



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 and relay modules, and wireless sensor motes. Data from the RX3000 station is transferred at regular connection intervals to HOBOLink® web-based software where you can check the latest conditions, view graphs, configure sensors and alarms, set up a dashboard, download your data, or schedule data delivery via email or FTP. Inside its weatherproof enclosure, this durable station has a built-in 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. Up to three individual relays can be activated on the optional relay module while 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. All three easy-to-install modules can be configured with HOBOLink.

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:

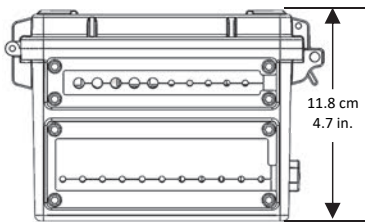
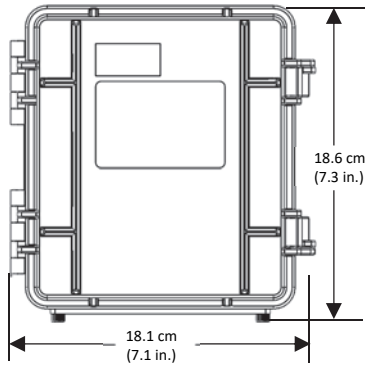
- Smart sensors
- Analog sensor module (RXMOD-A1)
- Relay module (RXMOD-R1)
- RXW Manager (RXMOD-RXW-xxx) and RXW motes
- External DC power cable (CABLE-RX-PWR)
- Tripod kit (M-TPA or M-TPB)
- Guy wire kit (M-GWA)
- 1/2 inch stake kit (M-SKA)
- Grounding kit (M-GKA), required if using wind speed or wind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

Specifications

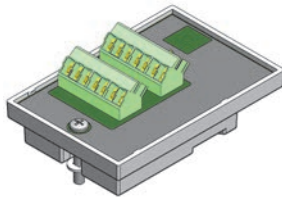
Station

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 manual 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 operated in the temperature range -20° to 40°C (-4°F to 104°F); operation outside this range will reduce 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 inch) mast or wall mount
Environmental Rating	Weatherproof enclosure, NEMA 4X (requires proper installation of cable channel system)

Specifications (continued)



Dimensions



Analog Sensor Module (RXMOD-A1)



The CE Marking identifies this product as complying with all relevant directives in the European Union (EU)

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

Ethernet (RX3001)

Connector	One RJ45/100BaseT
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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 will 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
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

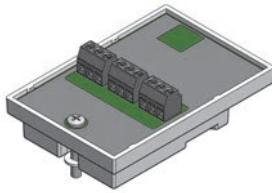
Cellular (RX3003 and RX3004)

Wireless Radio	<p>RX3003: GSM/GPRS/EDGE: Quad band 850/900/1800/1900 MHz, UMTS/HSPA+: Five band 800/850/900/1900/2100 MHz</p> <p>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</p>
Antenna	<p>RX3003: Penta band</p> <p>RX3004: 4G LTE</p>

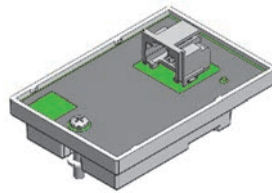
Optional Analog Sensor Module (RXMOD-A1)

Input Channels	Four, single-ended, in addition to smart sensor data channels
Measurement Range and Accuracy	<p>0–25.6 mA DC, ±5 µA ± 0.15% of reading</p> <p>0–2.5 V DC, ±0.25 mV ±0.2% of reading</p> <p>0–5 V DC, ±0.25 mV ±0.2% of reading</p> <p>0–10 V DC, ±0.3 mV ±0.2% of reading</p> <p>0–20 V DC, ±0.6 mV ±0.2% of reading</p> <p>0–33 V DC, ±1.20 mV ±0.2% of reading</p>
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
Alarm Output Relays	Each relay contact closure can be configured as normally open, normally closed, or pulsed for one second
Voltage	30 V max

Specifications (continued)



Relay Module (RXMOD-R1)



RXW Manager Module (RXMOD-RXW-xxx)

Optional Relay Module (RXMOD-R1)

Relays	Three independent relays
Current	1 Amp max

Optional RXW Manager Module (RXMOD-RXW-xxx)


