Infrastructure & Solar Nodes

Prebuilt Solar Repeater Units

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Prebuilt solar nodes take the complexity out of outdoor deployments. They arrive weather-rated, often pre-flashed, and ready to mount. The trade-off is higher cost compared to a DIY build.

RAK WisMesh Repeater - $129

IP67-rated enclosure with 5.2Ah battery and pre-flashed MeshCore repeater firmware. Designed specifically for unattended outdoor deployment. Mount it, point the solar panel, and it runs.

- **IP rating:** IP67
- **Battery:** 5.2Ah
- **Firmware:** MeshCore (pre-flashed)
- **Solar:** External panel required (sold separately)

RAK WisMesh Repeater Mini - $69

A smaller, lower-cost version of the WisMesh Repeater. IP65 rated with a 2000mAh battery. Good starting point for a solar site where you want a prebuilt option without the full Repeater cost.

SenseCAP Solar Node P1 - $69.90

Integrated solar panel in the housing. No external battery included - you add your own 18650 cells. Low entry cost if you already have cells.

SenseCAP Solar Node P1-Pro - $89.90

The community's top recommendation for outdoor MeshCore repeaters per RegionMesh. Includes built-in GPS, capacity for 4x 18650 cells, and an integrated solar panel. Ships with MeshCore firmware. The GPS enables position reporting from the repeater itself.

- **GPS:** Yes
- **Battery capacity:** 4x 18650 (cells not included)
- **Solar:** Integrated
- **Firmware:** MeshCore (pre-flashed)
- **Community rating:** "Best choice for outdoor MeshCore repeaters" - RegionMesh

Atlavox Beacon - $235.99

Premium solar repeater with a 5W ETFE solar panel, 5000mAh battery, and IP67 rating. ETFE panels are more durable and efficient than standard PET-laminated panels, making this a good long-term investment for critical sites.

Atlavox Beacon Outpost - $269.99

Same hardware as the Beacon but comes pre-flashed and pre-configured, with an ALFA antenna included. Zero-setup deployment - unbox, mount, done.

PEAKmesh Solar Nodes - $99+

Community-built nodes rated for 30+ days of runtime. Available in birdhouse and tree-hang form factors - useful for natural environments where a standard enclosure would look out of place or draw attention.

Yeti Wurks Base Station - $99+

IP65-rated, pre-configured. Yeti Wurks also offers a solar kit ($150) that bundles the base station with a 5.5W solar panel - a convenient all-in-one purchase for a new solar site.

Seeed MeshCore Starter Kit - $132.80

Bundles a SenseCAP P1-Pro (solar node/repeater) with a Wio Tracker L1 Pro (handheld/carry device), both pre-flashed with MeshCore. The most convenient way to get both an infrastructure node and a personal device in one purchase.

Prebuilt Solar Node Comparison

Device	Price	Battery	IP Rating	Solar Included	Pre-flashed	GPS
RAK WisMesh Repeater	$129	5.2Ah	IP67	No	Yes	No
RAK WisMesh Repeater Mini	$69	2000mAh	IP65	No	No	No
SenseCAP P1	$69.90	18650 (DIY)	Yes	Yes	No	No
SenseCAP P1-Pro	$89.90	4x 18650 (DIY)	Yes	Yes	Yes	Yes

Device	Price	Battery	IP Rating	Solar Included	Pre-flashed	GPS
Atlavox Beacon	$235.99	5000mAh	IP67	5W ETFE	Yes	No
Atlavox Beacon Outpost	$269.99	5000mAh	IP67	5W ETFE	Yes (configured)	No
PEAKmesh Solar Nodes	$99+	30+ day rated	Yes	Yes	Yes	Varies
Yeti Wurks Base Station	$99+	-	IP65	Optional ($150 kit)	Yes	No

Base Station Nodes

Base Station Nodes

Base station nodes are designed for fixed high-site installations where maximum transmit power, receive sensitivity, and continuous power availability matter more than portability or battery life.

Station G2 - $109

The Station G2 is the benchmark base station for MeshCore and Meshtastic networks. It delivers 36.5 dBm (approximately 4.5W) of TX power - substantially more than the 22 - 28 dBm typical of portable devices. A built-in LNA improves receive sensitivity, extending the effective range on both transmit and receive.

Station G2 Key Specs

- **TX power:** 36.5 dBm (4.5W) - see FCC compliance note below
- **LNA:** Yes - improves receive sensitivity
- **Power input:** 15V USB-C Power Delivery (PD) - standard USB-A/5V chargers will not work
- **MCU:** ESP32
- **Antenna:** SMA connector; use a high-quality outdoor antenna
- **Enclosure:** Open board; requires weatherproof enclosure for outdoor deployment

FCC Part 15 Note: In the US, the maximum EIRP for 915 MHz ISM band operation under Part 15 is 36 dBm (4W). The Station G2's 36.5 dBm conducted TX power already approaches this limit before accounting for antenna gain. Adding a high-gain antenna will push EIRP above legal limits. Consult Part 15 rules and your antenna's gain specification before deploying. Amateur radio operators using Part 97 authority have higher power limits but must meet other requirements.

