

HOBO® RX Wireless Sensor Network

HOBO RXW Repeater (RXW-RPTR-xxx) Manual



The HOBO RXW Repeater is designed to work with the HOBO RX Wireless Sensor Network in which data is transmitted wirelessly from sensor motes across the network to the RX3000 station and then uploaded to HOBOLink® web-based software. The repeater is ideal when there is an obstruction between motes and the station or for extending the transmission range of motes in the network. With HOBOLink, you can monitor the network, view graphs, set up alarms, download data, and more.

HOBO RXW Repeater

Models:

- RXW-RPTR-900 (US)
- RXW-RPTR-868 (Europe)
- RXW-RPTR-922 (Australia/NZ)

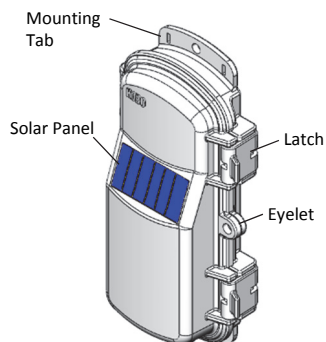
Items Included:

- Cable ties

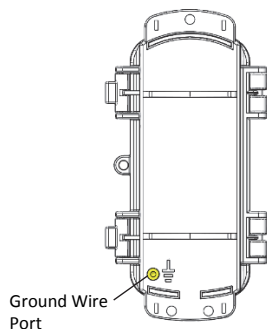
Specifications

Operating Temperature Range	-25° to 60°C (-13° to 140°F) with rechargeable batteries -40 to 70°C (-40 to 158°F) with lithium batteries
Radio Power	12.6 mW (+11 dBm) non-adjustable
Transmission Range	At least 304.8 m (1,000 ft) line of sight at 1.8 m (6 ft) from the ground, 457.2 m (1,500 ft) typical
Wireless Data Standard	IEEE 802.15.4
Radio Operating Frequencies	RXW-RPTR-900: 904–924 MHz RXW-RPTR-868: 866.5 MHz RXW-RPTR-922: 916–924 MHz
Modulation Employed	OQPSK (Offset Quadrature Phase Shift Keying)
Data Rate	Up to 250 kbps, non-adjustable
Duty Cycle	<1%
Maximum Number of Motes	50 motes per one RX Wireless Sensor Network
Battery Type/ Power Source	Two AA 1.2V rechargeable NiMH batteries, powered by built-in solar panel or two AA 1.5 V lithium batteries for operating conditions of -40 to 70°C (-40 to 158°F)
Battery Life	With NiMH batteries: Typical 3–5 years when operated in the temperature range -20° to 40°C (-4°F to 104°F) and positioned toward the sun (see <i>Deployment and Mounting</i>), operation outside this range will reduce the battery service life With lithium batteries: 1 year, typical use
Dimensions	16.2 x 8.59 x 4.14 cm (6.38 x 3.38 x 1.63 inches)
Weight	219 g (7.74 oz)
Materials	PCPBT, silicone rubber seal
Environmental Rating	IP67
Compliance Marks	<p>FC RXW-RPTR-900: See last page</p> <p>CE RXW-RPTR-868: The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).</p> <p>RoHS RXW-RPTR-922: See last page</p>

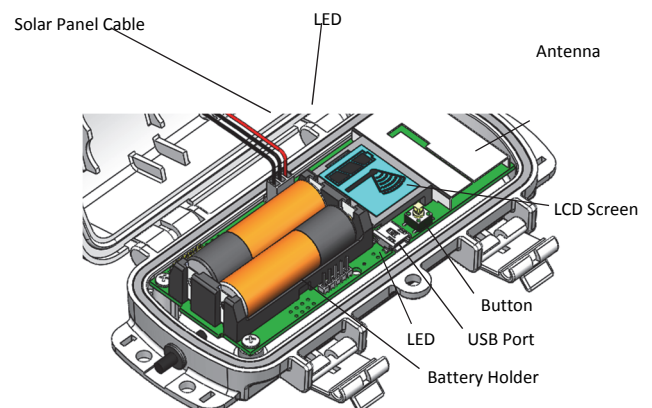
Components and Operation



Repeater Closed, Front



Repeater Closed, Back



Repeater Opened

Mounting Tab: Use the tabs at the top and bottom of the repeater to mount it (see *Deploying and Mounting*).