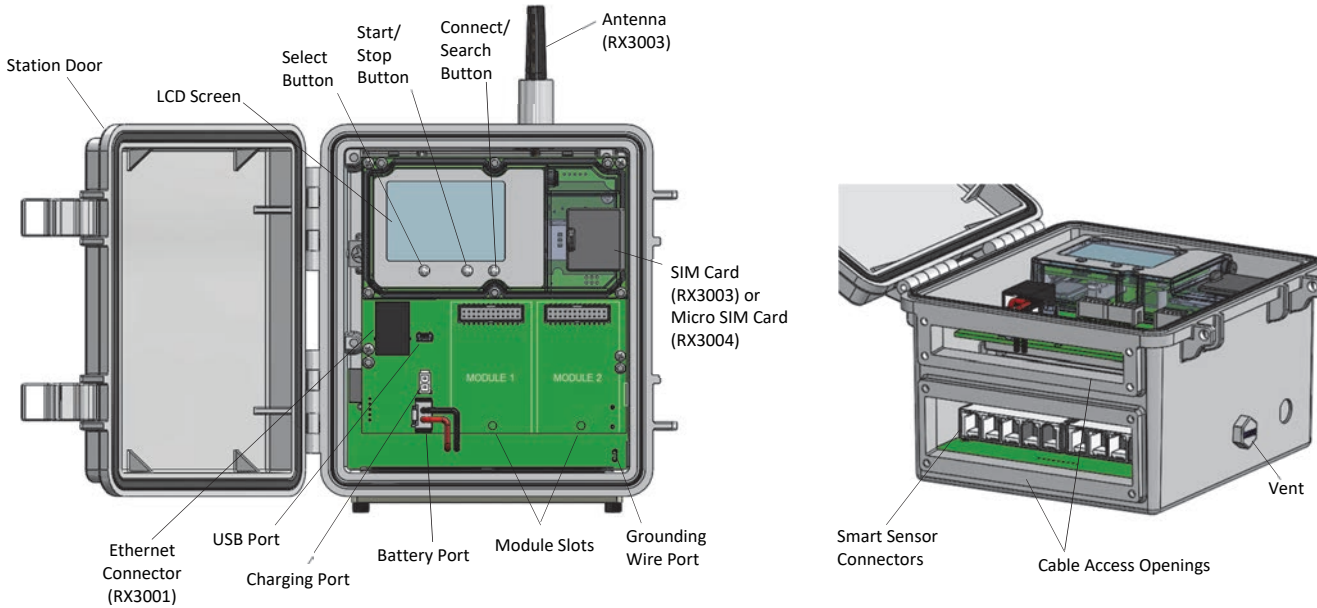
Operating Temperature Range	-25° to 60°C (-13° to 140°F)
Radio Power	12.6 mW (+11 dBm) non-adjustable
Transmission Range	At least 304.8 m (1,000 ft) line of sight at 1.8 m (6 ft) from the ground, 457.2 m (1,500 ft) typical
Wireless Data Standard	IEEE 802.15.4
Radio Operating Frequencies	RXMOD-RXW-900: 904–924 MHz RXMOD-RXW-868: 866.5 MHz RXMOD-RXW-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
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	<p>FC RXMOD-RXW-900: See last page</p> <p>CE RXMOD-RXW-868: The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).</p> <p> RXMOD-RXW-922: See last page</p>

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Device Components and Operation



Station Door: This is the 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, 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*).

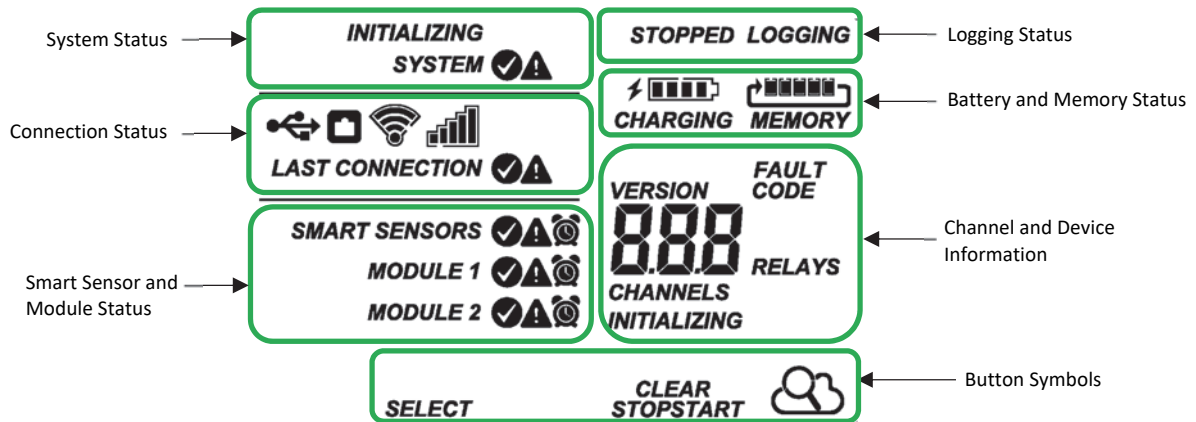
Smart Sensor Connectors: Use these input jacks to connect up to 10 smart sensors (see *Setting up the Station*). The station can support up to 15 smart sensor data channels; some smart sensors have more than one data channel.

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

This 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.



