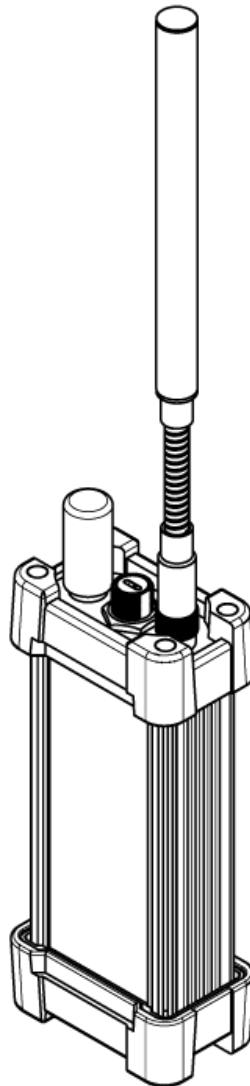




RM-2

**MANET RADIO DEVICE FAMILY
SPECIFICATION DOCUMENT**



Revision: -



Date: 08 February 2026

SUMMARY

The RM-2 family of devices provides ad-hoc mesh data networking capabilities for austere environments. Designed specifically for the needs of first responders, remote/austere workers, force protection entities, and utilities workers, the RM-2 devices deliver robust data connectivity options with high-power RF performance.

Each of the RM-2 variants is based on a common rugged housing, battery system, and base radio. The all-aluminum housings of the RM-2 radios ensure extreme protection of the internal components in the most austere of environments.

The base radio allows the RM-2 to function as a high-power beacon for personnel accountability even in contested or “loud” RF environments.

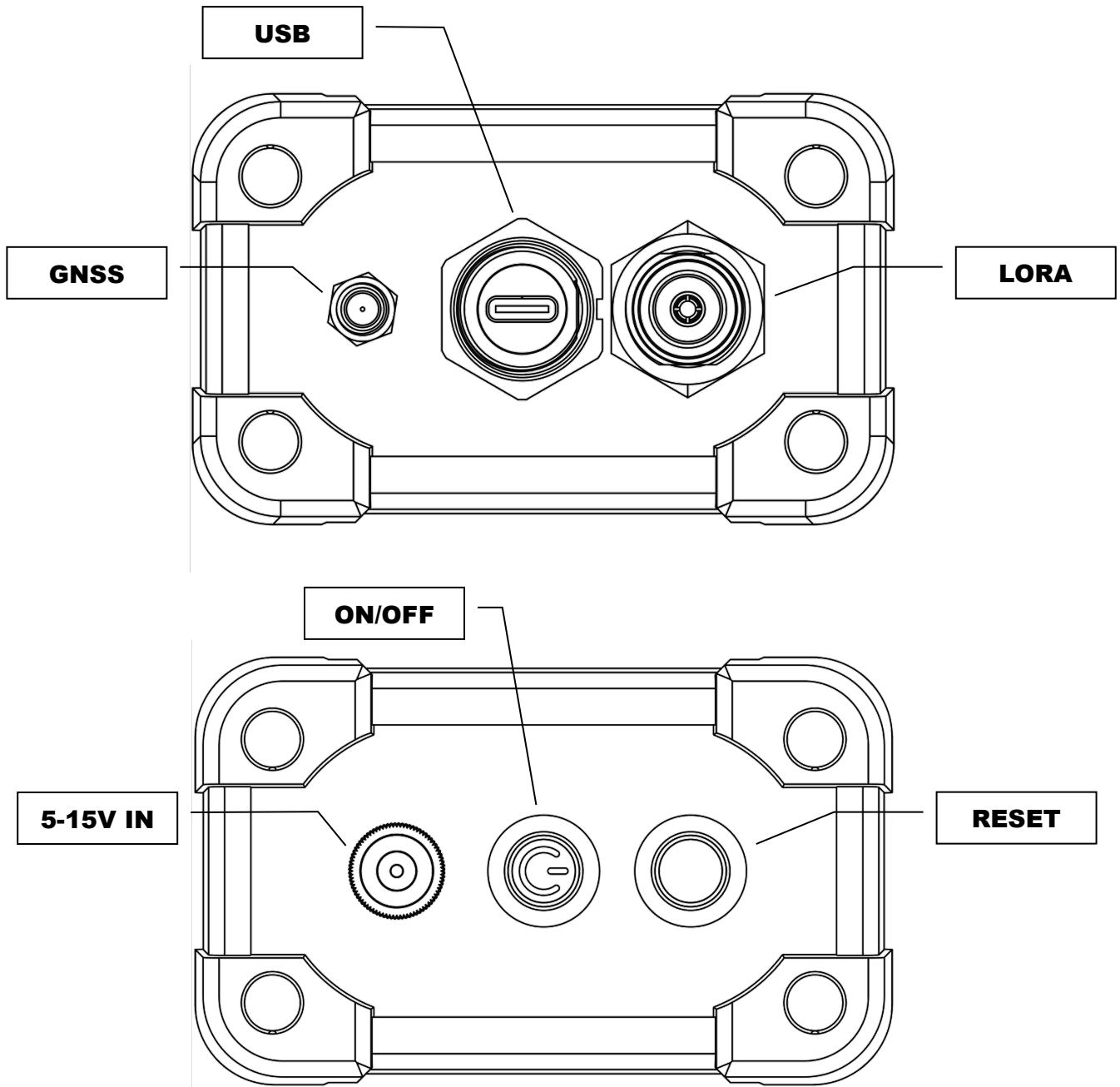
QUICK SPECS	
Case Material	Aluminum (extruded body, cast end caps), Silicone
Base Radio	868/915mhz LoRa
Connectivity	BLE, USB-C
Battery	1S3P 18650 Pack – 3.7V / 10,050mAh
Ingress Protection	IP67 (**certification pending**)