Solar Panel: Position the solar panel towards the sun to charge the repeater batteries (see *Deploying and Mounting*).

Eyelet: Use this eyelet to attach a 3/16 inch padlock to the repeater for security.

Latch: Use the two latches to open and close the repeater door.

Ground Wire Port: Use this port to connect a ground wire (see *Deploying and Mounting*).

Antenna: This is the built-in antenna for the radio communications across the RX Wireless Sensor Network.

Solar Panel Cable: This cable connects the built-in solar panel to the repeater circuitry.

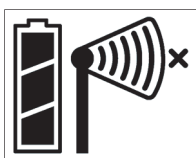
LEDs: The blue LED to the left of the LCD screen blinks at 4 seconds during normal operation. It blinks more frequently when initially joining a network. If the mote is not currently part of a network, the blue LED will be off. If the LED is on and not blinking, there is a problem with the mote. Contact Technical Support at www.onsetcomp.com/support/contact. The yellow-green LED to the upper right of the batteries only blinks during the process of joining a network.

Battery Holder: The location where the rechargeable AA batteries are installed as shown (see *Battery Information*).

USB Port: Use this port to connect to the repeater to a computer via USB cable if you need to update the firmware (see *Updating Repeater Firmware*).

Button: Push this button for 1 second to illuminate the LCD or 3 seconds for the repeater to search for an RX Wireless Sensor Network to join (see *Adding the Repeater to the RX Wireless Sensor Network*).

LCD Screen: The repeater is equipped with an LCD screen that displays details about the current status. This example shows all symbols illuminated on the LCD screen followed by definitions of each symbol in the table.



LCD Symbol	Description
	The battery indicator shows the approximate battery charge remaining.
	This is a signal strength indicator. The more bars, the stronger the signal between motes. This icon will blink when you press the button on the repeater to search for a network to join (see <i>Adding the Mote to the RX Wireless Sensor Network</i> for details).
	This indicates that the repeater is not part of a network. See <i>Adding the Repeater to the RX Wireless Sensor Network</i> for details on how to add it to the network.
	This indicates a problem with the sensor itself (the mote is operational). Check the sensor and make any adjustments to it as needed. Contact Onset Technical Support if the problem persists.

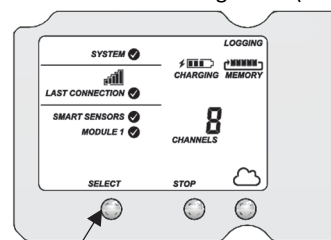
Adding the Repeater to the RX Wireless Sensor Network

The repeater must join an RX Wireless Sensor Network before it can begin transmitting data. This requires accessing the RX3000 Station and the repeater at the same time so it is recommended that you complete these steps before deploying the repeater.

Important: If you have not configured the RX3000 Station with the RXW Manager, follow the instructions in the RX3000 Quick Start before continuing.

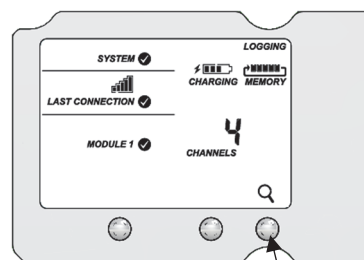
To add a repeater to the RX Wireless Sensor Network:

1. If the LCD is blank on the RX3000 station, press any button to wake it up.
2. Press the Select button once (which shows the number of smart sensors installed) and then press it again once if the HOBO RXW Manager is installed in the left slot (module 1) or twice if it is installed on the right slot (module 2).