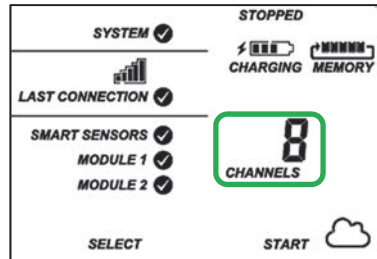
<p>System Status</p> <p>SYSTEM or INITIALIZING SYSTEM</p>	<p>This part of the LCD shows the overall system status.</p> <p>When the station is powered up, "Initializing System" flashes in the upper left part of the LCD. After initialization is complete, "System" remains illuminated and one of these symbols will appear:</p> <ul style="list-style-type: none"> ✓ indicates the system is ok. ⚠ indicates there is a problem with the system; check the Device Information panel on your station page in HOBOLink.
<p>Connection Status</p> <p>CONNECTION or LAST CONNECTION</p>	<p>This part of the LCD shows the communication method used for connecting to HOBOLink and the system connection status.</p> <ul style="list-style-type: none"> This indicates the station is connected via a USB cable. This indicates the station is using Ethernet to connect to HOBOLink. This will blink while connecting to HOBOLink. This indicates the station is using Wi-Fi to connect to HOBOLink. This also shows the strength of the wireless signal; the more bars there are, the stronger the signal. This will blink while connecting to HOBOLink. This indicates the station is using a cellular network to connect to HOBOLink. This also shows the strength of the cellular signal; the more bars there are, the stronger the signal. This will blink while connecting to HOBOLink. <p>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 will appear:</p> <ul style="list-style-type: none"> ✓ indicates the last connection to HOBOLink was ok. ⚠ indicates there was a problem with the last connection; check the Connections log in HOBOLink.
<p>Smart Sensor and Module Status</p> <p>SMART SENSORS MODULE 1 MODULE 2</p>	<p>This part of the LCD 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.</p> <p>One of the following symbols will also appear next to smart sensors or a module (if applicable):</p> <ul style="list-style-type: none"> ✓ 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 will flash on the LCD until the alarm is cleared; check the Alarms log in HOBOLink.
<p>Logging Status</p> <p>STOPPED or LOGGING</p>	<p>This part of the LCD indicates whether the station is currently logging.</p> <p>"Stopped" indicates the station is not currently logging while "Logging" indicates it is currently logging. Press the Start/Stop button to start or stop logging as desired. Note that "Logging" will blink until the first data point is logged after the Start button is pressed.</p>
<p>Battery and Memory Status</p> <p> or CHARGING MEMORY</p>	<p>This part of the LCD shows the current battery level and memory.</p> <p>The battery indicator shows the approximate battery power remaining. In this example, the battery is fully charged. The lightning bolt will appear when an AC adapter, solar panel, or external power source is plugged into the station. "Charging" will flash while the battery is being charged.</p> <p>When the station is logging, it will record 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.</p>

Channel and Device Information

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

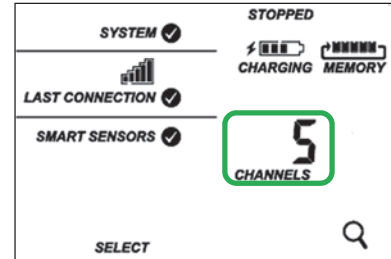
Main Screen

When viewing the main LCD screen, the total number of channels in use by the system is displayed. 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, then 8 channels are shown on the main screen, as in the following example.



Smart Sensors Screen

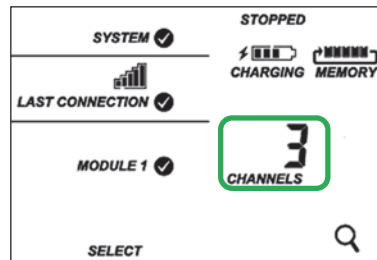
When viewing the smart sensors screen, the number of smart sensor channels is displayed. Note that some smart sensors have more than one channel associated with them so the number of channels may not match the number of physical smart sensors. In this example, there are 5 smart sensor channels.



12
CHANNELS
or
000 RELAYS

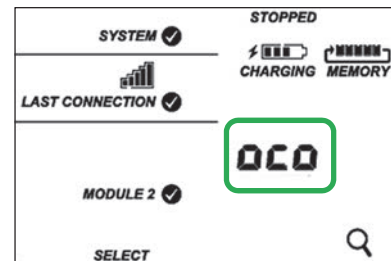
Module 1

When viewing the Module 1 or Module 2 screen, information about that particular module is displayed. 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 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.



Module 2

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.



INITIALIZING

This will blink in the lower right part of the LCD when a firmware update is underway. It will display which module or element is being updated.



This is 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.

This is the version number of the station firmware. It only appears 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
START
STOP

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

Press this button to start logging. This option is not available while the station is actively connected to HOBOLink.

Press this button to stop logging. This option is not available while the station is actively connected to HOBOLink.



Press this button to connect to HOBOLink. This option is only available on the main LCD screen. It is not available when 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 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 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 will turn 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.

a. Log in to HOBOLink.

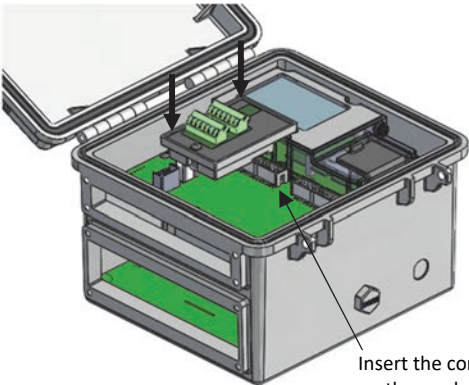
Log in to an existing account or create a new one. You'll receive an email to activate the new account.

b. Register the station.

