HOBO® RX3000 Remote Monitoring Station User Guide

HOBO RX3000 Remote Monitoring Station

Models: RX3001-00-01 Ethernet
RX3002-00-01 Wi-Fi
RX3003-00-01 Cellular
RX3004-00-01 Cellular 4G

Included Items:

- Two plates for cable access openings with eight thumbscrews and one wrench
- Two rubber cable channels
- Rubber plugs
- Grease packet
- Two mounting plates with four screws
- Grounding wire
- Two U-bolts

Required Items:

- HOBOlink
- HOBOware® 3.7.2 or later with USB cable for RX3002 Wi-Fi models (optional for RX3001, RX3003, and RX3004 models)
- AC adapter (AC-U30) or solar panel (SOLAR-xW)

Optional Items:

- Smart sensors
- Analog sensor module (RXMOD-A1)
- Relay module (RXMOD-R1)
- RXW Manager (RXMOD-RXW-xxx) and RXW motes
- Water level sensor module (RXMOD-W1) with water level sensor (MX2001-0x-SS-S or MX2001-0x-Ti-S) and cable (CABLE-RWLMOD-xxx)
- External DC power cable (CABLE-RX-PWR)
- Tripod kit (M-TPA or M-TPB)
- Guy wire kit (M-GWA)
- 1/2 inch stake kit (M-SKA)
- Grounding kit (M-GKA), required if using wind speed or wind direction smart sensor

Sensors, modules, and accessories are available at www.onsetcomp.com.

The HOBO RX3000 Remote Monitoring Station provides continuous logging for a broad range of energy and weather monitoring applications with up to ten smart sensors, optional analog sensor, water level sensor, relay modules, and wireless sensor motes. Data from the RX3000 station is transferred at regular connection intervals to HOBOlink® cloud software where you can check the latest conditions, view graphs, configure sensors and alarms, set up a dashboard, and create on-demand and scheduled data exports. Inside its weatherproof enclosure, this durable station has an LCD screen to check the current system configuration and status, start and stop logging, add and remove smart sensors, and connect to HOBOlink on demand. You can activate up to three individual relays on the optional relay module. The optional analog module has four analog inputs that support excitation power, scaling, and statistics measurements. An optional RXW Manager module is also available for the station to set up the HOBOnet Wireless Sensor Network, which can support up to 50 motes. You can configure all easy-to-install modules using HOBOlink.

Specifications

Operating Range	-40° to 60°C (-40° to 140°F); no remote communications for battery voltage less than 3.9 V DC
Smart Sensor Connectors	10
Smart Sensor Network Cable Length	100 m (328 ft) maximum
Smart Sensor Data Channels	Maximum of 15 (some smart sensors use more than one data channel; see sensor user guide for details)
Module Slots	2
Logging Rate	1 second (RX3001 and RX3002) or 1 minute (RX3003 and RX3004) to 18 hours
Time Accuracy	±8 seconds per month in 0° to 40°C (32°F to 104°F) range; ±30 seconds per month in -40° to 60°C (-40° to 140°F) range
Battery Type/Power Source	4 Volt, 10 AHr, rechargeable sealed lead-acid; external power required using one of these options: AC power adapter (AC-U30), solar panel (SOLAR-xW), or external power source 5 V DC to 17 V DC with external DC power cable (CABLE-RX-PWR)
Rechargeable Battery Service Life	Typical 3–5 years when operating in the temperature range -20° to 40°C (-4°F to 104°F); operating outside this range reduces the battery service life
Memory	32 MB, 2 million measurements, continuous logging
Alarm Notification Latency	Logging interval plus 2–4 minutes, typical
Enclosure Access	Hinged door secured by two latches with eyelets for use with user-supplied padlocks
LCD	LCD is visible from 0° to 50°C (32° to 122°F); the LCD may react slowly or go blank in temperatures outside this range
Materials	Outer enclosure: Polycarbonate/PBT blend with stainless steel hinge pins and brass inserts; Inner enclosure: Polycarbonate; Gaskets: Silicone rubber; Cable channel: EPDM rubber; Cable opening cover: Aluminum with ABS plastic thumb screws; U-Bolts: Steel with zinc dichromate finish
Size	18.6 x 18.1 x 11.8 cm (7.3 x 7.1 x 4.7 in.); see diagrams on next page
Weight	2.2 kg (4.85 lb)
Mounting	3.8 cm (1.5 in.) mast or wall mount
Environmental Rating	Weatherproof enclosure, NEMA 4X (requires proper installation of cable channel system)
CE	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU)
FC IC	See last page. **RX3002:** FCC ID R68XPICOW, IC ID 3867A-XPICOW **RX3003:** FCC ID QIPEHS6, IC ID 7830A-EHS6; approved for use in Taiwan and Japan **RX3004:** FCC ID QIPPLS62-W, IC ID:7830A-PLS62W **RX3004:** FCC ID QIPPLS63-W, ISED ID:7830A-PLS63W; approved for use in Japan

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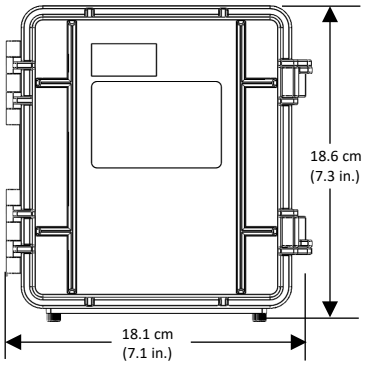
Specifications (continued)



Dimensions

Ethernet (RX3001)

Connector	One RJ45/100BaseT

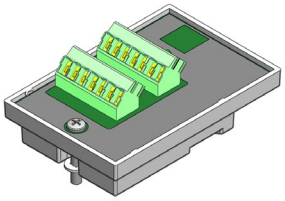
Wi-Fi (RX3002)

Network Standards	IEEE 802.11b/g/n
Frequency Range	2.412–2.484 GHz
Antenna Connector	1, no diversity supported
Data Rates	1, 2, 5.5, 11 Mbps (802.11b); 6, 9, 12, 18, 24, 36, 48, 54 Mbps (802.11g 802.11n, HT20 MCS0 (6.5 Mbps) to HT20 MC87 (65 Mbps)
Number of Selectable Radio Subchannels	Up to 14 channels; profiles available include USA, France, Japan, Spain, Canada, and Other (multiple countries)
Radio Modulations	OFDM, DSSS, DBPSK, DQPSK, CCK, 16QAM, 64QAM
Security	WEP 64/128, WPA-PSK, AES end-to-end encryption, WPA2, protocols not listed are not supported
Maximum Receive Level	-10 dBm (with PER <8%)
Receiver Sensitivity	-72 dBM for 54 Mbps, -87 dBm for 11 Mbps, -89 dBm for 5.5 Mbps, -90 dBm for 2.0 Mbps, -92 dBm for 1.0 Mbps

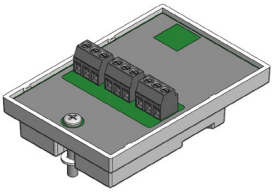
Cellular (RX3003 and RX3004)

Wireless Radio	**RX3003:** GSM/GPRS/EDGE: Quad band 850/900/1800/1900 MHz, UMTS/HSPA+: Five band 800/850/900/1900/2100 MHz **RX3004:** GSM/GPRS/EDGE: Quad band 850/900/1800/1900 MHz UMTS/HSPA+: Seven band 800/850/900/1800/1900/2100 MHz LTE: Twelve Band 700/800/850/900/1800/1900/2100/2600 MHz
Antenna	**RX3003:** Penta band **RX3004:** 4G LTE

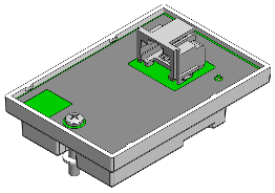
Module Specifications



Analog Sensor Module (RXMOD-A1)



Relay Module (RXMOD-R1)



RXW Manager Module (RXMOD-RXW-xxx)

Optional Analog Sensor Module (RXMOD-A1)

Input Channels	Four, single-ended, in addition to smart sensor data channels
Measurement Range and Accuracy	0–25.6 mA DC, ±5 µA ± 0.15% of reading 0–2.5 V DC, ±0.25 mV ±0.2% of reading 0–5 V DC, ±0.25 mV ±0.2% of reading 0–10 V DC, ±0.3 mV ±0.2% of reading 0–20 V DC, ±0.6 mV ±0.2% of reading 0–33 V DC, ±1.20 mV ±0.2% of reading
Resolution	15 bits
Field Wiring	Two- or three-wire via screw terminals, 16–24 AWG
Minimum/Maximum Input Voltage	0/33 V DC
Minimum/Maximum Input Current	0/25.6 mA
Minimum Source Impedance for Current Measurement	20 KΩ
Excitation Voltage	12 V DC ±5% at 200 mA maximum per module

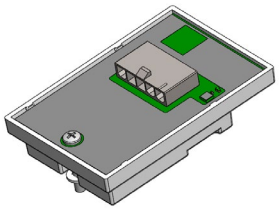
Optional Relay Module (RXMOD-R1)

Relays	Three independent relays
Alarm Output Relays	Each relay contact closure can be configured as normally open, normally closed, or pulsed for one second
Voltage	30 V max
Current	1 Amp max

Optional RXW Manager Module (RXMOD-RXW-xxx)

Operating Temperature Range	-25° to 60°C (-13° to 140°F)
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	RXMOD-RXW-900: 904–924 MHz RXMOD-RXW-868: 866.5 MHz RXMOD-RXW-921: 921 MHz RXMOD-RXW-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	Up to 50 wireless sensors or 336 data channels per one HOBO RX station
Power Source	Powered by the RX3000 station
Dimensions	Mote: 16.2 x 8.59 x 4.14 cm (6.38 x 3.38 x 1.63 inches) Cable length: 2 m (6.56 ft)
Weight	Mote: 159 g (5.62 oz)
Materials	Mote: PCPBT, silicone rubber seal
Environmental Rating	Mote: IP67
Compliance Marks	RXMOD-RXW-900: See last page RXMOD-RXW-868: The CE Marking identifies this product as complying with all relevant directives in the European Union (EU). RXMOD-RXW-921: See last page RXMOD-RXW-922: See last page

Module Specifications (continued)



Water Level Sensor Module (RXMOD-W1)

Optional Water Level Sensor Module (RXMOD-W1)

Pressure (Absolute) and Water Level Measurements MX2001-01-SS-S and MX2001-01-Ti-S

Operation Range	0 to 207 kPa (0 to 30 psia); approximately 0 to 9 m (0 to 30 ft) of water depth at sea level, or 0 to 12 m (0 to 40 ft) of water at 3,000 m (10,000 ft) of altitude
Factory Calibrated Range	69 to 207 kPa (10 to 30 psia), 0° to 40°C (32° to 104°F)
Burst Pressure	310 kPa (45 psia) or 18 m (60 ft) depth
Water Level Accuracy*	Typical error: ±0.05% FS, 0.5 cm (0.015 ft) water Maximum error: ±0.1% FS, 1.0 cm (0.03 ft) water
Raw Pressure Accuracy**	±0.3% FS, 0.62 kPa (0.09 psi) maximum error
Resolution	<0.02 kPa (0.003 psi), 0.21 cm (0.007 ft) water
Pressure Response Time (90%)***	<1 second at a stable temperature