Deployment Considerations

- Mount at the highest practical point. Line-of-sight dominates range at 915 MHz - elevation matters far more than TX power.
- Use low-loss coax (LMR-400 or equivalent) for the feedline. At 36.5 dBm output, cable loss becomes significant. Every 3 dB of cable loss halves your effective radiated power.
- Pair with a 5 - 8 dBi omni antenna for broad coverage, or a Yagi for point-to-point backbone links.
- The 15V PD requirement means you need a USB-C PD charger or power supply. Many laptop chargers work. For solar-powered base stations, you will need a 15V solar charge controller output, which is non-standard - most builders use a boost converter from a 12V battery.

RAK WisBlock Base Station Approach

An alternative base station can be built using a RAK4631 (nRF52840 + SX1262) on a RAK19007 base board, mounted in a weatherproof enclosure. This approach costs more upfront but offers modularity: you can add GPS modules, environmental sensors, or additional radios on the WisBlock connector system. The RAK4631 draws less power than the Station G2, making it more practical for solar-powered base stations without a boost converter.

Siting a Base Station

Consideration	Guidance
Height	Every doubling of height adds ~6 dB of effective range. Rooftop > hilltop > pole-mounted > ground level.
Obstructions	Buildings and trees absorb 915 MHz. Clear line of sight to the horizon is ideal.
Antenna choice	5 - 8 dBi for omnidirectional coverage. Higher gain focuses the beam - avoid if terrain varies in elevation around the site.
Lightning protection	Use a DC-grounded lightning arrestor on the feedline. Ground the mast. 915 MHz arrestors are inexpensive (<$20).
Power	Mains power is preferred. Solar requires careful sizing for winter minimums.

Fixed Infrastructure Node Hardware Selection

Fixed infrastructure nodes - backbone repeaters, room server hosts, and long-term outdoor installations - have different hardware requirements than portable client nodes. Reliability, power efficiency, and maintainability are the priorities.

Primary Hardware Candidates

RAK4631 (nRF52840 + SX1262)

The RAK4631 WisBlock core is the most popular choice for fixed infrastructure in 2025-2026:

- **Current draw:** ~3 mA in LoRa receive (idle), ~80 mA transmit at 22 dBm
- **Average power:** 8-15 mA in typical repeater operation
- **Advantages:** Modular WisBlock system allows easy sensor/GPS/display add-ons; nRF52840 has excellent power management; SX1262 supports all required frequencies
- **Form factor:** Small enough to fit in an IP67 enclosure with a 18650 battery pack
- **Firmware:** MeshCore (REPEATER or Companion), Meshtastic

LILYGO T-Beam Supreme (ESP32-S3 + SX1262)

Good choice when WiFi/MQTT gateway capability is needed at a fixed site:

- **Current draw:** ~80-120 mA (ESP32 WiFi active), ~30 mA (WiFi off, LoRa only)
- **Advantages:** Built-in GPS, WiFi for MQTT bridge, USB-C, relatively large community
- **Disadvantages:** Higher power draw than nRF52 makes solar budget larger; ESP32 requires periodic watchdog resets in some deployments
- **Best for:** Gateway nodes with internet connectivity, sites with reliable grid or large solar panels

Heltec HT-n62 (nRF52840 + SX1262)

Ultra-compact option for space-constrained installations:

- **Current draw:** Very similar to RAK4631; nRF52840-based
- **Advantages:** Extremely small form factor; built-in LiPo connector
- **Best for:** Discreet indoor deployments, installations with severe space constraints

Hardware Selection Matrix

Use Case	Recommended Hardware	Reason
Solar outdoor repeater	RAK4631	Lowest power, weatherproof WisBlock ecosystem
Indoor backbone with internet gateway	T-Beam Supreme	WiFi for MQTT, GPS for position tracking
High-altitude remote repeater	RAK4631	Low power essential for limited solar; reliable firmware
Room Server host: RAK4631 or Heltec V3 running MeshCore Room Server firmware	RAK4631 via USB serial	Pi handles room server; RAK handles LoRa radio

Antenna Considerations for Fixed Sites

Infrastructure nodes should use external antennas rather than the stub antennas included with most development boards:

- **Omnidirectional (5-8 dBi fiberglass):** Best for covering 360 degrees; mount at highest practical point
- **Yagi/directional (10-15 dBi):** Best for point-to-point backbone links over long distances; requires careful alignment
- **Antenna cable:** LMR-195 or LMR-400 (minimize cable length to reduce loss; LMR-400 has ~1 dB/10m loss at 915 MHz)