In HOBOLink, click Devices and then click the Register a Device link. Give the station a name and enter the serial number and device key from the label inside the station door.

3. Install optional modules or user-supplied SIM.

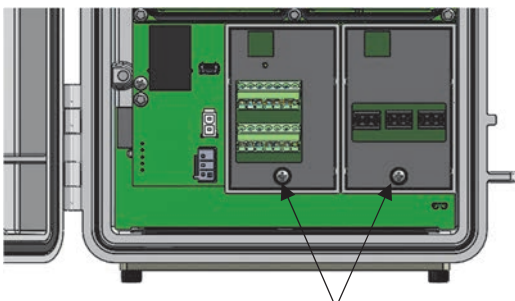
- Make sure the station is powered down (unplug any charging device and then disconnect the battery).
- Insert the connector on the back of the module into the receptacle in the left or right module slot. Add a second module to the other slot if desired.



Insert the connectors on the module here

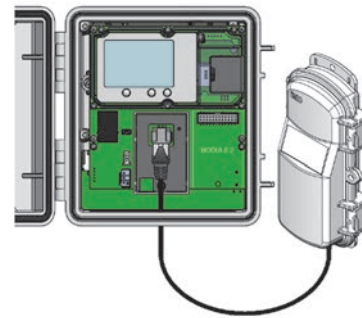
Tip: Install the analog module or RXW Manager module on the left and the relay module on the right for easier cable routing.

- 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 are installing 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.

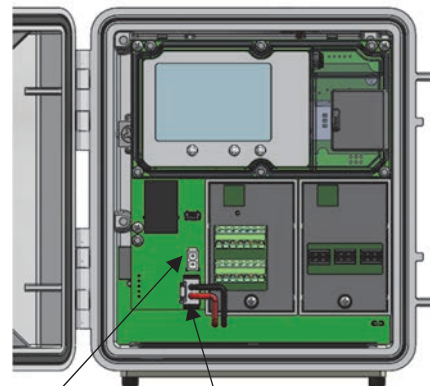


WARNING: If you inadvertently install modules while the power is on, you must disconnect and then reconnect the battery and charging device to guarantee proper operation.

Note: If you are using your own SIM card, follow the instructions at h

4. Plug in the battery and charging device.

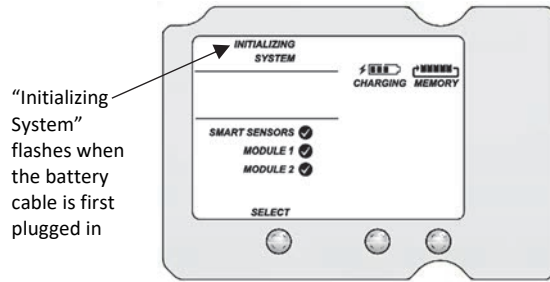
- Plug in the battery cable.
- Feed the AC adapter or solar panel cable through the smaller of the two cable openings and plug it in. You can also use an optional external DC power cable (CABLE-RX-PWR) with your own powering device in place of the AC adapter or solar panel.



Plug in an AC adapter or solar panel here

Connect the battery cable here

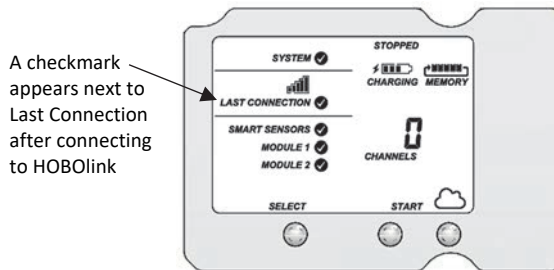
- c. Once the battery cable is plugged in, "Initializing System" will flash on the LCD. A checkmark appears next to "System" after the station initialization is complete.



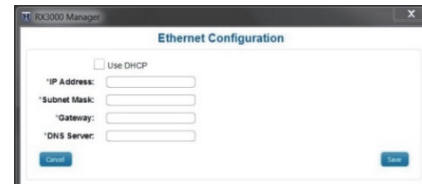
5. Check and configure device communications.

For RX3003 and RX3004 cellular models:

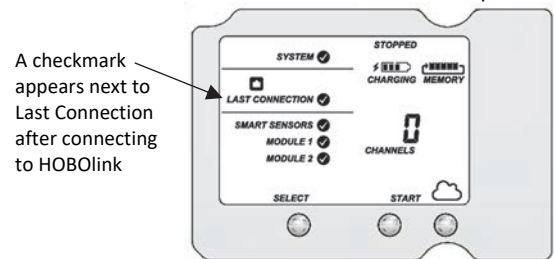
After the station powers up in the previous step, it will connect to HOBOLink automatically within two minutes. The cellular icon and "Connection" will flash while the connection is underway. Once the connection is complete, a checkmark appears next to Last Connection. Note that the entire initialization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



- some features. Select Domain networks and click Allow Access.)
- d. In the RX3000 Manager, click the Actions button.
- e. Deselect the Use DHCP checkbox.