Pressure (Absolute) and Water Level Measurements MX2001-02-SS-S

Operation Range	0 to 400 kPa (0 to 58 psia); approximately 0 to 30.6 m (0 to 100 ft) of water depth at sea level, or 0 to 33.6 m (0 to 111 ft) of water at 3,000 m (10,000 ft) of altitude
Factory Calibrated Range	69 to 400 kPa (10 to 58 psia), 0° to 40°C (32° to 104°F)
Burst Pressure	500 kPa (72.5 psia) or 40.8 m (134 ft) depth
Water Level Accuracy*	Typical error: ±0.05% FS, 1.5 cm (0.05 ft) water Maximum error: ±0.1% FS, 3.0 cm (0.1 ft) water
Raw Pressure Accuracy**	±0.3% FS, 1.20 kPa (0.17 psi) maximum error
Resolution	<0.04 kPa (0.006 psi), 0.41 cm (0.013 ft) water
Pressure Response Time (90%)***	<1 second at a stable temperature

Pressure (Absolute) and Water Level Measurements MX2001-03-SS-S

Operation Range	0 to 850 kPa (0 to 123.3 psia); approximately 0 to 76.5 m (0 to 251 ft) of water depth at sea level, or 0 to 79.5 m (0 to 262 ft) of water at 3,000 m (10,000 ft) of altitude
Factory Calibrated Range	69 to 850 kPa (10 to 123.3 psia), 0° to 40°C (32° to 104°F)
Burst Pressure	1,200 kPa (174 psia) or 112 m (368 ft) depth
Water Level Accuracy*	Typical error: ±0.05% FS, 3.8 cm (0.125 ft) water Maximum error: ±0.1% FS, 7.6 cm (0.25 ft) water
Raw Pressure Accuracy**	±0.3% FS, 2.55 kPa (0.37 psi) maximum error
Resolution	<0.085 kPa (0.012 psi), 0.87 cm (0.028 ft) water
Pressure Response Time (90%)***	<1 second at a stable temperature

Pressure (Absolute) and Water Level Measurements MX2001-04-SS-S and MX2001-04-Ti-S

Operation Range	0 to 145 kPa (0 to 21 psia); approximately 0 to 4 m (0 to 13 ft) of water depth at sea level, or 0 to 7 m (0 to 23 ft) of water at 3,000 m (10,000 ft) of altitude
Factory Calibrated Range	69 to 145 kPa (10 to 21 psia), 0° to 40°C (32° to 104°F)
Burst Pressure	310 kPa (45 psia) or 18 m (60 ft) depth
Water Level Accuracy*	Typical error: ±0.075% FS, 0.3 cm (0.01 ft) water Maximum error: ±0.15% FS, 0.6 cm (0.02 ft) water
Raw Pressure Accuracy**	±0.3% FS, 0.43 kPa (0.063 psi) maximum error
Resolution	<0.014 kPa (0.002 psi), 0.14 cm (0.005 ft) water
Pressure Response Time (90%)***	<1 second at a stable temperature

Module Specifications (continued)

Water Level Sensor and Cable

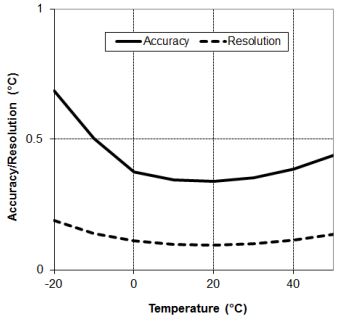
Dimensions	Sensor (MX2001-0x-SS-S and MX2001-0x-Ti-S): 2.54 cm (1.0 in) diameter, 9.91 cm (3.9 in) length Cable (CABLE-RWLMOD-xxx): 0.47 cm ±0.03 (0.185 in ±0.01) diameter, 0.2 to 400 m (0.65 to 1,312 ft) length **Note:** The length of the water level logger cable can vary -0% to +3% +10 cm (3.9 in) from the length ordered.
Weight	Stainless sensor (MX2001-0x-SS-S): Approximately 141.4 g (4.99 oz) in air; approximately 93.4 g (3.3 oz) in fresh water Titanium sensor (MX2001-0x-Ti-S): Approximately 80 g (2.83 oz) in air; approximately 37 g (1.3 oz) in fresh water Cable (CABLE-RWLMOD-xxx): 39 g (1.38 oz) per 1 meter (3.28 ft)
Materials	Stainless sensor (MX2001-0x-SS-S): Stainless steel housing, Viton and Buna-N O-rings, ceramic sensor in stainless steel end cap Titanium sensor (MX2001-0x-Ti-S): Acetal housing, Viton and Buna-N O-rings, ceramic sensor in Titanium end cap Cable (CABLE-RWLMOD-xxx): Polycarbonate top end connector, PVC end cap (sensor connection), nylon collar nuts, Viton O-rings, polyurethane jacket
Environmental Rating	IP68; cable is waterproof for continuous immersion up to 112 m (368 ft), refer to sensor model specifications for sensor depth rating

Barometric Pressure (RXMOD-W1)

Operation Range	66 to 107 kPa (9.57 to 15.52 psia)
Temperature Calibrated Range	-20° to 50°C (-4° to 122°C)
Accuracy	±0.2 kPa (±0.029 psi) over full temperature range at fixed pressure; maximum error ±0.5% FS
Water Level Accuracy*	Typical error: ±0.075% FS, 0.3 cm (0.01 ft) water Maximum error: ±0.15% FS, 0.6 cm (0.02 ft) water
Resolution	<0.01 kPa (0.0015 psi)
Response Time	<1 second at stable temperature
Stability (Drift)	<0.01 kPa (0.0015 psi) per year

Temperature (Water Level Sensors MX2001-0x-SS-S and MX2001-0x-Ti-S)

Operation Range	-20° to 50°C (-4° to 122°F)
Accuracy	±0.44°C from 0° to 50°C (±0.79°F from 32° to 122°F), see *Plot A*
Resolution	0.1°C at 25°C (0.18°F at 77°F), see *Plot A*
Response Time (90%)	5 minutes in water (typical)
Stability (Drift)	0.1°C (0.18°F) per year



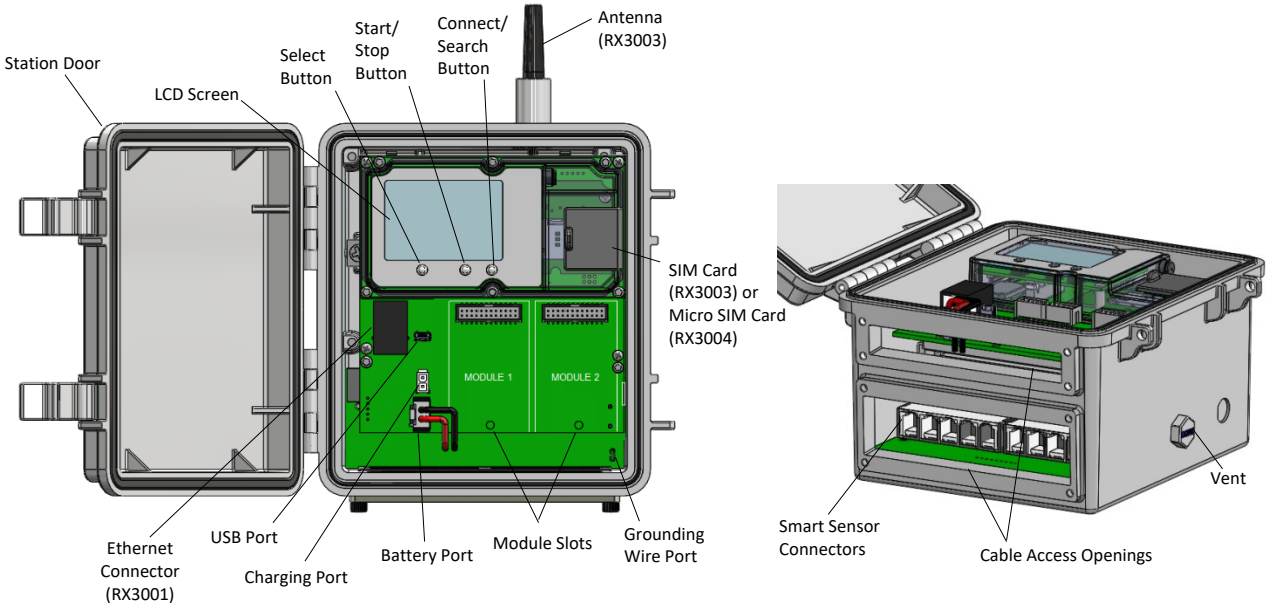
Plot A

* Water Level Accuracy: With accurate reference water level measurement, known water density, and a stable temperature environment. System Water Level Accuracy equals the sum of the Barometric Water Level Accuracy plus the selected sensor Water Level Accuracy.

** Raw Pressure Accuracy: Absolute pressure sensor accuracy includes all sensor drift, temperature, and hysteresis-induced errors.

*** Changes in Temperature: Allow 20 minutes in water to achieve full temperature compensation of the pressure sensor. There can be up to 0.5% of additional error due to rapid temperature changes. Measurement accuracy also depends on temperature response time.

Device Components and Operation



Station Door: This is a protective, hinged door covering the LCD and electronics. The station serial number and device key needed for HOBOlink registration are located on the inside of the door.

LCD Screen: This shows details about system, module, and sensor operation (see *LCD Operation*).

Select Button: Use this button to cycle through information about the smart sensors and optional modules (see *LCD Operation*).

Start/Stop Button: Use this button to start and stop logging or clear a fault code (see *LCD Operation*).

Connect/Search Button: Use this button to connect to HOBOlink or search for new smart sensors (see *LCD Operation*).

Antenna: This is the external radio antenna for cellular communication in the RX3003 model. The RX3002 and RX3004 models use an internal antenna.

SIM Card/Micro SIM Card: A SIM card is installed in the RX3003 model or a micro SIM card is installed in the RX3004 model to enable cellular communications.

Grounding Wire Port: Use this port to connect a grounding wire (see *Deploying and Mounting the Station*).

Module Slots: These are two slots for installing optional analog sensor, relay, water level sensor, or RXW Manager modules (see *Setting up the Station*).

Battery Port: Use this port to plug in the internal battery cable (see *Setting up the Station* and *Battery Information*).

Charging Port: Use this port to plug in an AC adapter, solar panel, or external power source to keep the battery charged (see *Setting up the Station* and *Battery Information*).

USB Port: Use this port to connect the station to the computer via USB cable as needed for HOBOware.

Ethernet Connector: Use this port to connect an Ethernet RJ45 cable for the RX3001 model (see *Setting up the Station*).