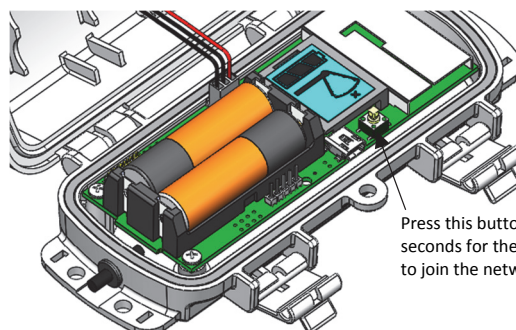
Press this button to view the module where the RXW Manager is installed

3. Press the Search button (the magnifying glass). The magnifying glass icon will blink while the RX3000 is in search mode.



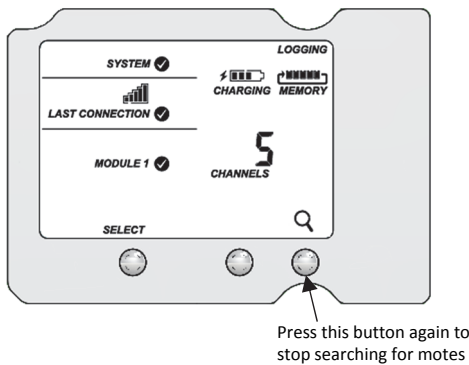
Press this button so the station is ready to have motes join the network

4. Open the repeater door and install the batteries if you have not already done so.
5. Press the button on the repeater for 3 seconds. The signal strength icon will flash and then cycle.



Press this button for 3 seconds for the repeater to join the network

6. Watch the LCD on the repeater. The signal strength icon and the LEDs will quickly blink while the repeater searches for the wireless network. Once it has found the network, the icon will stop blinking and the signal strength bars will slowly cycle from left to right. As the repeater completes its registration process with the network, the “x” icon to the right of the signal strength icon will flash and the yellow-green LED will stop blinking. Once the registration is complete, the signal strength bars will stop cycling and remain solid and the channel count on the RX3000 LCD will be updated by 1 to represent the battery channel in the repeater. This process may take up to five minutes.
7. Press the Search button (the magnifying glass) on the RX3000 Station to stop searching for motes.



Use HOBOLink to monitor repeater status. See the HOBOLink Help for details on how to check mote status, add the mote to a map, and more.

Deployment and Mounting

When to Use a Repeater

- Motes cannot transmit data to each other if there is an obstruction between them, such as a hill or mountain in the example diagram below on the left. If there is an obstruction in the path of two sensor motes or between a sensor mote and the RXW Manager, then use a repeater mounted on the obstruction between the two as shown in the diagram below on the right.



- Data logged by a wireless sensor must travel or “hop” across the wireless network from one mote to the next until it ultimately reaches the RXW Manager at the RX3000 station. To make sure the data can successfully travel across the network, the sensor mote should not be more than five hops away from a repeater or manager. Use a repeater if your network has more than five motes in any direction.
- If the distance between two motes is greater than the recommended transmission range of 304.8–457.2 m

(1,000–1,500 feet), then you will need to add a repeater between them.

- If the signal between two motes is weak (consistently one bar on the LCD) even though the motes are within the recommended transmission range, add a repeater between them.

Mounting and Positioning the Repeater

- Use cable ties to mount the repeater via the holes on the mounting tabs.
- Avoid mounting the repeater near metal, which can cause interference with the signal.
- Position the repeater towards the sun, making sure the solar panel is oriented so that it receives optimal sunlight throughout each season. It may be necessary to periodically adjust the repeater position as the path of the sunlight changes throughout the year or if tree and leaf growth alters the amount of sunlight reaching the solar panel.
- Make sure the repeater door is closed, with both latches fully locked to ensure a watertight seal.
- Consider using a 3/16 inch padlock to restrict access to the repeater. With the repeater door closed, hook a padlock through the eyelet on the right side of the door and lock it.
- The RX Wireless Sensor Network can support a maximum of 50 motes.
- Use a #4-40 screw to attach a ground wire to the port on the back of the repeater if you are deploying it in a location where lightning is a concern.
- Make sure the repeater remains in a vertical position once it is placed in its deployment location for optimal network communications.

Maintenance

The repeater is designed for outdoor use, but should be inspected periodically. When inspecting the repeater, do the following:

- Verify the repeater is free of visible damage or cracks.
- Make sure the repeater is clean. Wipe off any dust or grime with a damp cloth.
- Wipe off any water before opening the repeater.
- Make sure the interior seal is intact and the latches are fully locked when the repeater door is closed.

