

Hardware

DIY vs kits, power systems, and enclosures.

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DIY vs Pre-built Kits

You can build a Meshtastic repeater from scratch or purchase a pre-built kit. The right choice depends on your budget, technical skills, and time available.

DIY builds

Building from components gives you full control over every aspect of the hardware and can be lower cost if you have relevant skills or existing parts.

Core components needed

- **LoRa board** - ESP32 or nRF52-based board with SX1262 or similar radio (\$20 - \$40). Must support 915 MHz and have an external antenna connector.
- **Antenna** - quality 915 MHz external antenna (\$5 - \$20 for omni, more for high-gain)
- **Weatherproof enclosure** - IP65-rated box with cable glands (\$10 - \$20)
- **Power system** - LiFePO4 battery, solar panel (if remote), charge controller

Challenges

- Reliable weatherproofing requires attention to detail - water ingress through cable glands or enclosure seals is the most common failure mode
- Power system sizing requires calculation to ensure adequate runtime through cloudy periods
- Soldering may be required depending on the board and power connections

Pre-built kits

Several manufacturers offer kits designed for easy Meshtastic deployment. These trade customization for convenience: weatherproofing is engineered from the factory, power systems are pre-integrated, and setup is primarily software.

Advantages

- Engineered weatherproofing - no DIY enclosure work required
- Integrated power system - battery, solar, and charge controller in one unit
- Faster time to deployment

- Known-good hardware compatibility with Meshtastic firmware

Disadvantages

- Higher upfront cost (\$60 - \$150+)
- Limited hardware customization

Which to choose

| Factor | DIY | Kit |
|-----------------------------|--------------------------------|-----------------------------|
| Cost | Lower potential, more variable | Higher, more predictable |
| Setup time | Significant | Minimal |
| Technical skill needed | Moderate to high | Low |
| Customization | Full control | Limited |
| Weatherproofing reliability | Skill-dependent | Generally good to excellent |

Power Systems for Repeaters

Repeater and Router role nodes keep the LoRa radio on continuously, which draws significantly more power than a client device that sleeps between uses. Reliable power is a first-class concern for any permanent repeater deployment.

Solar systems

Solar power is the standard for remote deployments without access to mains power. MeshCore and Meshtastic repeaters can run on surprisingly modest solar setups due to their low continuous power draw.

Recommended components

- **Solar panel:** 10 - 30W panel, mounted to maximize year-round sun exposure. South-facing, angled at your latitude (in North America).
- **Battery:** LiFePO4 chemistry strongly recommended. It handles temperature extremes, cold weather, and deep discharge cycles far better than LiPo. Size for 5 - 7 days of runtime without solar input for resilience through extended cloudy periods.
- **Charge controller:** MPPT controllers are more efficient than PWM and better suited to variable solar conditions. Sized appropriately for your panel wattage.

Mains power

For rooftop or indoor repeaters with access to building power, a quality regulated 5V or 12V supply is simpler and more reliable than solar. Add a small UPS or battery backup to maintain operation during brief outages.

Software power optimization

Even with always-on radio requirements, you can reduce power draw in software:

- Turn off GPS if the node does not need to report position (REPEATER role does this automatically)
- Disable the screen/display if present
- Disable Bluetooth: `meshtastic --set bluetooth.enabled false`
- Use the minimum transmit power needed for coverage goals

- Choose LongFast or a balanced modem preset rather than the most aggressive long-range preset (which increases airtime and thus power)

Monitoring battery voltage

For remote deployments, periodically check battery voltage to detect degraded performance before the repeater goes offline. Some Meshtastic nodes can report telemetry data including battery voltage over the mesh.