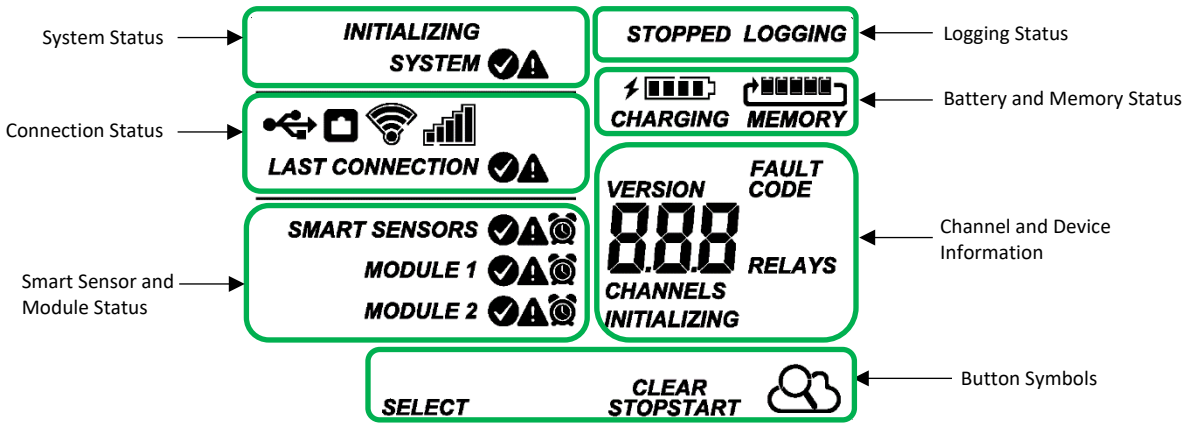
Smart Sensor Connectors: Use these input jacks to connect up to 10 smart sensors (see *Setting up the Station*). The station can support up to 15 smart sensor data channels; some smart sensors have more than one data channel.

Cable Access Openings: These are the two openings for connecting cables and wires to the station (see *Setting up the Station*). Install the cover plates and rubber cable channels in these openings to create a weatherproof seal (see *Deploying and Mounting the Station*).

Vent. This vent allows pressure to equalize inside the station while keeping water out. Note that the pressure inside the station does not match the outside air pressure exactly. Therefore, a barometric pressure sensor deployed within the case cannot measure the true atmospheric pressure unless it has its own unrestricted vent to the outside.

LCD Operation

The following example shows all symbols illuminated on the LCD screen with an overview of what each section of the LCD represents. Refer to the table below for details about each section and associated symbols.



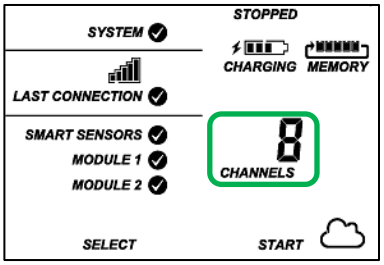
System Status	Shows the overall system status.
SYSTEM or ***INITIALIZING SYSTEM***	When the station is powered up, Initializing System flashes in the upper left part of the LCD. After initialization is complete, System remains illuminated and one of the following symbols appears: ✓ Indicates the system is ok. ⚠ Indicates there is a problem with the system; check your device page in HOBOlink.
Connection Status	Shows the communication method used for connecting to HOBOlink and the system connection status.
	Indicates the station is connected via a USB cable.
	Indicates the station is using Ethernet to connect to HOBOlink. Blinks while connecting to HOBOlink.
	Indicates the station is using Wi-Fi to connect to HOBOlink. Also shows the strength of the wireless signal; the more bars, the stronger the signal. Blinks while connecting to HOBOlink.
	Indicates the station is using a cellular network to connect to HOBOlink. Also shows the strength of the cellular signal; the more bars, the stronger the signal. Blinks while connecting to HOBOlink.
CONNECTION or ***LAST CONNECTION***	When the station is attempting to connect or is currently connected to HOBOlink, Connection flashes on the LCD. After the connection is complete, Last Connection remains illuminated and one of these symbols appears: ✓ Indicates the last connection to HOBOlink was ok. ⚠ Indicates there was a problem with the last connection; check the Connections Log in HOBOlink.
Smart Sensor and Module Status	Shows the status of the smart sensors and any optional modules installed. Module 1 is installed in the left slot and Module 2 in the right slot.
SMART SENSORS ***MODULE 1*** ***MODULE 2***	One of the following symbols also appears next to smart sensors or a module (if applicable): ✓ Indicates the smart sensor or module is ok. ⚠ Indicates there is a problem with the smart sensor or module; check your device page in HOBOlink. Indicates a sensor alarm has tripped and flashes on the LCD until the alarm is cleared; check the Latest Alarms list in HOBOlink.
Logging Status	Indicates whether the station is currently logging.
STOPPED or ***LOGGING***	Stopped indicates the station is not currently logging; Logging indicates it is currently logging. Press the Start/Stop button to start or stop logging as desired. Note that Logging blinks until the station logs the first data point after you press the Start button.
Battery and Memory Status	Shows the current battery level and memory.
or ***CHARGING***	Shows the approximate battery power remaining. In this example, the battery is fully charged. The lightning bolt appears when an AC adapter, solar panel, or external power source is plugged into the station. Charging flashes while the battery is being charged.
MEMORY	When the station is logging, it records data indefinitely, with newest data overwriting the oldest data until the station is stopped. This continuous logging is represented by the arrow in this symbol.

Channel and Device Information

Shows the number of channels and other information about each module. It also shows general device information. Press Select to scroll through four screens: the main screen, smart sensors screen, Module 1, and Module 2 screens.

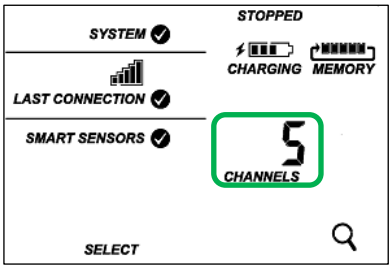
Main Screen

The main LCD screen displays the total number of channels in use by the system. This is a combination of smart sensor channels and enabled sensor channels. For example, if there are 5 smart sensor channels and 3 analog sensor channels, the main screen shows 8 channels, as in the following example.



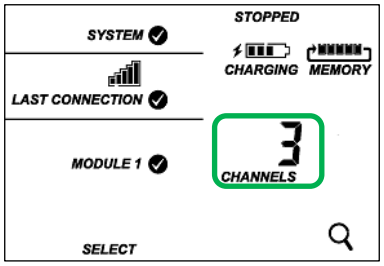
Smart Sensors Screen

The smart sensors screen displays the number of smart sensor channels. Note that some smart sensors have more than one channel associated with them so the number of channels may not match the number of physical smart sensors. In this example, there are 5 smart sensor channels.

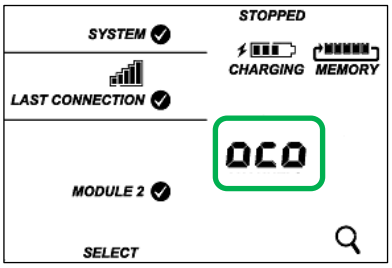


Module 1 and 2

The Module 1 or Module 2 screen displays information about that particular module. If an analog sensor module is installed, the number of enabled analog sensors is displayed in the channels count (three sensors in this example). If an RXW Manager module is installed, the channel count represents all measurement channels plus a battery channel for each mote in the HOBOnet RX Wireless Sensor Network. For example, one temp/RH wireless sensor has a channel count of three as shown below: two for temperature and RH and one for the mote battery.



When a relay module is installed, the state of each relay is shown on the module screen. In this example, a relay module is installed in the Module 2 slot so this shows whether each relay is open “o” or closed “c”. In this example, the first and third relays are open, and the second one is closed.



If a water level sensor module is installed, the channel count is listed as 4. This represents barometric pressure, water pressure, differential pressure, and water temperature. Water level and water flow channels are derived in HOBOlink and not included in the channel count shown on the station LCD.

Blinks in the lower right part of the LCD when a firmware update is underway. Displays which module or element is being updated.

A numerical code that appears when a system fault has occurred. You may need to provide this code to Onset Technical Support. See *Troubleshooting* for details.

The version number of the station firmware. Appears only when powering up the device.

Button Symbols

Use the three buttons below the following symbols to operate the station. Press any of the three buttons to turn on the LCD.

SELECT Press this button to cycle through status information about the smart sensors and two optional modules.

START Press this button to start logging. Not available while the station is actively connected to HOBOlink.

STOP Press this button to stop logging. Not available while the station is actively connected to HOBOlink.

Press this button to connect to HOBOlink. This option is available only on the main LCD screen. It is not available when you are scrolling through smart sensor and module information with the Select button. In addition, this option is not available while a connection is underway or active.

Press this Search button for the station to detect all currently installed smart sensors or to add motes to your HOBOnet RX Wireless Sensor Network. As you add or remove smart sensors while the station is stopped, press the Select button and then the Search button for the system to recognize your changes. This option is not available for smart sensors while the station is logging. To add motes to the HOBOnet RX Wireless Sensor Network, press the Select button to switch to the module for the RXW Manager and then press the Search button for the station to find the motes. The station can search for motes whether it is logging or stopped.

CLEAR Use this button to clear a fault code.

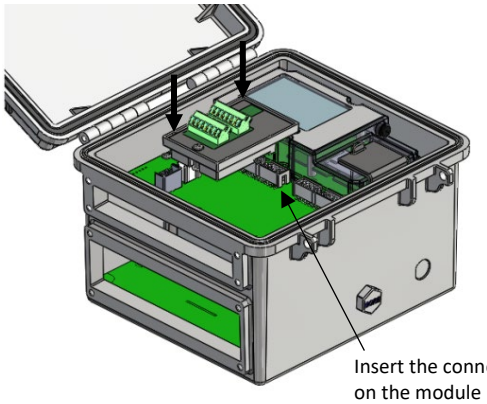
Notes on LCD Operation:

- The LCD turns off after 5 minutes of inactivity. Press any button to turn the LCD back on.
- There can be a delay before the LCD updates. For example, if you plug in an AC adapter, it may take a few seconds before the lightning bolt icon appears on the LCD. This delay is by design to preserve battery life.

Setting up the Station

Follow these steps to set up the station.

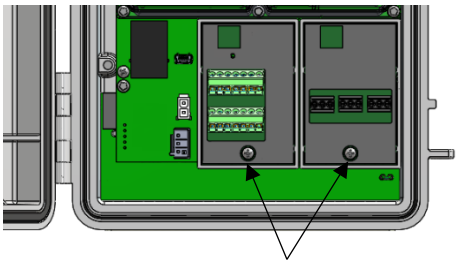
1. **Install optional modules or a user-supplied SIM.**
   a. Make sure the station is powered down (unplug any charging device and then disconnect the battery).
   b. Insert the connector on the back of the module into the receptacle in the left or right module slot. Add a second module to the other slot if desired.



Insert the connectors on the module here.

> **Tip:** Install the analog module, water level sensor, or RXW Manager module on the left and the relay module on the right for easier cable routing.

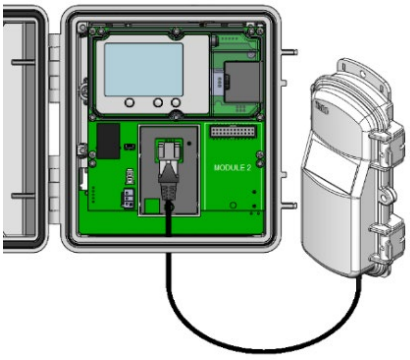
   c. Using a Phillips-head screwdriver, tighten the screw at the bottom of each module. In this example, an analog module is installed in the Module 1 slot and a relay module is installed in the Module 2 slot.



Tighten the screw on installed modules.

If you installed an RXW Manager module:

Plug the cable from the RXW Manager mote into the jack on the module, making sure the cable is inserted through the bottom of the station case. Do not reconnect the power on the station until the mote is plugged in as shown.