ROLES

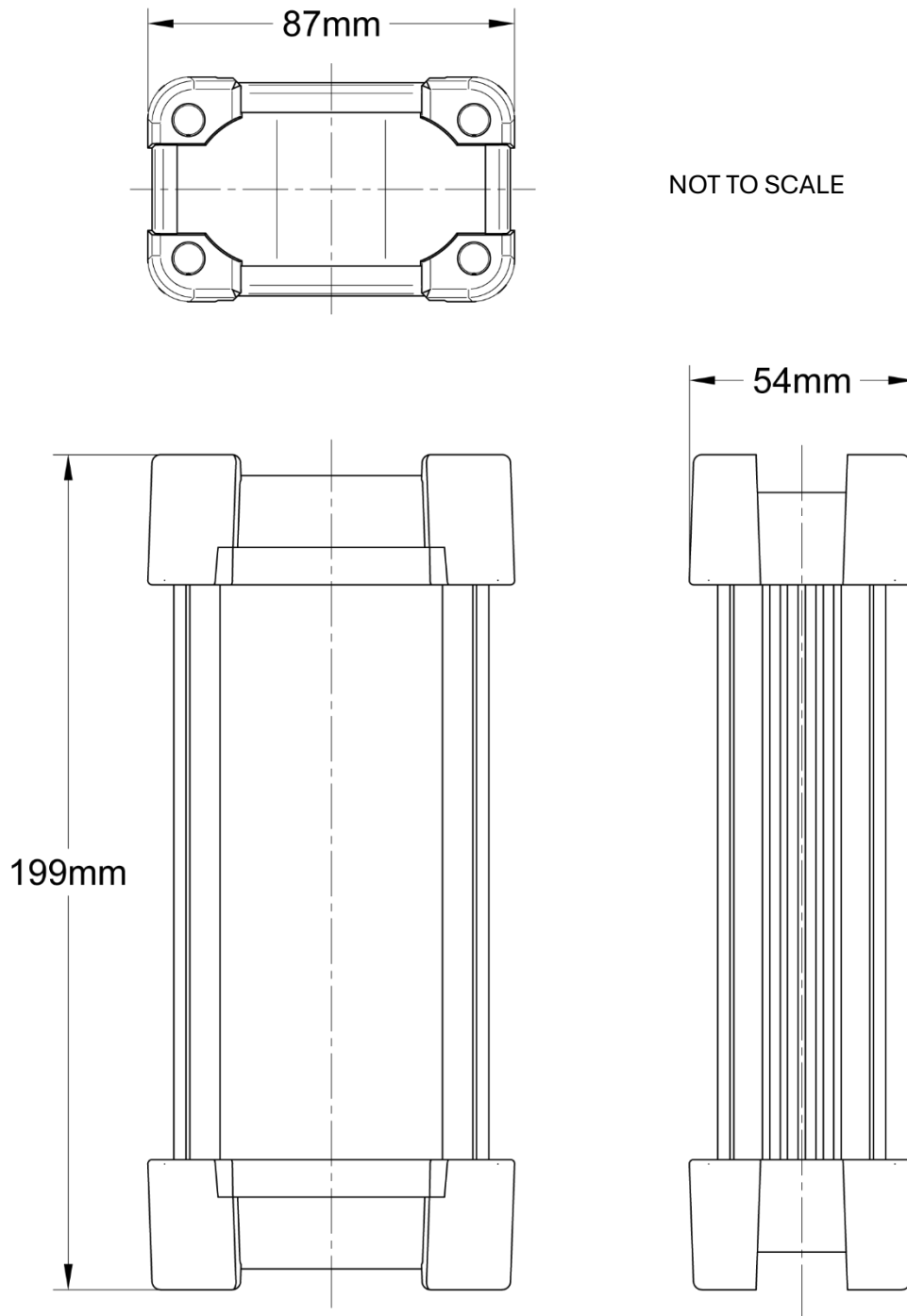
The RM-2 series of devices are broken into three primary device roles:

