1 Watt Ikoka Box Build

The Ikoka Box is a high-mounted infrastructure repeater design intended for fixed installations - rooftops, towers, and elevated structures. It uses the Ikoka Stick radio module (available in 0.15W, 1W, and 2W variants) paired with a purpose-built solar power system housed in a weatherproof QILIPSU enclosure. This is a more capable and more expensive build than the JadeNode, intended for sites where reliability and output power matter. **Note: the 2W Ikoka Stick variant (33 dBm conducted) exceeds the FCC Part 15 limit for unlicensed 902-928 MHz use - see the regulatory warning under "The Ikoka Stick Radio Module" below. For unlicensed US deployment choose the 1W variant.**

Mounting & safety: This is a high-mounted build for rooftops, towers, and elevated structures. Use fall protection / working-at-height precautions for any elevated work (OSHA fall-protection triggers are 4 ft in general industry, 6 ft in construction). Keep the mast and its full fall radius clear of overhead power lines - contact with power lines is a leading installer-fatality cause. Bond the antenna ground rod to the building grounding electrode system and add surge/lightning protection (NEC 810.21 / 250). Tower climbing requires training, certified anchors, 100% tie-off, and a spotter.

See Mounting Outdoor Nodes for required fall-protection and grounding practice.

Parts List

Component	Approx. Cost	Notes
Ikoka Stick (0.15W, 1W, or 2W variant)	Varies	Choose the 1W variant for US infrastructure sites. The 2W variant (33 dBm) exceeds the FCC Part 15 1 W / 30 dBm conducted limit at 902-928 MHz and is not legal for unlicensed US operation. Confirm current per-variant pricing on the vendor listing.
Voltset 20W solar panel	~$30	Price approximate; verify on a current retailer listing (as of 2026-06-08).
Renogy Wanderer 10A solar charge controller	~$26	Renogy Wanderer 10A PWM controller; price approximate (as of 2026-06-08).

Component	Approx. Cost	Notes
DROK 12V → 5V USB buck converter	~$10	Steps down from 12V battery to 5V USB for the Ikoka Stick. Confirm the model's output current covers the radio's peak TX draw; price approximate.
Nermak 12V 10Ah LiFePO4 battery	~$30	LiFePO4 chemistry preferred for longevity in outdoor thermal cycling. Use a BMS with a low-temperature charge cutoff (do NOT charge below 0 °C). Price approximate (as of 2026-06-08).
Inline fuse + disconnect (battery positive)	~$5	**Required.** Install an inline fuse at the battery positive terminal (sized to the wiring) and a disconnect switch. A 10Ah LiFePO4 cell can source very high short-circuit current.
QILIPSU IP67 outdoor enclosure 11.4×7.5×5.5"	~$30	IP67 rated - dust-tight and resistant to temporary immersion (IEC 60529). Verify dimensions/price on the vendor listing.
Optional: Baymesh 910 MHz bandpass/cavity filter	~$90	For very noisy deployment locations. Verify filter topology and insertion loss on the datasheet; price approximate.

Power System Design

Unlike the JadeNode and Raccoon Tree Node (which use 5V direct solar charging), the Ikoka Box uses a conventional 12V solar system:

1. **Solar panel** charges a 12V LiFePO4 battery via the Renogy Wanderer charge controller.
2. **DROK buck converter** steps the 12V battery voltage down to regulated 5V USB output for the Ikoka Stick. **Install an inline fuse at the battery positive terminal (sized to the wiring) and a disconnect switch between the battery and the charge controller/converter. A 10Ah LiFePO4 cell can source very high fault current; never wire it without overcurrent protection close to the battery.**
3. **LiFePO4 chemistry** is chosen over standard lithium for better cycle life and inherent safety. On the discharge side it also tolerates cold somewhat better, but this is a modest advantage - **do NOT charge any lithium chemistry, including LiFePO4, below 0 °C (32 °F)**; charging a cold cell causes lithium plating and is a safety hazard. Use a BMS / charge controller with a low-temperature charge cutoff for the PNW winters.

The 10Ah battery at 12V provides 120 Wh of storage - sufficient for several days of autonomous operation without solar input at typical repeater power draws.