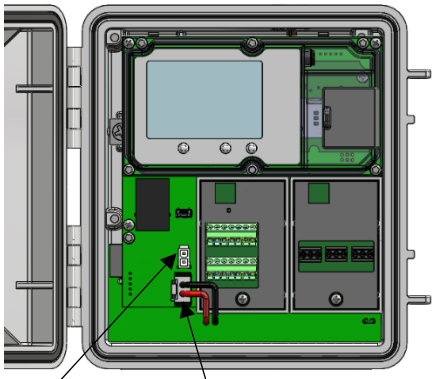


> **WARNING:** If you inadvertently install modules while the power is on, you must disconnect and then reconnect the battery and charging device to guarantee proper operation.

If you are installing your own SIM:

Before continuing, follow the instructions at www.onsetcomp.com/resources/documentation/19051-installing-sim-rx3000-station.

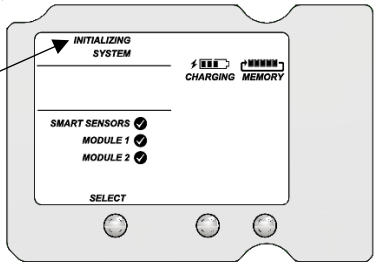
2. **Plug in the battery and charging device.**
   a. Plug in the battery cable.
   b. Feed the AC adapter or solar panel cable through the smaller of the two cable openings and plug it in. You can also use an optional external DC power cable (CABLE-RX-PWR) with your own powering device in place of the AC adapter or solar panel.



Plug in an AC adapter or solar panel here.

Connect the battery cable here.

   c. Once the battery cable is plugged in, Initializing System flashes on the LCD. A checkmark appears next to System after the station initialization is complete.

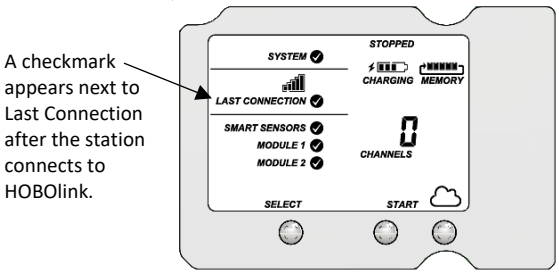


Initializing System flashes when the battery cable is first plugged in.

Check and configure device communications.

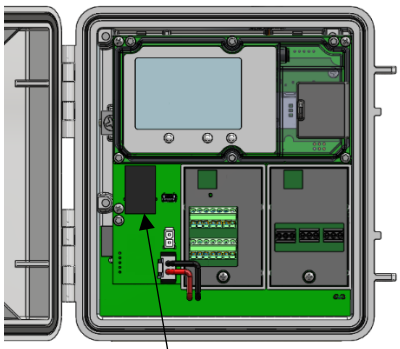
3. *For RX3003 and RX3004 cellular models:*

After the station powers up in the previous step, it connects to HOBOlink automatically within two minutes. The cellular icon and Connection flashes while the station is making the connection. Once the connection is complete, a checkmark appears next to Last Connection. Note that the entire initialization process may take several minutes; wait until Last Connection and the checkmark appear before continuing to step 6.



For RX3001 Ethernet models:

a. Plug in an Ethernet cable.



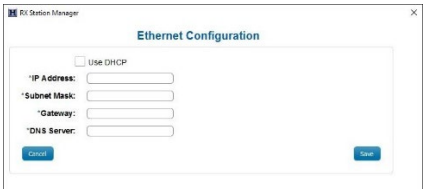
b. The station uses DHCP by default. If your network uses DHCP, skip to step i.

   If your network uses static IP addresses, connect the station to the computer with the USB cable. (Consult your Network Administrator if you are unsure whether your network uses static IP addresses or for help with the following steps).

c. In HOBOware, select Manage RX Station from the Device menu. (On a computer with Microsoft® Windows®, you may see a warning that Windows Firewall has blocked some features. Select Domain networks and click Allow Access.)

d. In the RX Station Manager, click the Actions button and select Network Access.

e. Deselect the Use DHCP checkbox.

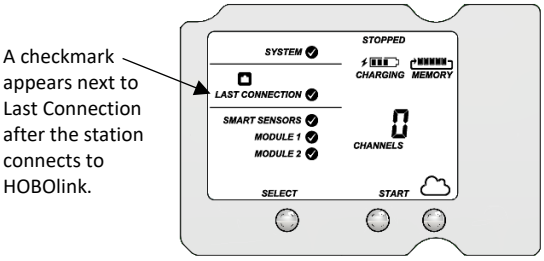


f. Enter the IP Address, Subnet Mask, Gateway, and DNS Server. Consult your Network Administrator for the appropriate addresses to complete these fields.

g. Click Save in the RX Station Manager. Click Done and then close the RX Station Manager.

h. Disconnect the USB cable.

i. Press the Connect button on the station (the cloud should be visible on the LCD screen) to connect to HOBOlink. The Ethernet icon and Connection flash while the station is making the connection. Once the connection is complete, a checkmark appears next to Last Connection. Wait for the checkmark and then continue to step 6.



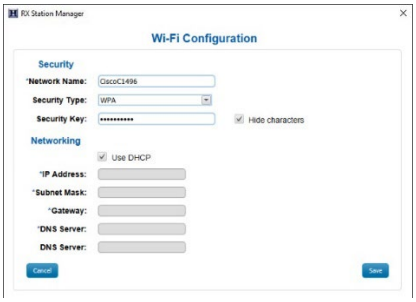
For RX3002 Wi-Fi models:

a. Connect the station to the computer with the USB cable.

b. In HOBOware, select Manage RX Station from the Device menu. (On a computer with Microsoft® Windows®, you may see a warning that Windows Firewall has blocked some features. Select Domain networks and click Allow Access.)

c. In the RX Station Manager, click the Actions button and select Network Access.

d. Enter the Security information for your Wi-Fi network. Type the Network Name, select the Security Type, and type the Security Key. Select the Hide characters checkbox to hide any characters typed into the Security Key field. Consult your Network Administrator or wireless router documentation for help with determining your network security type.



e. The station uses DHCP by default. If your network uses DHCP, skip this step.

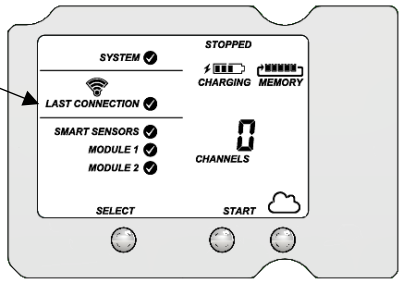
   If your network uses static IP addresses, deselect the Use DHCP checkbox. Enter the IP Address, Subnet Mask, Gateway, and DNS Server. Consult your Network Administrator if you are unsure whether your network uses static IP addresses or for the appropriate addresses to enter in this fields.

f. Click Save in the RX Station Manager. Click Done and then close the RX Station Manager.

g. Disconnect the USB cable.

h. Press the Connect button on the station (the cloud should be visible on the LCD screen) to connect to HOBOlink. The Wi-Fi icon and Connection flash while the station is making the connection. Once the connection is

complete, a checkmark appears next to Last Connection. Wait for the checkmark and then continue to step 6.

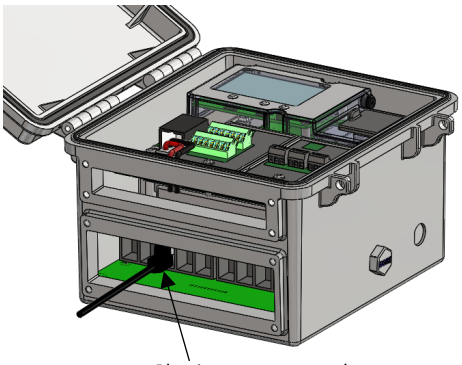


A checkmark appears next to Last Connection after the station connects to HOBOlink.

4. Plug in and search for any smart sensors.

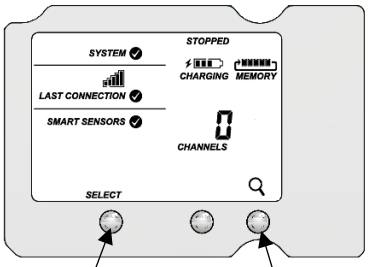
Important: If this RX3000 station is a replacement for an existing U30 station, it is imperative that you power down the U30 station you are replacing (disconnect the battery and AC adapter or solar panel) before you remove the smart sensors and connect them to the RX3000. Do not repower the U30 station or allow it to connect to HOBOlink again unless at least one different smart sensor is connected to the U30 station first.

a. Feed the smart sensor cable for one smart sensor through the larger of the two cable openings and plug it into one of the 10 smart sensor connectors. Repeat for any additional smart sensors.



Plug in smart sensors here.

b. Press the Select button to view the smart sensors on the LCD and then press the Search button (the magnifying glass icon should be visible as in the following example). The station searches for all connected smart sensors and shows the number of channels after a few seconds.



Press the Select button to view the smart sensor screen.

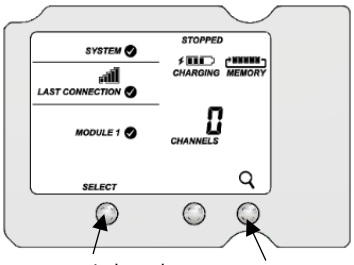
Press the Search button for the station to find all connected smart sensors.

Note that some smart sensors have more than one channel associated with them so the number of channels may not match the physical number of smart sensors connected (for example the temperature/RH smart sensor has two channels: one for temperature and one for RH).

5. Add any wireless sensor motes.

Important: Keep the motes near the RX3000 station while completing these steps.

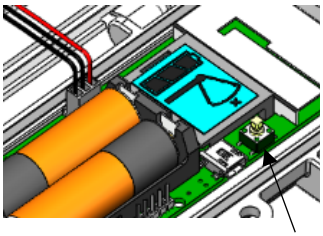
a. Press Select to switch to the module where the RXW Manager is installed (Module 1 or Module 2) then press the Search button to wait for motes to join the network.



Press the Select button to switch to the module with RXW Manager installed.

Press the Search button for the station to search for motes to join.

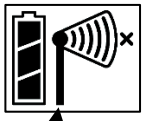
b. Install the rechargeable batteries in the mote and press the button on the mote for 3 seconds.



Press this button for 3 seconds.

c. Watch the mote LCD during the process of joining the network.

a.

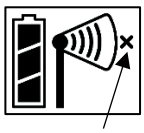


The signal strength icon blinks while the mote is searching for a network.

b.

Once the mote finds a network, the icon stops flashing and the bars cycle from left to right.

c.



The network connection "x" icon blinks while the mote completes the registration process, which may take up to five minutes.

d.

Once the mote has finished joining the network, the "x" icon disappears and the channel count on the station LCD increases by the number of measurement channels for the mote plus the

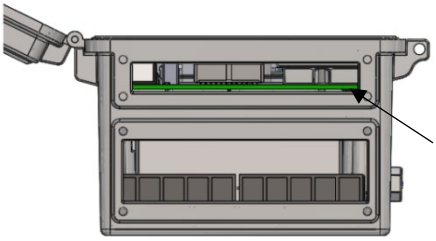
Note: If the mote cannot find the network or has trouble remaining connected during this process, make sure the mote is in a vertical, upright position and within range of the station.

Repeat these steps to add other motes. Press the Search button on the station when finished adding motes.

6. Connect water level sensor, analog sensors, or relay devices.

Note: You may wait to connect these until you are at the deployment site.

