compare in watt-hours.

Antenna Options

Antenna Type	Gain	Best Use
Stub/whip (stock)	2-3 dBi	Portable, handheld, omnidirectional coverage
Mag-mount whip (915 MHz)	3-5 dBi	Vehicle rooftop, rapid deploy, omnidirectional
Yagi (3-6 element)	8-13 dBi	Point-to-point relay link, fixed direction
Fiberglass vertical (1/2 wave)	5-6 dBi	Elevated fixed relay node, omnidirectional

Part 15 power note: Under 47 CFR §15.247, antenna gain above 6 dBi requires a dB-for-dB reduction in conducted transmitter power below the 1 W (30 dBm) maximum to keep EIRP within the limit. With an 8-13 dBi Yagi you must reduce transmitter output accordingly (e.g., a 13 dBi antenna requires roughly a 7 dB power reduction from 30 dBm). Pairing a 13 dBi Yagi with a full 1 W node would exceed the lawful EIRP — verify your configuration stays within the limit.

For most go kits, a 5 dBi mag-mount whip on a metal ground plane (cookie sheet, vehicle roof) provides a practical balance of gain and omnidirectional coverage. Include SMA adapters and short coax pigtails in the kit.

Node Hardware Selection

- **LILYGO T-Beam v1.1 or v1.2:** Integrated ESP32, SX1276/SX1262, GPS, and 18650 battery holder. Best for portable handheld use. Available with 868/915/923 MHz variants.
- **RAK4631 (WisBlock):** nRF52840 + SX1262 modular system. Excellent power efficiency, compact. Requires WisBlock Base Board. Best for compact fixed relay builds. GPS available as an add-on module.
- **Heltec LoRa32 v3:** ESP32-S3 + SX1262 + integrated OLED. Good budget option for fixed relay nodes.

Pre-Deployment Checklist

- ☐ Node firmware updated to latest stable Meshtastic release
- ☐ Node name set to tactical identifier per IAP (e.g., SHELTER-B)
- ☐ Channel/PSK configured to match operational channel plan
- ☐ GPS fix confirmed (cold start may take 2-5 minutes outdoors)
- ☐ Battery charged and voltage verified. Note: 12.8V is the *nominal* voltage of a 4S LiFePO4 pack, not the fully-charged figure — a fully charged 4S LiFePO4 pack rests near 13.3-13.6V (and reads ~14.2-14.6V during or just after charging). Do not treat 12.8V as 100% state of charge, or you will under-charge the pack.
- ☐ Antenna SMA connector torqued finger-tight plus 1/8 turn (do not over-torque)
- ☐ Coax and antenna tested for continuity (SWR check if meter available)
- ☐ Spare 18650 cells or USB power bank included
- ☐ [Meshtastic app](#) (iOS/Android) or web client tested and connected via BLE/WiFi
- ☐ Deployment contact list (COML name, frequency, mesh channel, check-in interval) printed and laminated
- ☐ ICS 214 form (blank) included for activity logging
- ☐ Case latches and pressure valve inspected; foam dry

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