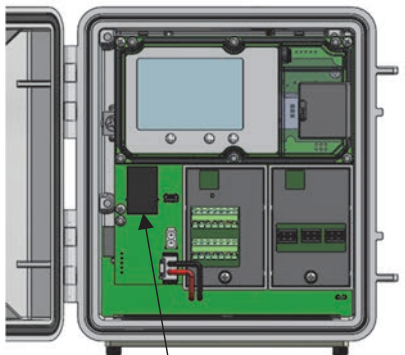


- f. Enter the IP Address, Subnet Mask, Gateway, and DNS Server. Consult your Network Administrator for the appropriate addresses to complete these fields.
- g. Click Save in the RX3000 Manager. Click Done and then close the RX3000 Manager.
- h. Disconnect the USB cable.
- i. Press the Connect button on the station (the cloud should be visible on the LCD screen) to connect to HOBOLink. The Ethernet icon and "Connection" will flash while the connection is underway. Once the connection is complete, a checkmark appears next to Last Connection. Wait for the checkmark and then continue to step 6.



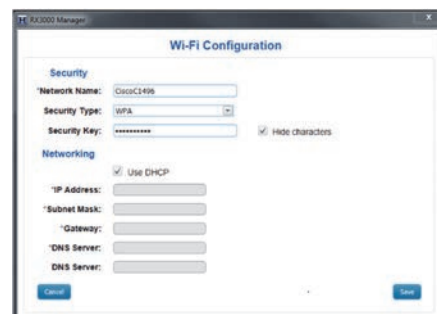
For RX3001 Ethernet models:

- a. Plug in an Ethernet cable.



For RX3002 Wi-Fi models:

- a. Connect the station to the computer with the USB cable.
- b. In HOBOWare, select Manage RX3000 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 RX3000 Manager, click the Actions button.
- 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.



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

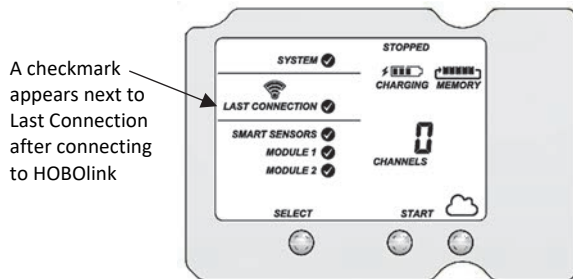
If your network uses static IP addresses, connect the station to the computer with the USB cable. (Consult your Network Administrator if you are unsure whether your network uses static IP addresses or for help with the following steps).

- c. In HOBOWare, select Manage RX3000 from the Device menu. (On a computer with Microsoft® Windows®, you may see a warning that Windows Firewall has blocked

- 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.

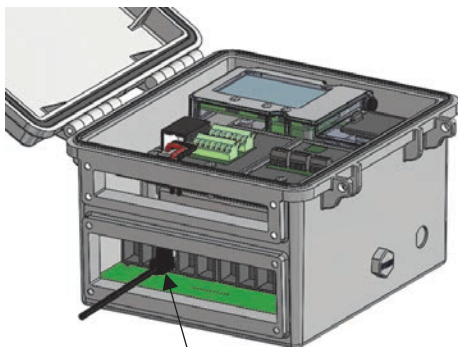
- f. Click Save in the RX3000 Manager. Click Done and then close the RX3000 Manager.
- g. Disconnect the USB cable.
- h. Press the Connect button on the station (the cloud should be visible on the LCD screen) to connect to HOBOLink. The Wi-Fi icon and "Connection" will flash while the connection is underway. Once the connection is complete, a checkmark appears next to Last Connection. Wait for the checkmark and then continue to step 6.



6. Plug in and search for any smart sensors.

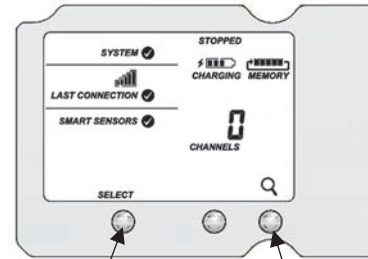
Important: If this RX3000 station is a replacement for an existing U30 station, it is imperative that you power down the U30 station being replaced (disconnect the battery and AC adapter or solar panel) before you remove the smart sensors and connect them to the RX3000. Do not repower the U30 station 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.



- 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 will search for all connected smart sensors and show the number of channels after a few seconds.



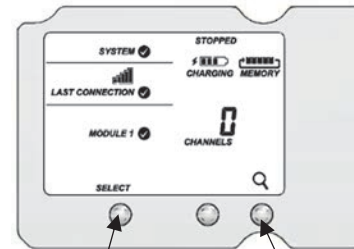
Press the Select button to view the smart sensor screen Press the Search button for the station to find all connected smart sensors

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).

7. Add any wireless sensor notes.

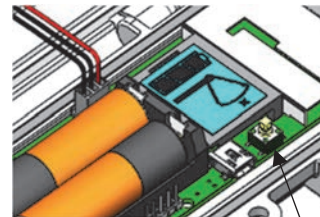
Important: Keep the mote(s) near the RX3000 station while completing these steps.

- a. Press select to switch to the module where the RXW Manager is installed (Module 1 or Module 2) and 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.