The Ikoka Stick Radio Module

The Ikoka Stick is available in three output power variants:

- **0.15W:** Low power (~22 dBm, near the bare SX1262 maximum), suitable for portable or battery-constrained applications.
- **1W:** Standard infrastructure variant - recommended for most fixed sites. 1W (30 dBm) is exactly at the FCC Part 15.247 conducted ceiling for 902-928 MHz and is legal with an antenna gain of ≤6 dBi.
- **2W:** High-power variant. **WARNING: 2W (33 dBm) conducted output exceeds the FCC Part 15 limit of 1 W / 30 dBm conducted for unlicensed 902-928 MHz operation (47 CFR 15.247) and is NOT legal for unlicensed US use - irrespective of antenna gain. It may only be operated by a licensed amateur under Part 97, which requires station identification (97.119) AND prohibits encryption (97.113) - meaning MeshCore/Meshtastic default AES encryption must be DISABLED. For any unlicensed US deployment, choose the 1W variant or limit conducted output to 30 dBm.**

For most CascadiaMesh infrastructure deployments, the 1W variant provides a good balance of range and power consumption while remaining within the legal US conducted limit.

Optional: Baymesh 910 MHz Cavity Filter

In high-RF-noise environments (urban rooftops, sites near cellular infrastructure, etc.), the Baymesh 910 MHz filter (~$90) can be installed inline between the radio and antenna. A higher-Q bandpass or coaxial-resonator filter provides better out-of-band rejection than a small ceramic bandpass module such as the JMT filter used in the Raccoon Tree Node, at the cost of higher insertion loss (~0.5-2 dB) that reduces both TX power (EIRP) and RX sensitivity. Verify the actual filter topology and insertion loss on the manufacturer datasheet before deploying; a true multi-cavity filter is physically large and far more expensive than $90, so a $90 part is most likely a small ceramic/coaxial-resonator bandpass filter rather than a true cavity. **A bandpass/cavity filter only rejects strong out-of-band signals (e.g. nearby cellular/paging transmitters outside 902-928 MHz) that overload the receiver front end. It does NOT reduce in-band noise or co-channel interference within the LoRa band itself - in-band noise passes straight through.** Use when an out-of-band signal is causing receiver desensitization.

Enclosure

The QILIPSU IP67 enclosure (11.4×7.5×5.5") is large enough to house the Ikoka Stick, charge controller, buck converter, and battery connections in a single weatherproof package. Per IEC 60529, IP67 means dust-tight and resistant to temporary immersion (30 min to 1 m). Verify the internal dimensions on the vendor listing and sanity-check battery fit.

Firmware Configuration

Flash MeshCore Repeater firmware and configure for CascadiaMesh:

- Frequency: 910.525 MHz / BW: 62.5 kHz / SF7 / CR 4/5
- Zero Hop Interval: 0 / Flood Advert Interval: 48 hours
- Do not include "Repeater" in the node name

These are CascadiaMesh-specific LoRa parameters (a regional community convention, not a universal default). A node configured this way will NOT interoperate with nodes left on the standard MeshCore/Meshtastic US/Canada default preset that the per-board and flashing guides describe. Only use these settings if you are joining CascadiaMesh; otherwise match the default preset used by the rest of your mesh. The 910.525 MHz channel is within the 902-928 MHz band and, with LoRa digital modulation at ≤30 dBm conducted, operates compliantly under the 15.247 digital-transmission-system rules.

Community Build Variations

The following are reported community builds (advanced/reference). Figures and component brands are builder-reported and not independently verified. MPPT = maximum power point tracking (a more efficient solar charger).

- **Scott's Node:** Heltec V4 + Waveshare MPPT solar board + 10,000 mAh pancake Li battery + Zivif 10W panel + 5.8 dBi antenna. A compact high-capacity single-unit design. (5.8 dBi stays within the FCC ≤6 dBi no-derate window at 1W.)
- **mcarper's 10x Heltec V4 Build (~$81 each, builder-reported):** Heltec V4.3.1 from Rokland + 4 dBi antennas + IP65 ABS boxes + 18650 battery packs (4 - 8 cells) + EasySkyMesh PowerSaving firmware. Reported to achieve ~5.5 mA idle current. Optimized for low-cost bulk deployment across a coverage area.

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