Power down the station (unplug any charging device and then disconnect the battery). Connect any sensors or devices to the optional modules as described in the following sections. Be sure to feed any cables or wires through the smaller cable access opening shown below.



Feed analog sensor, relay, and water level sensor cables through this opening to connect them to the optional modules.

Important: If you are installing the weatherproof rubber cable channel in the cable access opening as described in *Deploying and Mounting the Station*, the cable diameter for analog sensors or relay devices must be 4.0 mm (0.156 in.) to fit through one of the smaller holes or 6.4 mm (0.25 in.) to fit through one of the larger holes. If the cable diameter is too small, build up the diameter using heat shrink. If the cable is too big, splice on another cable with a smaller diameter to fit through the hole. If you are using the rubber cable channel designed for the water level sensor, reserve the medium holes for the water level sensor cable.

To connect analog sensors:

You can connect a two- or three-wire sensor or transducer to one of the four terminals in the analog module.

a. Loosen the screw for each pin on the screw terminal.

b. Feed the wire through the smaller of the two cable access openings.

c. Insert the correct wire into the screw terminal (see the pinout table below). Trim the wire to expose 0.25 inches ±0.04 inches of bare wire.

d. Tighten the screw.

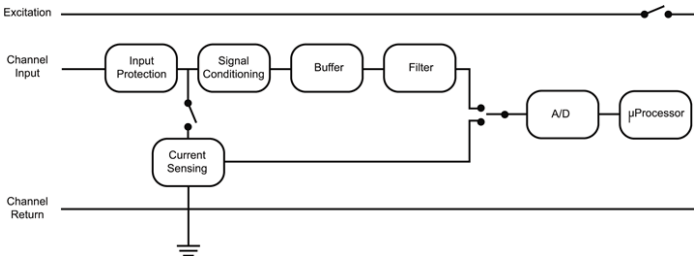
e. Plug in the battery and then the charging device to power up the station.

Analog Module Pinout Table

J1 Pin #	Pin Description	J2 Pin #	Pin Description
1	CH1 SIGNAL	1	CH3 SIGNAL
2	CH1 GND	2	CH3 GND
3	+12V Excitation	3	+12V Excitation
4	GND (EX. RTN)	4	GND (EX. RTN)
5	CH2 SIGNAL	5	CH4 SIGNAL
6	CH2 GND	6	CH4 GND
7	SHIELD	7	SHIELD

Note: All four input channels share the same common ground.

Analog Module Functional Diagram



To connect relay devices:

You can connect up to three devices to the relay module. The relays are for low power switching only. To switch to higher power, use an correctly rated relay and use the station relay to switch the external relay on or off.

a. Loosen the screw for each pin on the screw terminal.

b. Feed the wire through the smaller of the two cable access openings.

c. Insert the correct wire into the screw terminal (pins 1 and 2 are interchangeable, pin 3 is optional; see the pinout table).

d. Tighten the screw.

e. Plug in the battery and then the charging device to power up the station.

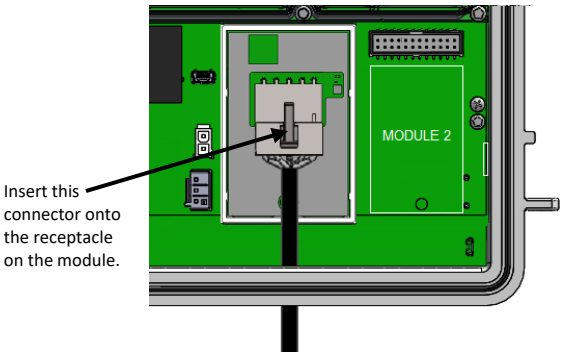
Relay Module Pinout Table

RELAY-1	Pin Desc.	RELAY-2	Pin Desc.	RELAY-3	Pin Desc.
1	Relay	1	Relay	1	Relay
2	Relay	2	Relay	2	Relay
3	Shield	3	Shield	3	Shield

To install a water level sensor:

a. Feed the water level sensor cable through the smaller of the two cable access openings.

b. Insert the connector at the end of the cable into the receptacle on the module as shown below. The connector snaps into place once installed. Be careful not to push, pull, or twist the cable while installing the connector.



Insert this connector onto the receptacle on the module.

c. Install any other sensors and cables that use the top cable access opening.

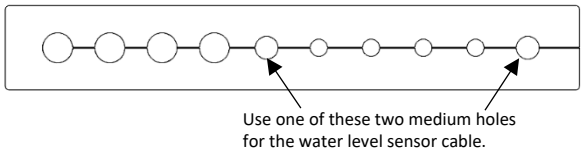
d. Install the top rubber cable channel into the cable access opening.

i. Use silicone grease to lightly coat all four outer edges and the inside of the rubber cable channel shipped with the water level sensor module (do not use the

small rubber cable channel shipped with the RX3000 station).

ii. Use the grease to lightly coat the portion of the water level sensor cable that will be in the cable channel. Repeat for all other cables.

iii. Position the cable channel around the cables, routing the cables through the proper grooves. Use one of the medium-sized holes shown below for the water level sensor cable.



iv. Close the cable channel and press it into the opening.

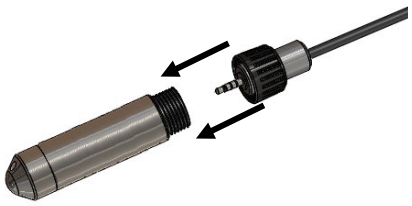
v. Install the cover plate with loosely installed thumbscrews.

vi. Lightly coat rubber plugs with a small amount of grease and use them to fill the empty holes. Use one of the rubber plugs included with the water level sensor module to fill the empty medium hole. Use the rubber plugs from the channel kit included with the station to fill any remaining large and small holes. Insert the thin part of the plug into the hole and push it in until the thick part fills the hole.

vii. Tighten the thumbscrews on the cover plate.

viii. Repeat these steps with the large cable channel. See *Installing the Weatherproof Rubber Cable Channel and Covers* for additional details.

e. Insert the water level sensor cable jack into the water level sensor. Screw on the locking nut (hand tighten).



Important: Make sure the O-rings on the cable jack end and the sensor mating housing surfaces are clear of any debris. Any contamination of these surfaces can cause leaks that may lead to sensor failure.

f. Plug in the battery and then the charging device to power up the station.

7. Log in to HOBOlink.

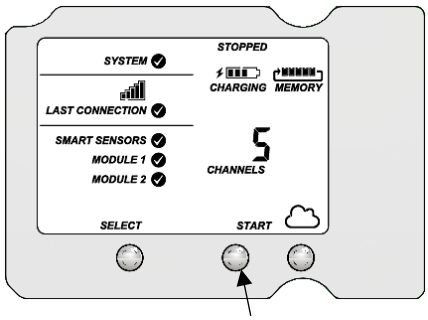
Log into an existing account at www.hobolink.com or create a new one. You'll receive an email to activate the new account.

8. Register and Configure the RX Device.

Once your device is set up, register it in HOBOlink. During the registration process, HOBOlink walks you through adding the device to your organization, configuring the device and its sensors, and setting up any alarms and alerts you want to add. See the *HOBOlink User Guide* for detailed information.

9. Start logging.

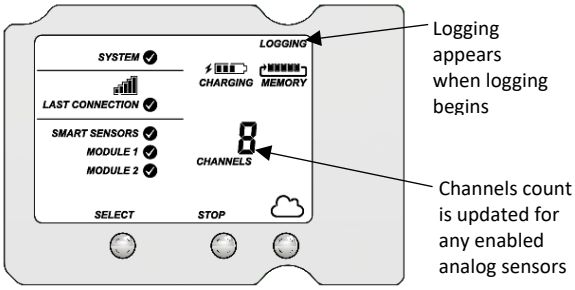
After you have finished configuring all the settings in HOBOlink, you can start logging. Press the Start button on the station to start logging. The station connects to HOBOlink (Connection blinks on the LCD) and logging begins at the logging interval specified for smart sensors and analog sensors (if applicable).



Press this button to start logging

You can also start logging from HOBOlink. Select Devices, select the tile for your device, then select Start Logging. Logging does not begin until the next time the station connects to HOBOlink. Press the Connect button on the station to connect to HOBOlink at any time.

Once logging begins, Logging appears in the upper right corner of the LCD as shown in the following example. Logging blinks until the first logging sample is recorded. At that point, it stops blinking and remains illuminated until logging stops. Also note that the Channels count on the LCD screen is updated to include any analog sensors that were enabled in HOBOlink.



Important: See *Deploying and Mounting the Station* for installation steps and other deployment guidelines. If you are using the station outdoors or in harsh indoor conditions, install the sensor cable channels and the plates for weatherproofing. Complete this before continuing to step 10 if you are using a water level sensor.

Setting up Water Level and Water Flow Channels in HOBOlink

If you installed a water level sensor module (RXMOD-W1) and sensor, obtain a reference water level reading, then configure the water level and water flow channels in HOBOlink.

Make sure the water level sensor is deployed in its final location and the station is logging. Take a reference level reading, measuring the water level from your reference point.

Important: Note the reference level reading as well as the date and time it was taken.

If you installed a water level sensor module and water level sensor, the station automatically logs four measurement channels:

- Barometric pressure
- Water pressure
- Differential pressure
- Water temperature

In addition, you can set up two additional channels in HOBOlink:

- Water level
- Water flow

These derived channels are available only once enabled in HOBOlink. The data for these two channels is calculated at each logging interval based on the measurements from the pressure and temperature channels and the settings and values you enter in HOBOlink.

If a water level sensor is not physically connected to the module, barometric pressure is the only channel logged related to the water level sensor. You cannot set up water level and water flow unless you install the water level sensor as described in *Setting up the Station*. Similarly, if you unplug a water level sensor while a station is logging, only barometric pressure is logged and the rest of the water level sensor channels report errors.

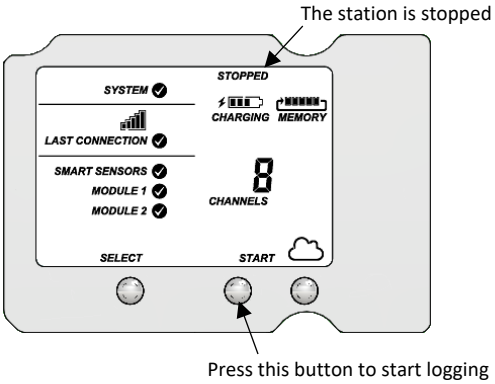
See the *HOBOlink User Guide* for detailed information.

Starting and Stopping Logging

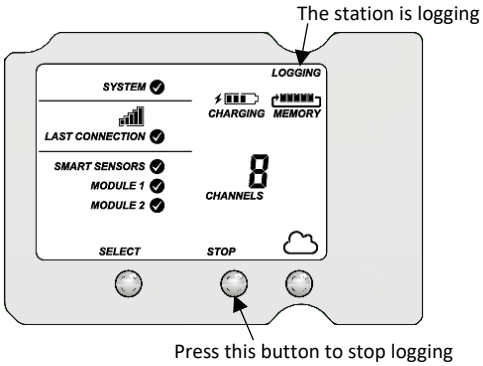
You can start and stop logging with the Start/Stop button on the station or from HOBOlink.

