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. Always-on repeaters draw power continuously and must be sized for worst-case conditions - the shortest winter days, multi-day storms, and cold (which cuts usable battery capacity). Undersized solar is a leading cause of repeaters failing exactly during the prolonged bad-weather emergencies the network is meant to serve. Size for the worst case with several days of autonomy and no solar input, not for average sunny-day draw.

Recommended components

- **Solar panel:** 10 - 30W panel, mounted to maximize year-round sun exposure. South-facing (in the Northern Hemisphere), angled at roughly your latitude for a good annual average. For winter resilience a steeper tilt (about latitude + 15°) is often preferred, because it favors the low sun angles of the short, low-sun months when a repeater is most likely to run short of power.
- **Battery:** LiFePO4 chemistry strongly recommended. It handles temperature extremes, deep discharge cycles, and cycle life far better than LiPo. One critical caveat: LiFePO4 must not be charged below 0°C (32°F) - doing so causes lithium plating and permanent damage or a safety hazard. For cold-climate solar repeaters, use a charge controller/BMS with a low-temperature charge cutoff, or a self-heating battery. A common target is several days (e.g. 3 - 7) of autonomy with no solar input; size it based on your local winter sun-hours and cloud patterns rather than a fixed figure.
- **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. The REPEATER role does not broadcast its position, but you may still want to explicitly disable the GPS module to save its power draw.
- Disable the screen/display if present
- Disable Bluetooth: `meshtastic --set bluetooth.enabled false`
- Use the minimum transmit power needed for coverage goals - and never exceed the legal maximum for your region and antenna (see legal considerations: conducted power is capped at 1 W / 30 dBm, reduced dB-for-dB for antenna gain above 6 dBi). Leave the region setting correct, as it is the master legal power cap.
- Choose a balanced modem preset rather than the most aggressive long-range preset (which increases airtime and thus power) - but only among the presets your local network uses. You must run the same modem preset as the rest of your local mesh; nodes on different presets cannot hear each other, so never choose a preset for power reasons alone or you risk isolating your node from the whole local network.

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.

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