This signal strength icon blinks while searching for a network.



Once a network is found, the icon will stop flashing and the bars will cycle from left to right.



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



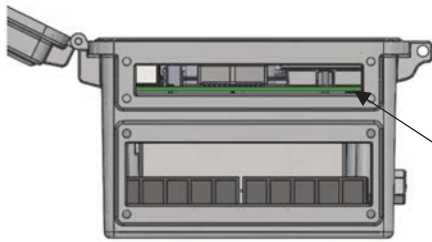
Once the mote has finished joining the network, the "x" icon is removed and the channel count on the station LCD increases by the number of measurement channels for the mote plus the battery.

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.

8. Connect analog sensors or relay devices.

If you are using the optional analog sensor module or relay module, follow the steps in this section to connect the sensors or devices. Be sure to feed any cables or wires through the smaller cable access opening shown below.



Feed analog sensor and relay cables through this opening to connect them to the optional modules

Important: If you will be 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 five smaller holes or 6.4 mm (0.25 in.) to fit through one of the five 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.

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.

- Loosen the screw for each pin on the screw terminal.
- Feed the wire through the smaller of the two cable access openings.

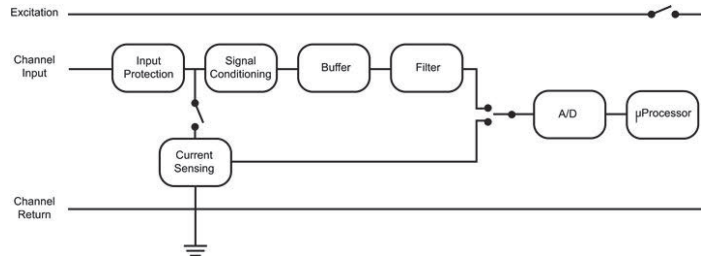
- Insert the appropriate wire into the screw terminal (see the pinout table below). The wire should be trimmed to expose 0.25 inches ±0.04 inches of bare wire.
- Tighten the screw.

Analog Module Pinout Table

J1		J2	
Pin #	Pin Description	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 only for low power switching. To switch to higher power, use an appropriately rated relay and use the station relay to switch the external relay on or off.

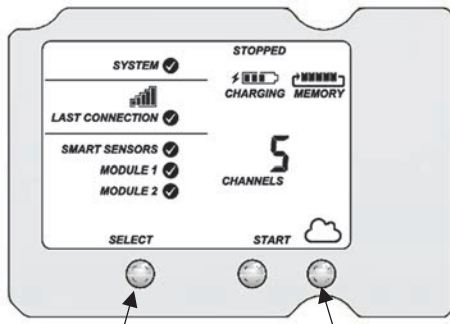
- Loosen the screw for each pin on the screw terminal.
- Feed the wire through the smaller of the two cable access openings.
- Insert the appropriate wire into the screw terminal (pins 1 and 2 are interchangeable, pin 3 is optional; see the pinout table).
- Tighten the screw.

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

9. Connect to HOBOLink.

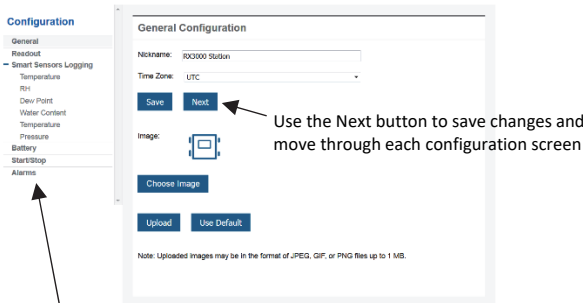
Use the Select button to return to the main LCD screen that shows all sensors and modules and then press the Connect button (the cloud icon should be visible as shown in the following example). This is necessary for HOBOLink to identify the newly added sensors (it does not start logging; this will be done later in this procedure). Note that analog sensors will not be listed in the channels count on the LCD until they are configured in HOBOLink in the next step.



Press the Select button to return to the main LCD screen Press the Connect button

10. Configure the station in HOBOLink.

Go to Devices > List and click the icon next to your station. Use the configuration screens in HOBOLink to finish setting up the station, starting with General Configuration (the nickname, time zone, and image for the station). Use the Next button to move from one configuration screen to the next or use the left menu to select a specific item to configure. Follow the steps in the next subsections to configure the readout settings, smart sensors, wireless sensors, and optional modules. Any changes you make will take effect the next time the station connects to HOBOLink. **Note:** Click Save or Next in any screen to save your changes. You will lose any changes made if you click Back without clicking Next or Save first.



Or, you can choose a specific item to configure from this menu

Readout Configuration

- Set the connection interval, which is how often the station will connect to HOBOLink. For the RX3003 and R3004 cellular models, the minimum connection interval depends on your communication plan.
- If you wish to set up a second connection interval, select the "Night mode" checkbox. Select when night mode should begin and end and then enter the connection interval you want to use during that part of the day. (The night mode schedule can take effect any time during the day; it does not have to be at night.) Use this option to save data in your communications plan (if applicable) or to conserve battery power at night when solar charging is unavailable. You can view current plan usage in the Device Information section on your station's page in HOBOLink.

c. Click Save or click Next.



