# Base Station Nodes

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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 (as of 2026-06-08)

The Station G2 is the benchmark base station for MeshCore and Meshtastic networks. It delivers 36.5 dBm (approximately 4.46W) 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. Price is volatile; check the current listing on the official B&Q Consulting shop (shop.uniteng.com) or Tindie before buying.

## Station G2 Key Specs

- **TX power:** 36.5 dBm (4.46W) via integrated 35 dBm PA - **note: this conducted level exceeds the FCC Part 15.247 1 W / 30 dBm conducted limit;** lawful at full power in the US only under an amateur Part 97 license (with encryption off) - 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-S3 (WROOM-1)
- **Radio:** SX1262
- **Display:** 1.3" OLED
- **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 902-928 MHz ISM band, FCC Part 15.247 limits **conducted** output to 1 W (30 dBm) referenced to an antenna of up to 6 dBi; with a 6 dBi antenna this works out to a derived 36 dBm (4 W) EIRP ceiling. The 36 dBm figure is a *derived* EIRP limit, not a flat standalone conducted limit. Antennas above 6 dBi require a dB-for-dB reduction in conducted power. The Station G2's 36.5 dBm **conducted** TX power already exceeds the 30 dBm conducted limit on its own, before any antenna gain - so it is not legal for unlicensed Part 15 operation at full power. Amateur radio operators using Part 97 authority may run higher power (up to 1500 W PEP under 47 CFR 97.313, subject to conditions), but Part 97 prohibits messages encoded to obscure their meaning - which conflicts with Meshtastic's default channel encryption - and requires a licensed

control operator and station identification. Consult Part 15.247 and Part 97 rules and your antenna's gain specification before deploying.

## 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. Remember that any antenna above 6 dBi requires reducing conducted power dB-for-dB under Part 15.247.
- 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 far less sleep power than the Station G2 (2.0 µA module sleep vs the ESP32-S3's milliamp-range sleep), making it more practical for solar-powered base stations without a boost converter. Note the RAK4631's bare SX1262 tops out at ~22 dBm, well below the Station G2's PA-boosted output.

# Siting a Base Station

| Consideration | Guidance |
|---|---|
| Height | Greater height extends the radio horizon and clears terrain and Fresnel-zone obstructions, which is usually the dominant range factor - the benefit is not a fixed amount per height doubling. (Separately, in free space doubling the link *distance* costs ~6 dB of path loss.) 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. Antennas above 6 dBi also require a dB-for-dB conducted-power reduction under FCC Part 15.247. |

| Consideration | Guidance |
| --- | --- |
| Lightning protection | Use a DC-grounded gas-discharge lightning arrestor on the feedline. Ground the mast. 915 MHz / sub-GHz arrestors are inexpensive (often under ~$30, as of 2026-06-08). |
| Power | Mains power is preferred. Solar requires careful sizing for winter minimums. |

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