To start and stop logging with the station:

1. When the station is stopped, press the Start button to start logging. The device connects to HOBOlink (*Connection* blinks on the LCD) and logging begins at the logging interval specified for smart sensors, wireless sensors, and analog sensors (if applicable).



2. To stop logging, press the Stop button. Logging stops immediately. Note that the station continues to connect to HOBOlink even if it is not logging.



To start and stop the station from HOBOlink:

1. In HOBOlink, select Devices and then select your station's tile.
2. Select either Start Logging or Stop Logging. The station starts or stops logging the next time it connects to HOBOlink.

Adding or Removing Smart Sensors

To add or remove smart sensors from the station:

1. If the station is currently logging, press the Stop button to stop it.
2. Press the Connect button and wait for the station to connect to HOBOlink so that all the latest data is downloaded before changing smart sensors.
3. If you are using the rubber cable channel, unscrew the plates and push the cable channel out of the case. Open it to access any smart sensors.
4. Unplug any smart sensors you wish to remove. Plug in any new smart sensors.
5. Press the Select button to view the smart sensors on the LCD screen.
6. Press the Search button for the station to detect all the smart sensors currently connected.
7. Press the Start button to begin logging again. The station will automatically connect to HOBOlink.
8. If using the rubber cable channel, grease and place any smart sensor cables or plugs, reinsert the rubber cable channel, and reinstall the plates. See *Installing the Weatherproof Rubber Cable Channel and Covers* for details.
9. Make any configuration changes in HOBOlink as desired, such as adding sensor labels or scaling (see *Setting up the Station*).

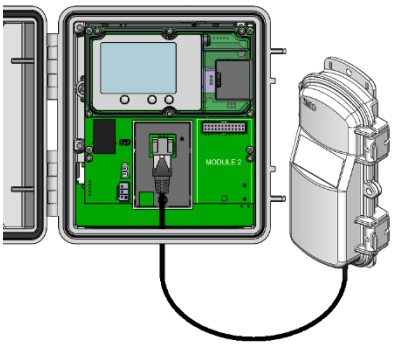
Adding or Removing Modules

The RX3000 has two slots in which optional analog, relay, water level sensor, or RXW Manager modules can be installed. You can add or remove these modules as desired.

To add a module:

1. Stop the station if it is currently logging.
2. Press the Connect button and wait for the station to connect to HOBOlink so that all the latest data is downloaded before adding a new module.

3. Power down the station (unplug any charging device and then disconnect the battery).
4. Insert the module into the left or right module slot.
5. Using a Phillips-head screwdriver, tighten the screw at the bottom of the module.
6. If you installed a water level sensor module, feed the cable through the top cable access opening and slide the connector at the end of the cable into the receptacle on the module. Insert the cable jack on the other end into the water level sensor and screw on the locking nut (see *Setting up the Station* for more details).
7. If you installed an RXW Manager module, plug the cable from the RXW Manager mote into the jack on the module, making sure the cable is inserted through the upper cable access opening on the bottom of the station case. Do not reconnect the power on the station until the mote is plugged in as shown.



8. Plug in the battery and then the charging device, and wait for the device to power up. Verify that the new module is listed on the LCD screen with a checkmark.
9. The station should automatically connect to HOBOlink (press the Connect button on the station if needed). Check your station's page to make sure the new module is listed.
10. Do the following to complete the setup:
    - Connect any analog sensors or relays (see *Setting up the Station* for details).
    - Add any wireless motes (see *Adding or Removing Motes*).
    - If you added a water level sensor module, be sure to obtain a reference water level reading and configure the water level and water flow channels as described in *Setting up the Station* and *Setting up Water Level and Water Flow Channels in HOBOlink*.
    - Make any configuration changes as needed in HOBOlink and start logging again when ready.

WARNING: If you inadvertently install modules while the power is on or, you must disconnect and then reconnect the battery and charging device to guarantee proper operation. In addition, if you did not plug the manager mote into the module while the power was off, it may not be recognized by the station. Disconnect and reconnect the battery and charging device.

To remove a module:

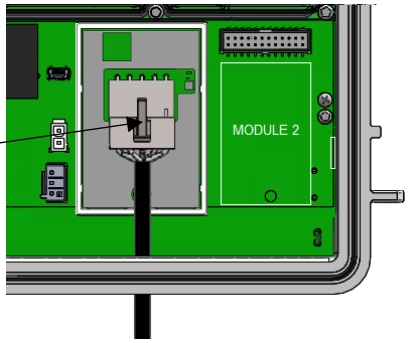
1. Stop the station if it is currently logging.
2. Press the Connect button and wait for the station to connect to HOBOlink so that all the latest data is downloaded before adding a new module.
3. Power down the station (unplug any charging device and then disconnect the battery).
4. Disconnect any analog sensors, relay devices, or the water level sensor. If removing an RXW Manager module, unplug the RXW Manager mote.
5. Using a Phillips-head screwdriver, unscrew the bottom screw on the module until loosened (it remains attached to the module).
6. With your fingers on the top and bottom edges of the module, carefully pull it out of the slot.
7. Plug in the battery and then the charging device. Make sure the station connects to HOBOlink (press the Connect button on the station if needed).
8. Make any configuration changes as needed in HOBOlink and start logging again when ready.

WARNING: If you inadvertently remove modules while the power is on, you must disconnect and then reconnect the battery and charging device to guarantee proper operation.

Adding or Removing Analog Sensors, Relay Devices, or Water Level Sensors

Power down the station (unplug any charging device and then disconnect the battery) when adding or removing sensors or devices connected to modules installed in the station.

- If removing a sensor or device, uninstall the cover plate and the rubber cable channel first.
- To add or remove an analog sensor or relay device, see the section *Connect analog sensors, relay devices, or water level sensors* in *Setting up the Station*.
- To remove a water level sensor, press down on the level on the connector shown below and slide the connector out from the receptacle on the module being careful to not put stress on the cable wires.



- After adding a sensor or device, be sure to install the rubber cable channel and cover plate before deploying the station (see *Installing the Weatherproof Rubber Cable Channel and Covers*).

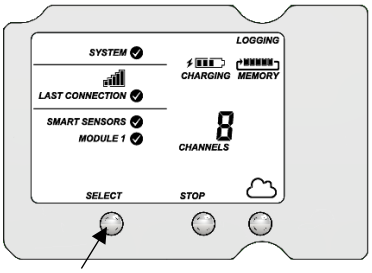
Adding or Removing Motes

To add a mote to the HOBOnet RX Wireless Sensor Network:

Important: Keep the mote near the RX3000 station while completing these steps.

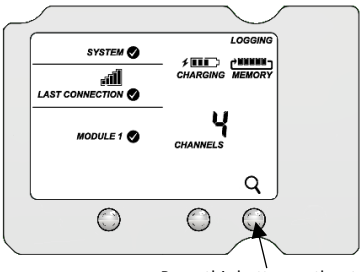
1. If the LCD is blank on the RX3000 station, press any button to wake it up.

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).



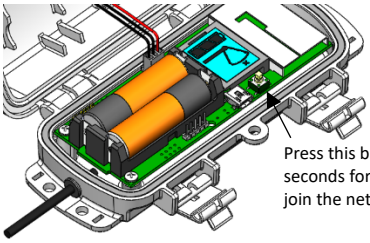
Press this button to view the module where the RXW Manager is installed

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



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

4. Open the mote door and install the batteries if you have not already done so.
5. Press the button on the mote for 3 seconds. The signal strength icon flashes and then cycles.



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

6. Watch the LCD on the mote.

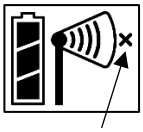
a.

The signal strength icon blinks while the mote is searching for a network.

b.

Once the mote finds a network, the icon stops flashing and the bars cycle from left to right.

c.



The network connection "x" icon blinks while the mote completes the registration process, which may take up to five minutes.

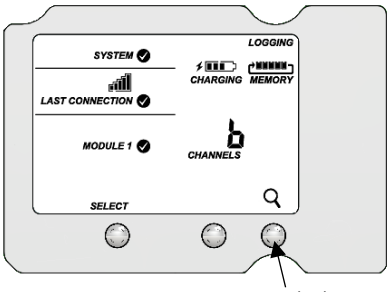
d.

Once the mote has finished joining the network, the "x" icon disappears and the channel count on the station LCD increases by the number of measurement channels for the mote plus the battery.

The green LED blinks quickly while the mote searches for a network to join and then blinks slowly while it completes the network registration. Once the mote has finished joining the network, the green LED turns off and the blue LED then blinks indefinitely while the mote is part of the network.

Note: If the mote cannot find the network or has trouble remaining connected during this process, make sure the mote is in a vertical, upright position and within range of the station.

7. Repeat steps 4–6 for any additional motes to add.
8. Press the Search button (the magnifying glass) on the RX3000 station to stop searching for motes.



Press this button again to stop searching for motes

Measurements are recorded at the logging interval specified in HOBOlink, transmitted to the RX3000 station, and uploaded to HOBOlink at the next connection interval (readout).

To remove a mote from the HOBOnet RX Wireless Sensor Network:

a. In HOBOlink, select Devices and then click the wrench icon on your station's tile.
b. Select Wireless Sensors Logging and click the down arrow to open the configuration for the sensor you want to delete.
c. Click Delete to remove the mote from the network.
d. If the mote you are deleting is currently active on the network (i.e., powered up and transmitting data), the station will need to connect to HOBOlink to complete the removal process. Otherwise, the mote will not officially leave the network and can attempt to automatically rejoin the network in the future. To connect to HOBOlink, press the Connect button on the station. Once the station is connected, a command is sent to the station and the mote permanently leaves the network.

Managing Connections to HOBOlink

The station connects to HOBOlink at the Connection Interval you specify.

To change the Connection Interval:

1. In HOBOlink, select Devices and then click the wrench icon on your station's tile.
2. Select Connection Interval and edit the frequency the station connects with.

Setting Up Power Saving Mode

In low power situations, such as a solar-powered station or for a station during the winter, you may want to save power through power saving mode.

To set up a second connection interval with power saving mode:

1. In HOBOlink, select Devices and then click the wrench icon on your station's tile.
2. Select Enable Power Saving Mode.
3. Select when this mode should begin and end and then enter the Power Save Connection Interval you want to use during the time you specified.
4. Click Save. The changes to the connection interval will take place the next time the station connects to HOBOlink.

You can connect to HOBOlink from the station at any time, regardless of the connection schedule. Press the Connect button on the station to connect to HOBOlink. Unless the station is running on a power saving connection interval, the normal connection schedule then restarts after the connection is complete. For example, a station is configured to connect hourly and the last connection on its regular schedule occurred at 10:05. If you use the Connect button on the station to connect to HOBOlink at 10:15, the next connection is at about 11:15 based on the one-hour connection interval. Similarly, if a station misses a connection, the connection schedule shifts depending on the time of the next successful connection. While the station is using a second, power saving mode schedule, all connections follow that schedule only; any extra connections while the station is in power saving mode do not cause a shift in the connection schedule.

Also note that the station connects to HOBOlink when the device is powered up and when you press the Start button.