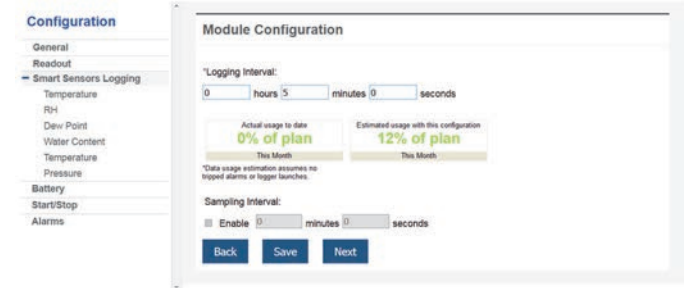
Smart Sensors Logging and Configuration

You can configure both the global settings that affect all smart sensors (logging interval and sampling interval) and the settings for each smart sensor (labels, graphs, and scaling).

- Click Smart Sensors Logging from the menu on the left.
- Select the logging interval. This will be used by all configured smart sensors.
- Enable the sampling interval and enter the rate to use in minutes and seconds.

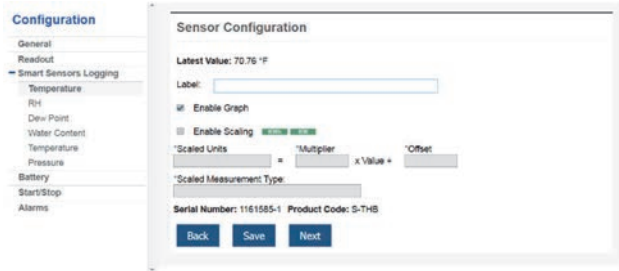
Tip: When a sampling interval is configured, the station will take multiple measurements within a given logging interval and then average them together to create a single logged data point. This is only an option for the following smart sensors that support measurement averaging: temperature (S-TMB-M0xx), PAR (S-LIA-M003), solar radiation (S-LIB-M003), barometric pressure (S-BPA-CM10 and S-BPB-CM50), 4-20mA input (S-CIA-CM14), 12-bit voltage input (S-VIA-CM14), and FlexSmart TRMS module (S-FS-TRMSA-D). Disable the sampling interval if none of your smart sensors support measurement averaging to avoid unnecessary drain on the battery power.

d. Click Save or click Next.



- Click a smart sensor from the menu.
- Type a label for the smart sensor (optional) and click to enable or disable the graph (enabled by default).
- To set up scaling for the smart sensor, click the Enable Scaling checkbox and fill in the Scaled Units, Multiplier, Offset, and Scaled Measurement Type fields.

- h. Click Save. You can also click Next to move from one smart sensor to the next.

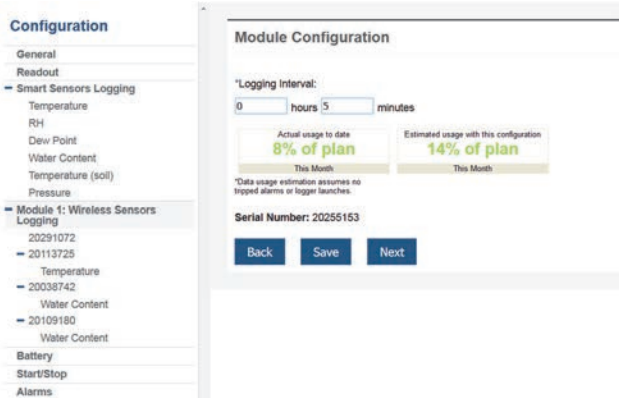


- i. Repeat steps e–h for any additional smart sensors you need to configure.

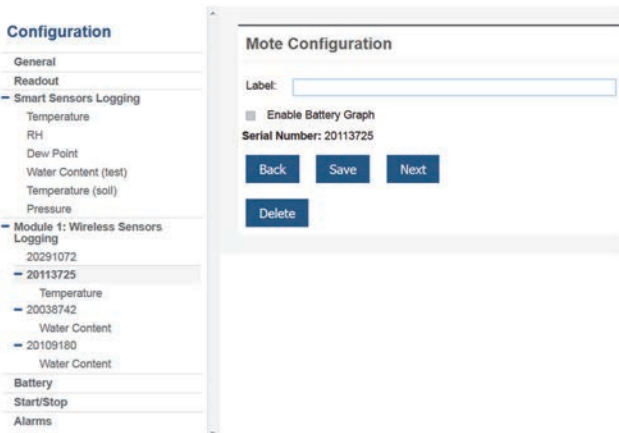
Wireless Sensor Configuration

You can configure both the global settings for the RXW Manager module that affect all sensor motes (logging interval) and the settings for each individual mote (labels, enabled graphs, and scaling).

- a. Click Module <#>: Wireless Sensors Logging from the menu on the left.
- b. Select the logging interval to be used for all wireless sensors, which can be different than the one used for smart sensors and analog sensors (if applicable).