Updating Repeater Firmware

If a new firmware version is available for the repeater, use HOBOLink to download the file to your computer. Connect the repeater to the computer with a USB cable (open the repeater door and use the USB port to the right of the LCD). The repeater appears as a new storage device in the computer’s file storage manager. Copy the downloaded firmware file to the new storage device (the repeater). After the file is copied, eject the storage device from the computer and disconnect the cable from the repeater. The file will be installed automatically on the repeater. **Note to Mac® users:** A message may appear indicating the disk has not ejected properly. The repeater is operational and you can ignore the message.

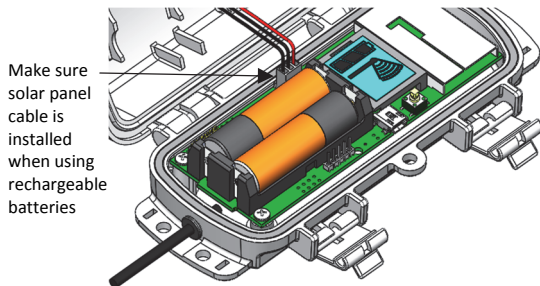
Battery Information

The mote uses two 1.2 V rechargeable NiMH batteries, charged by the built-in solar panel. The quality and quantity of solar light can affect whether the battery is sufficiently charged to last through the night and cloudy periods. Make sure the mote is placed in a location that will receive several hours of sunlight each day. If the mote does not receive enough sunlight to recharge the batteries, the battery life is estimated at 3–4 months. When batteries are regularly recharged, expected battery life is estimated at 3–5 years. Battery life varies based on the ambient temperature where the mote is deployed, the logging interval, the number of tripped alarms, and other factors. Deployments in extremely cold or hot temperatures can impact battery life. Estimates are not guaranteed due to uncertainties in initial battery conditions and operating environment.

Mote operation will stop when battery voltage drops to 1.8 V. Mote operation will return if the battery recharges to 2.3 V. If the batteries are unable to be recharged, replace them with fresh rechargeable batteries.

To replace rechargeable batteries:

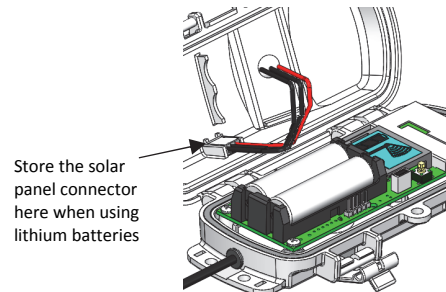
1. Open the mote door.
2. Remove the old batteries and install the new ones observing polarity.
3. Make sure the solar panel cable is plugged in.



You can use two 1.5 V lithium batteries (HWSB-LI) for operation at the extreme ends of the mote operating range. Lithium battery life is an estimated at 1 year, but varies based on the ambient temperature where the mote is deployed, the logging interval, the number of tripped alarms, and other factors. Estimates are not guaranteed due to uncertainties in initial battery conditions and operating environment. When using lithium batteries, you must disconnect the solar panel cable because the batteries will not be recharged.

To install lithium batteries:

1. Open the mote door.
2. Remove any old batteries and install the new ones observing polarity.
3. Push in the side tab of the solar panel cable connector and pull the connector out of the cable port.
4. Place the connector in the slot on the inside of the mote door. Make sure the solar panel cables are tucked inside the door so that they do not interfere with the interior seal when the mote is closed.



⚠ WARNING: Do not cut open, incinerate, heat above 85°C (185°F), or recharge the batteries. The batteries may explode if the logger is exposed to extreme heat or conditions that could damage or destroy the battery cases. Do not mix battery types, either by chemistry or age; batteries may rupture or explode. Do not dispose of the logger or batteries in fire. Do not expose the contents of the batteries to water. Dispose of the batteries according to local regulations.

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Industry Canada Statements

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Avis de conformité pour l'Industrie Canada

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

To comply with FCC and Industry Canada RF radiation exposure limits for general population, the logger must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.