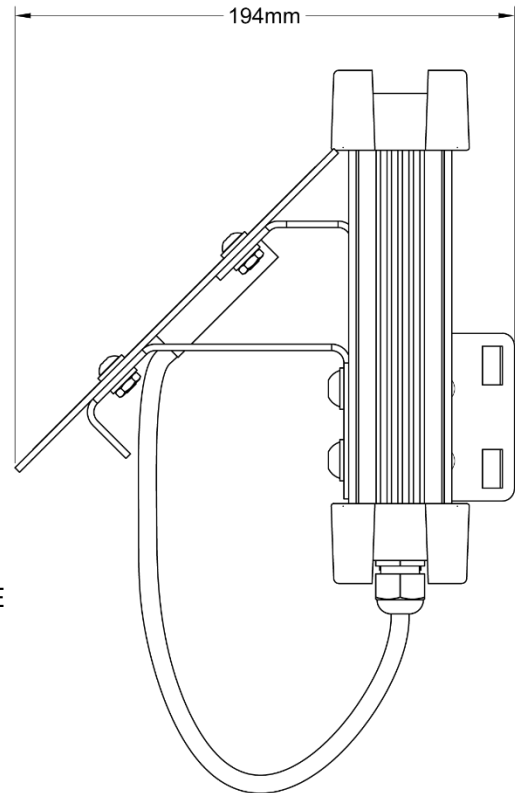
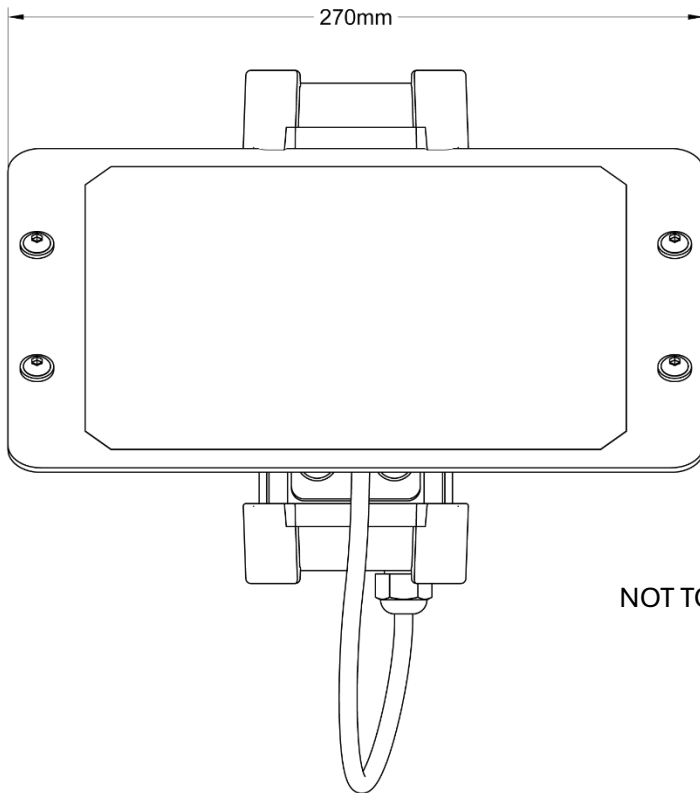
- **Infrastructure** – Used as repeater and router nodes. Includes stainless steel brackets for solar panel installation and mounting to poles/trees/towers. Note: Devices ordered as infrastructure nodes will have additional machined holes in the housing to support the solar and mounting brackets.
- **Mobile** – Mounted to vehicles and equipment to track those assets and provide mesh resiliency. Includes Safariland (or compatible) QLS fork for rapid attachment as well as pigtail for 12v input. Note: Devices ordered as mobile nodes will have additional holes machined in the housing to support the mounting fork.
- **Portable** – Mounted to belts, plate carriers, web gear, or backpacks/rucksacks and connected to personnel EUDs as mesh endpoints. Includes weatherproof USB-C bulkhead with matching thread-on cable.

PRODUCT DETAILS



MECHANICAL DETAILS





NOT TO SCALE

MATERIALS

Item	Material	Color
Housing Bumpers	Silicone	Black
Housing End Caps	Diecast Aluminum	Black
Housing Body	Extruded Aluminum	Black
Solar Panel Mounting Brackets	Stainless Steel	Natural
Pole Mounting Bracket	Stainless Steel	Natural



ELECTRICAL DETAILS

ROHS STATEMENT

Every attempt has been made to utilize RoHS components throughout the development and manufacturing of the RM-2. Every sub-component of the device is individually RoHS certified; however, the general assembly of the device has not been independently adjudicated to be RoHS compliant.