Checking Latest Conditions with HOBOware

The RX Station Manager within HOBOware is available for showing the current sensor readings in an RX3000 Station connected to a computer. To do this:

1. Connect the station to the computer with a USB cable and open HOBOware.
2. From the Device menu in HOBOware, select Manage RX Station. Note for Windows: You may see a warning that Windows Firewall has blocked some features. Select Domain networks and click Allow Access.
3. In the RX Station Manager, the Latest Conditions panel shows the currently configured sensors and modules for the device. Click the refresh button  in the Latest Conditions panel to take a measurement for each sensor and display the value. (Note: Sensor readings do not refresh automatically.) You can also view general information about the RX3000 Station in the Device information panel.
4. Close the RX Station Manager when done and disconnect the USB cable.

Note: The Latest Conditions and Device Information available in the RX Station Manager are for reference only. Use HOBOlink to view complete station details, access logged data, and configure the device.

Deploying and Mounting the Station

Follow the guidelines and steps in this section for deploying and mounting the station.

Guidelines for Deploying the Station

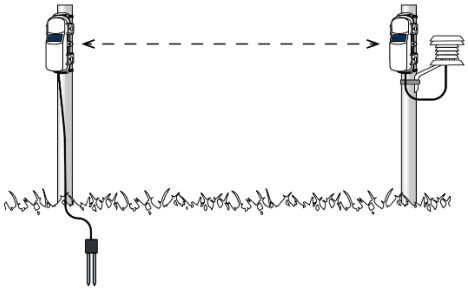
- Check the signal strength on the LCD in the location you wish to deploy the station to make sure it will be able to reliably connect to HOBOlink (RX3002 Wi-Fi and RX3003 and RX3004 cellular models). The station may have difficulty connecting if there is only one bar illuminated in the Wi-Fi or cellular LCD symbol. (The signal strength shown on the LCD is from the last connection.)
- The RX3003 and RX3004 cellular models must be mounted at least one foot from all sensors to avoid interference from the built-in radio module and antenna with the measurements made by the sensors.
- Make sure the station remains in a vertical position once it is placed in its deployment location. If it is mounted horizontally, the battery could be damaged over time as it is charged and the antenna (if applicable) will not have optimal range.
- If you haven't already done so, plug in an AC adapter, solar panel, or other external power source to keep the battery charged.
- If you are using a wind speed/direction sensor or if the station will be installed on a roof or in a location with exposure to lightning, use the grounding wire included with this station and ground the tripod or mast using appropriate grounding, such as the Grounding Kit (M-GKA). A grounding wire may also reduce potential sensor errors that can result from installing near other radio or electrical equipment or antennas. See *Installing the Grounding Wire*.
- Make sure all cables and wires are fastened securely, routed through the cable access openings, and placed in the rubber cable channels. Any empty holes in the cable channels need to be filled with the appropriate size plug to ensure the station is weatherproof. See *Installing the Weatherproof Rubber Cable Channel and Covers*.
- Do not store excess sensor cable wire coiled inside the station case or within one foot outside the case.
- Protect cables and wires with conduit. Exposed cables can be chewed by rodents.
- Make sure the total cable length for all installed smart sensors does not exceed 100 m (328 ft).
- Consider using a padlock to restrict access to the station. With the station door closed, hook a padlock through one of the latches on the right side of the door and lock it.

Guidelines for Deploying the HOBOnet RX Wireless Sensor Network

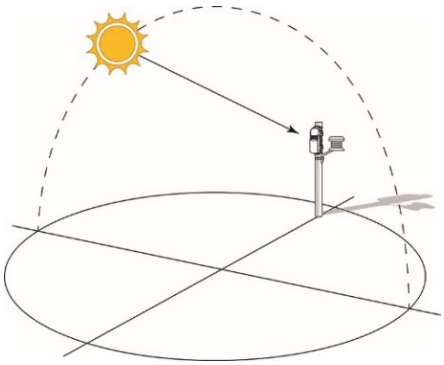
- Stay close to the RX3000 station when adding motes to the wireless network because you will need to access both the station and the mote at the same time. After the mote has successfully joined the wireless network, you can then move it to its deployment location.
- Check the signal strength on the mote LCD on the location where you want to place the mote. If there is only one or two bars on the signal strength indicator, consider moving

the mote to a location where the signal strength is stronger.

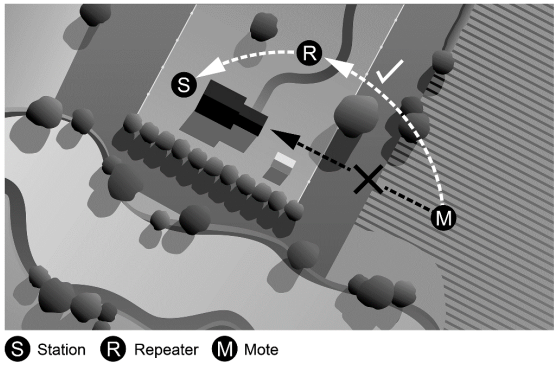
- Consider using a plastic pole such as PVC to mount the motes.
- Make sure motes are mounted a minimum of 1.8 m (6 feet) above the ground or vegetation to help maximize distance and signal strength as shown below.



- Make sure each sensor mote and repeater is positioned so that the built-in solar panel receives optimal sunlight throughout each season as shown. It may be necessary to periodically adjust the mote 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.



- Obstructions between motes can prevent reliable network communication. If the mote is blocked by a small obstruction (e.g. a pole, the RX3000 station, shrubbery), then move the mote to a location where the obstruction is not blocking the path to the nearest mote. If there is a change in elevation between motes or a large obstruction is in the way (e.g. a building or tree), then either reposition the mote until there is full line of sight to the next mote or add a repeater between them.



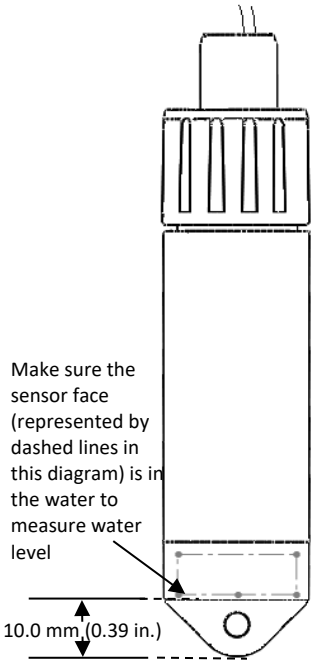
- There should not be more than five motes in any direction at their maximum transmission range from the RXW Manager. Data logged by a wireless sensor must travel or "hop" across the wireless network from one mote to the next until it ultimately reaches the RXW Manager at the RX3000 station. To make sure the data can successfully travel across the network, the mote should not be more than five hops away from the manager.
- Use the Map feature in HOBOlink for a bird's eye view of the network and wireless paths. See the *HOBOlink User Guide* for details on this and other ways to monitor the status of your network and sensor data.
- Use cable ties or screws to mount the mote via the holes on the mounting tabs.
- Make sure the mote remains in a vertical position once it is placed in its deployment location for optimal network communications.
- Make sure the mote 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 mote. With the mote door closed, hook a padlock through the eyelet on the right side of the door and lock it.
- Mount the manager as high as possible above the RX3000 station to increase the radio signal and line of sight.

Guidelines for Deploying a Water Level Sensor

If a water level sensor module (RXMOD-W1) is installed in the station, follow these guidelines when deploying the water level sensor:

- The absolute pressure sensor in the water level sensor is temperature compensated over the range of 0° to 40°C (32° to 104°F). The barometric pressure sensor is temperature compensated over the range of -20° to 50°C (-4° to 122°F). To obtain the highest level of accuracy, both the sensor and station should be allowed to come to full temperature equilibrium (approximately 20 minutes) before the reference level is entered in HOBOlink as described in *Setting up the Station*.
- Sudden temperature changes should be avoided.
- When deploying the water level sensor in a well, make sure the well is vented to the atmosphere. Typically, a small hole can be drilled in the side of the well cap to ensure that the pressure inside and outside the well is at equilibrium. Use the Onset well cap (WELL-CAP-02) if it is a 5 cm (2 inch) well. Otherwise, you need to find another method of attaching the cable at the top of your well so that the sensor stays in position. The sensor cable includes a Kevlar® strength member so it can support the weight of the sensor and its cable. You can attach a clamp around the cable, such as a hose clamp, but be careful not to damage the cable.
- Make sure the vent on the side of the station does not collect water, which will block proper barometric pressure readings. The best way to avoid water collecting is to mount the station vertically.

- The sensor face located in the nose cone of the sensor end needs to be in the water to measure water level.

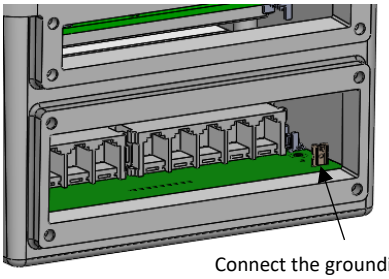


- Any change in length of the sensor cable will result in a 1-to-1 corresponding error in the depth measurement. Always pull-test a cable prior to deploying a logger in a well to make sure it does not stretch.
- If you are deploying the sensor in a lake, river, or stream, you must first build a stilling well to protect it and the cable. A simple stilling well can be constructed with PVC or ABS pipe. A properly constructed stilling well holds the sensor in position and protects the sensor from currents, wave action, and debris. Suspend the sensor in the stilling well so it is always underwater, but not on the bottom to be buried by silt.

  For more information, see the Technical Application Note for Constructing a Stilling Well at: https://www.onsetcomp.com/resources/tech-notes/constructing-stilling-well
- To prevent the sensor from moving in currents and to ensure the support cable is kept straight during deployment, you may need to add a weight to the suspension cable just above the sensor or hang a weight below the sensor. In some cases, you may need to both add a weight and use a stilling well.
- Be very careful not to exceed the burst pressure for the sensor. The pressure sensor will burst if the maximum depth is exceeded (see *Specifications*). The sensor should be positioned at a depth where it will remain in the water for the duration of the deployment, but not exceed the rated bursting depth.
- If the cable is too long, loop the cable and secure the cable with multiple zip ties to ensure the loop does not slip. The looped cable should be tight enough that the cable can be easily pulled out of the well if necessary, but it must not bend the cable any tighter than a 1.25 cm (0.5 inch) radius to prevent damage to the cable.

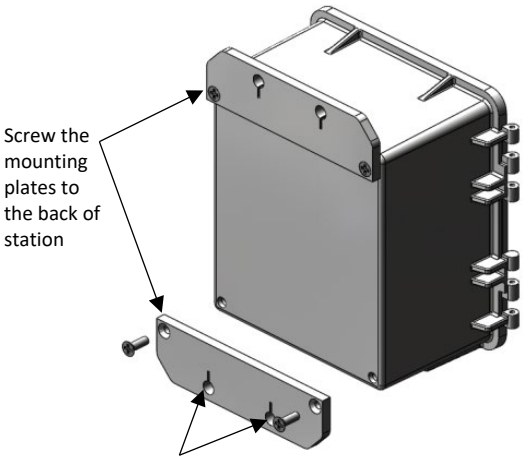
Installing the Grounding Wire

Insert the grounding wire through the larger of the two cable access openings and plug it into the ground connector. You may need pliers to connect it to the station. The grounding wire must be connected to a properly grounded mast (typically on one side of the U-bolt) when the station is mounted.

