

M115 Solar Repeater



In cases where installed M100 sensors are out of range of the nearest access point, one or more M115 repeater units can be used to provide a two-way relay between the out of range sensors and the access point. A repeater is pole mounted by the roadside and is positioned so that both the sensors and the tandem repeater or access point are within the view and within range.

The M115 Solar Repeater is a single pole mounted unit with a 10+ year life that eliminates any battery replacement for the effective life of the wireless sensor networking system, lowering ongoing maintenance costs. This version of repeater represents significant advantages over the long life version as the repeater is housed in a robust enclosure that provides IP67 protection. The solar panels are mounted on two sides of the enclosure cover to allow increased exposure to sunlight during the sun's trajectory over the course of a day seasonally.

The M115 Solar Repeater has three different power sources; 1) the solar panels are used in sunlight; 2) a rechargeable battery charged by solar panels and used when there is no sunlight; 3) a lithium battery as a backup where there might be extended periods of low sunlight. The multiple power sources provide a reliable mechanism to provide power for the repeater for at least 10 years.

Functions / Features

Relay of radio communications

- To / from wireless sensors (downlink)
- To / from access points (uplink)
- To / from another repeater (uplink or downlink)

Extension of range and coverage of the access point

- Installed up to 35m away from in-ground M100 sensors and up to 200m away from an M110 Access Point when installed 4.5m to 6m in height.
- Tandem operation – one repeater and its supported sensors can communicate with another repeater and then to the access point.
- Maximum single-hop range of 400m with a long range external antenna (antenna directed to AP).
- Maximum single-hop range of 35 meters from sensors with a long range external antenna. (Repeater directed to sensors)

Fully wireless operation – no cable connections

Radio signal quality measurements (of each link to wireless sensors or tandem repeater)

- Receive signal strength indicator (RSSI in dBm)
- Link quality index (LQI, figure of merit 40-99)

Enclosure

- Provides IP67 protection

Simple installation

- Any roadside location that provides adequate height (4.5-6m) and line of sight to sensors and the access point or repeater
- External connector and indicator to activate unit

Long range antenna available

Extend M100 system network up to 400m away from M110 access point with a long-range antenna. Suitable for junctions & MIDAS applications, use of long range antenna allows for extended system vehicle detection coverage

Functional Specifications

Interfaces	To/from sensors via 802.15.4 PHY radio To/from repeaters via 802.15.4 PHY radio To/from access point via 802.15.4 PHY radio
Over-the-air protocol	Custom TDMA protocol
Physical layer protocol	IEEE 802.15.4 PHY
Modulation	Direct sequence spread spectrum offset quadrature phase shift keying (DSSSO-QPSK)
Transmit/receive bit rate	250 kbps
Frequency band	2400 to 2483.5 MHz (ISM unlicensed band)
Frequency channels	16
Channel bandwidth	2 MHz
Internal antenna type	Microstrip patch antenna (side with (behind front face panel)
Internal antenna field of view	+60 degrees (azimuth & elevation)
Nominal output power	+3 dBm
Spurious emissions	30-1000 MHz: <-36 dBm 1-12.75 GHz: <-30 dBm 1.8-1.9 GHz: <-47 dBm 5.15-5.3 GHz: <-47 dBm
Typical receive sensitivity	-101 dBm (PER < 1%)
Saturation (Max input level)	> 10 dBm

Power, Physical & Environment

Power Supply	Solar panels (2): 100mm x 35mm, 0.33w each Rechargeable battery: Lithium Ion 18650 with protection, 3.6V, nominal capacity 2.2 Ah Backup battery; Li-SOCl2 3.6V primary battery pack, nominal capacity 57Ah
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Recommended system replacement	Every 10 years
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Dimensions	9.5"x 5.59"x 4.32" (24.13cm x 14.19cm x 10.97cm)
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Weight	2.2 lb (1 Kg)
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Environmental	Designed for weatherproof, outdoor operation with IP67 ingress protection
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Operating Temperature	-40°F to +176°F / -40°C to +80°C
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Installation recommendation	Mounted 4.5-6m in height up to 35m away from in-ground M100 sensors and 200m away from M110 Access Point
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Compliance

RF	2014/53/EU
EMC	2014/30/EU