INTERNAL BATTERY

- Structure: 1S3P 18650 Pack with Integral Safety System
- Chemistry: Lithium Ion
- Voltage: 3.7v Nominal
- Capacity
 - Typical: 10,050mAh
 - Minimum: 9500mAh
- Cut-Off Voltage
 - Charge: 4.2v
 - Discharge: 2.5v
- Charge Current
 - Standard Charge Current: 0.2C
 - Max Charge Current: 3000mA
 - Max Discharge Current: 3000mA
- Operating Temps
 - Charge Min: 0°C
 - Charge Max: 45°C
 - Discharge Min: -20°C
 - Discharge Max: 60°C
- Cycle Life: ≥ 300

PCB DETAILS

- MCU: Seeed Studio Xiao nRF52840 Kit
- LoRa Radio: E22 - 900M33S
 - Chipset: Semtech SX1262
 - Frequency: 850 – 930 MHz
 - Transmit Power: 33dbm
 - Instantaneous TX Current: 1200mA @ 33dbm
 - Instantaneous RX Current: 15mA
 - Sleep Current: 2uA



- GNSS: Quectel L76 Variant
 - Constellations Supported
 - GPS: L1 C/A
 - GLONASS: L1
 - BeiDou: B1I
 - Max Current: 29mA
 - Sleep Current: 20uA
 - Cold Start: 30s
 - Hot Start: 2s
 - Positional Accuracy: 2 meters
- External voltage in: 5-15v
- Onboard Charger
 - Model: TI BQ25303J
 - Fast Charging Current: 3000mA max
 - Onboard Temperature Measurement
 - Auto-Restart After Brownout

ANTENNA DETAILS

- GNSS Antenna
 - Mfg: Maxtena
 - Model: M1516HCT-15A-SMA
 - Frequencies: 1575.42 MHz (GPS) 1602 MHz (GLONASS)
 - Active Gain: 28 dBic (typical) @ 3.3 V
 - Passive Gain: -3 dBic (typical)
 - Current: 30 mA (typical) @ 3.3 V
- LoRa Antenna
 - Mfg: Gizort / AT Labs
 - Gain: 3-5dB (body coupling and flexure dependent)
 - Coupled SWR: 1.1 Max @ center operating frequency



POWER ESTIMATIONS

These power estimations show possible operating conditions based on rudimentary duty cycle calculations for the major power consumption components (LoRa, GNSS, GNSS Antenna).

100% DUTY CYCLE

$1200\text{mA} + 29\text{mA} + 30\text{mA} = 1260\text{mA} \Rightarrow 8 \text{ hours}$

1% DUTY CYCLE

$0.01 * (1260\text{mA}) + 0.99 * (15\text{mA}) = 28\text{mA} \Rightarrow 14 \text{ days}$

NOTE: The MCU power is not considered here, though it does provide some power consumption, the amount is quite small compared to the uptime of the RF components. Furthermore, the idle current for the 1% example is based on a 99% receive time which is both unrealistic and overly consumes compared to reality, regardless of RF environment. These very rudimentary calculations can be useful for GNSS update rate planning for battery longevity. Duty cycle rules vary by jurisdiction.

FIRMWARE DETAILS

TRANSMIT POWER WARNING

The Ebyte radio core in the RM-2 is sensitive to over-driven signals to the PA stage. A maximum TX limit of 8db is required to prevent permanent damage to the power amplifier. Note that adding channels to Meshtastic via QR code may cause the transmit power to increase to the default of 30, which can damage the radio irreparably.

ENTERING DFU MODE

The reset button on the Xiao module is exposed externally. The bottom momentary switch is tied to that reset function. Entering DFU mode can be done by double-pressing that reset button, by sending USB commands, or even by using newer Meshtastic firmwares with the OTA capabilities.

FIRMWARE UPDATES

When selecting your firmware updates, be sure to select them for the Xiao nRF52 kit. DO NOT attempt a BLE OTA upgrade. Always ensure that the radio TX limit is set correctly after each update.



Document History

Revision	Date	Description
-	08FEB26	Initial Release

AT Labs has made commercially reasonable efforts to verify the information contained in this specification. Some data, ratings, and parameters are sourced from third parties and may be revised by suppliers without notice. Accordingly, AT Labs makes no representations or warranties regarding the ongoing accuracy of such third-party information and disclaims liability for errors, omissions, or impacts resulting from supplier changes.