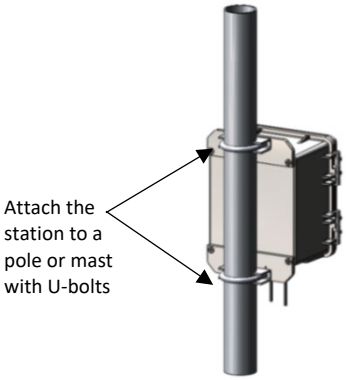


Mounting the Station

Attach the mounting plates with a Phillips-head screwdriver to the back of the station to mount it on a flat surface. Mount the station vertically to a wall or board using screws.



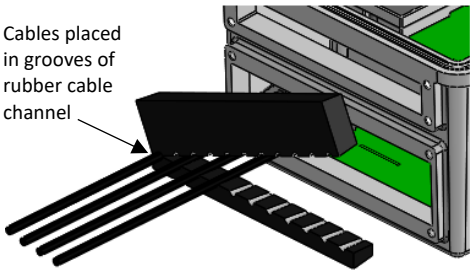
You can also mount the station vertically to a mast or pole and tripod using U-bolts (unscrew the nut on the U-bolt to place around the mast or pole). Screw the mounting plates to the back of the station as shown above. Make sure the mounting plates are mounted against the flat part of the U-bolt saddle clamps. If using the grounding wire, attach it to one end of the U-bolt. Refer to the *Tripod Setup Guide* for full details.



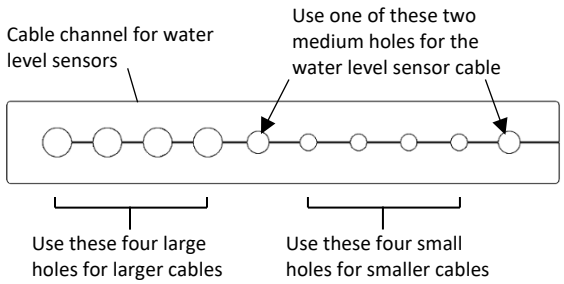
Installing the Weatherproof Rubber Cable Channel and Covers

Important: This is required for outdoor and weatherproof deployments and recommended for harsh indoor environments where debris could enter the station.

1. Make sure all sensors and cables are installed, including the solar panel, AC adapter cable, or external DC power cable, and the grounding wire.
2. If a water level sensor module is installed, you will need to use the rubber cable channel packaged with the water level sensor module rather than the smaller of the two rubber cable channels from the RX3000 Channel Kit packaged with the station.
3. Grease one of the two rubber cable channels.
   a. Apply a small amount of silicone grease (about the size of a pea) onto your fingertip.
   b. Lightly coat all four outer edges on the rubber cable channel with grease.
   c. Open the cable channel and lightly coat the inside of both halves (the part with the grooves).
4. Lightly coat the portion of each cable that will be in the channel with grease.
5. Position the cable channel around the cables, routing the cables through the proper grooves.
   a. Open the greased rubber cable channel so that the channel's hinged side is oriented to the left.
   b. Place each cable or wire into a single groove in the cable channel, installing them from left to right.
      - For the large cable channel, place smart sensor cables in the grooves. If using the grounding wire, place the black portion of it into the rightmost hole in the cable channel (the hole farthest from the hinged side).

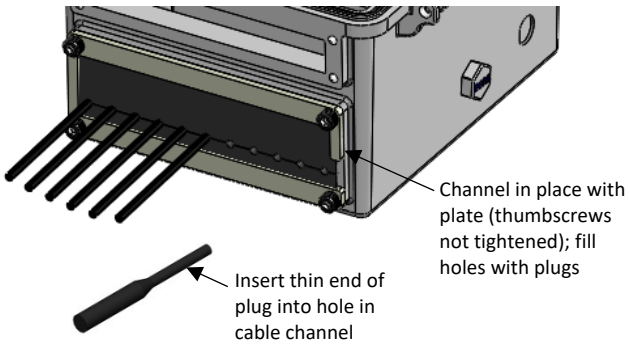


      - If you are using the small cable channel that was shipped with the RX3000 station (not the cable channel shipped with the water level sensor module), place the AC adapter or solar panel cable and any analog sensor cables or relay wires in each of the grooves. Place larger cables in the five grooves on the left closest to the hinged side and smaller cables in the five grooves on the right.
      - If you are using the small cable channel that was shipped with the water level sensor module (not the cable channel shipped with the station), place the water level sensor cable in one of the two medium holes. Place the AC adapter or solar panel cable and any analog sensor cables or relay wires in each of the remaining grooves, with larger cables in the four largest grooves and smaller cables in the four smallest grooves.

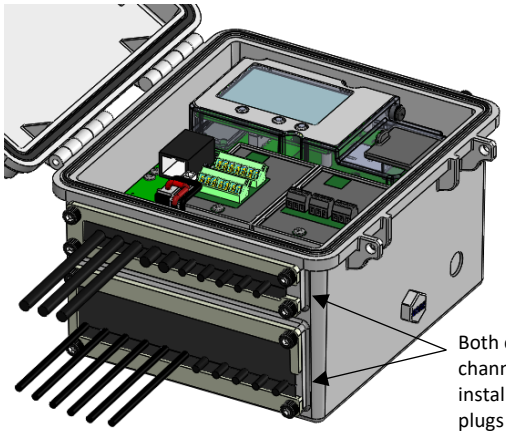


Important: The cable diameter must be 4.0 mm (0.156 in.) to fit through one of the smaller holes or 6.4 mm (0.25 in.) to fit through one of the larger holes in the rubber cable channel. If the cable diameter is too small, build up the diameter using heat shrink. If the cable is too big, splice on another cable with a smaller diameter to fit through the hole. If you are using the rubber cable channel designed for the water level sensor, reserve the medium holes for the water level sensor cable.

6. Close the rubber cable channel making sure the cables and wires remain in their grooves.
7. Press the cable channel into the opening until it is flush with the outside of the case (when fully seated, the channel will project slightly into the inside of the case). To reduce the amount of excess cable in the case, gently pull the cables toward you as you press the channel into place.
8. Using thumbscrews, install the plate on the cable access opening to hold the rubber cable channel in place. (Use the smaller plate for the top opening and the larger plate for the larger opening.) *Do not fully tighten the thumbscrews yet*; keep them loosely installed while you install the rubber plugs in the next step.
9. Lightly coat rubber plugs with a small amount of grease and use the plugs to fill any empty holes in the two cable channels. Insert the thin part of the plug into the hole and push it in until the thick part of the plug fills the hole. Use the large plugs in the larger holes and the small plugs in the smaller holes. If you are using the rubber cable channel designed for the water level sensor, then use one of the medium plugs included with the water level sensor module to fill an empty medium-sized hole.



10. Repeat steps 2 through 9 with the other rubber cable channel.
11. Use the included wrench to tighten the four thumb screws on each of the two plates until the plates are flat against the case.



Care and Maintenance

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

- Verify the station enclosure and any wireless sensor motes are free of visible damage or cracks.
- Make sure the station or mote enclosure is clean. Wipe any dust or grime off with a damp cloth.
- Wipe any water off the station or mote before opening it.
- Check that all cables and wires are free of damage, such as cracks, cuts, and splits.
- Make sure cables and wires are still fastened securely and any conduit is still intact.
- Verify that all cables and wires are free of corrosion. If moisture is visible inside the station or if there is any sign of corrosion on the connectors, spray WD-40® or an equivalent electronics-safe corrosion inhibitor on the connectors. This will displace moisture and prevent additional corrosion. Be sure to determine the source of the moisture and fix it. Check the cable channel and cover seals for any sign of moisture entry.
- Make sure any interior seals or cable channels are intact and the latches are fully locked when the station and any mote doors are closed.

Troubleshooting

Error codes can appear on the LCD if a problem arises with the station or a sensor. This table describes common error codes that may appear. Contact Onset Technical Support for help.

Fault Code #	Description	Action to Take
001	System Failed Initialization	Power cycle the station (disconnect the battery and charging device, wait for a minute, and then plug the battery and charging device back in).
004	Sensor Error/Fault	Check the smart sensor data in HOBOlink to see which smart sensor is producing an error. You may need to remove or replace the smart sensor if the smart sensor is consistently reporting erroneous data.
036	Missing Module	A previously installed module has gone missing. Power cycle the station (disconnect the battery and charging device, wait for a minute, and then plug the battery and charging device back in).
037	Module Improperly Installed	The station must be powered off when installing a module to guarantee proper operation. Power cycle the station (disconnect the battery and charging device, wait for a minute, and then plug the battery and charging device back in).
129	Smart Sensor Bus Fault	There is a problem with one or more of the smart sensor connections. Check that all smart sensors are fully plugged in (follow the instructions in *Adding or Removing Smart Sensors*). Also check that the smart sensor cables are ok.
132	Analog Excitation Bus Fault	Check the analog sensor connection and the excitation settings for the sensor in HOBOlink.

Battery Information

The station uses one rechargeable 4 volt, 10Ah, sealed lead-acid battery. Use the AC adapter (AC-U30), solar panel (SOLAR-xW), or external DC power cable (CABLE-RX-PWR) with your own charging device to keep the battery charged. If using a 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. Without a charging device connected, expected battery life varies based on the ambient temperature where the station is deployed, the logging or sampling interval, frequency of connections to HOBOlink, the number of channels that are active, excitation in analog modules, the number of tripped alarms, and other factors. Deployments in extremely cold or hot temperatures, a logging interval faster than 1 minute, or a sampling interval faster than 15 seconds can impact battery life. Estimates are not guaranteed due to uncertainties in initial battery conditions and operating environment.

Use the following table as a guideline for estimating how long the station will run using a fully charged battery and no source of external power. For these examples, the station has up to 10 smart sensors installed and no excitation enabled for the analog sensor module.

Connection Interval	Logging Interval	Typical Run Time
10 minutes	1 minute	20 days
1 hour	15 minutes	50 days
6+ hour	30 minutes	75 days

All communications stop if the battery voltage drops below 3.9 V. The station stops logging if the battery voltage drops below 3.6 V. If the station has stopped logging due to low battery voltage, plug in an AC adapter, solar panel, or external power source to recharge it. It may take several minutes for the station to power back up; the lower the remaining voltage, the longer it takes for power to return. Also note that it takes longer for power to return with a solar panel than with an AC

adapter. If the charging device is not recharging a dead battery, contact Onset Technical Support.

Important: Due to the self-discharge characteristics of this type of battery, it is imperative that you charge the battery for at least 12 hours every six months at minimum, even if you are not actively using the station. Otherwise, permanent loss of battery capacity may occur.

For information on mote batteries, refer to the wireless sensor or repeater user guide at www.onsetcomp.com/resources.

DANGER! HIGH VOLTAGE HAZARD!

This station can be used with sensors that may be installed in an energized electrical enclosure or on an energized conductor. Installation of sensors in an energized electrical enclosure or on an energized conductor can result in severe injury or death. These sensors are for installation by qualified personnel only. To avoid electrical shock, do not install or service these sensors unless you are qualified to do so. Disconnect and lock out all power sources during installation and servicing. Please read the sensor users guide for instructions and use.

WARNING

This station contains a radio and is not approved for use on airplanes. Disconnect the battery and all power sources before flight.

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.

NCC Statement

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Translation:

Article 12

Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to an approved low power radio-frequency device.

Article 14

The low power radio-frequency devices shall not influence aircraft security and interfere with legal communications. If found, the user shall cease operating immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act. The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

「減少電磁波影響，請妥適使用」

KC Statement

해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없음

Translation:

The service related to human safety is not allowed because this device may have the possibility of the radio interference.