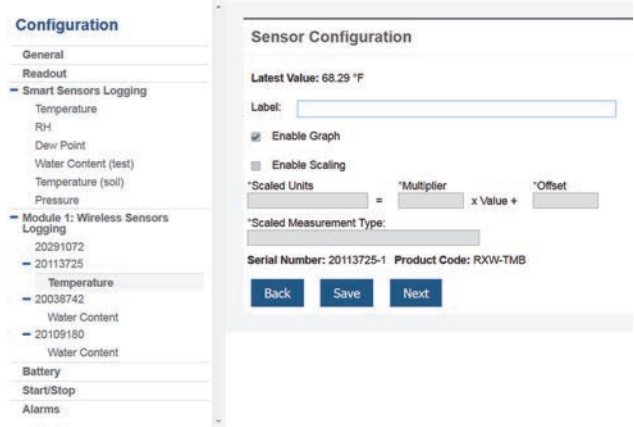
- c. Click Save or Next.
- d. Click one of the motes from the menu under Module <#>: Wireless Sensors Logging as shown in the following example. Click the serial number or name for the mote, not the measurement type.



- e. Type a label for the mote (optional) and click to enable the battery graph for the mote if desired. The label will

also automatically be applied to any mote sensors without a default label.

- f. Click Save or click to Next to move to either the next mote (if it was a repeater) or the sensor measurement type for that mote.
- g. Click one of the mote measurement types from menu under Module <#>: Wireless Sensors Logging as shown in the following example

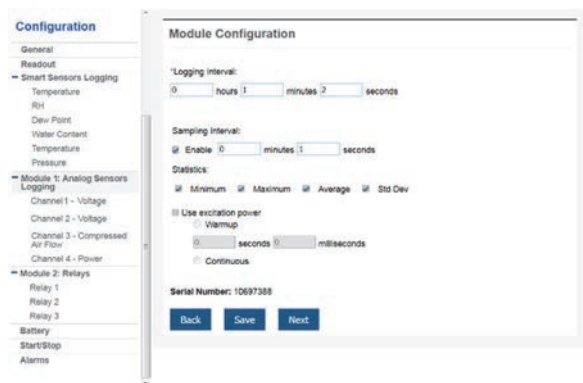


- h. Type a label for the measurement type (optional) and click to enable or disable the graph (enabled by default).
- i. To set up scaling for the wireless sensor, click the Enable Scaling checkbox and fill in the Scaled Units, Multiplier, Offset, and Scaled Measurement Type.
- j. Click Save or click Next.
- k. Repeat steps d–j for any additional motes you need to configure for the module.

Analog Module and Sensor Configuration

You can configure both the global settings for the analog module that affect all connected analog sensors (logging interval, statistics, and excitation) and the settings for each individual analog sensor (enabled logging and graphs, labels, sensor type, and scaling).

- a. Click Module <#>: Analog Sensors Logging from the menu on the left.
- b. Select the logging interval to be used for all analog sensors, which can be different than the one used for smart sensors and wireless sensors (if applicable).

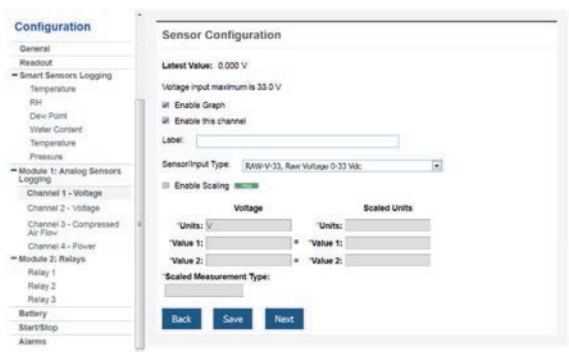


- c. Click the Enable checkbox under Sampling Interval if you want to log statistics. Enter the sampling interval to be used for calculating the statistics (must be a factor of the logging interval). Select the statistics to be logged:

- minimum, maximum, average, and standard deviation. The selected statistics will be calculated between each logging interval at the sampling interval rate you select. Each statistical value will then be logged at each logging interval.
- d. Enable “Use excitation power” if you want sensors to use the 12 V DC excitation voltage provided by the station. Select warmup and enter the seconds or milliseconds (5 milliseconds to 120 seconds), or select continuous. Note that the excitation power selected will be used for all of the module’s configured sensors.
 - With warmup, the station supplies excitation power, 12 V DC, for a brief period prior to each measurement. This allows you to select the minimum warm-up time needed to allow for sensor stabilization while conserving battery power. For example, if you specify a warm-up of one second and set the logging interval for the module to one minute, the station will power the external sensor for one second, log a measurement, and then turn off the excitation power for the next 59 seconds. Note that the excitation mode is automatically set to Continuous if the warmup time selected is within one second or greater than the logging or sampling intervals.
 - With continuous, the station supplies constant excitation power to the sensor for the entire duration of the deployment. Continuous mode is required if the sensor needs more than two minutes of warm-up time.

Important: Continuous mode operation will greatly affect battery operating life and is not recommended.

- Note that excitation power will not be enabled until logging begins (if “Logging” is blinking on the LCD, then excitation is not being used).
- e. Click Save. You can also click Next to move from one analog channel to the next.
- f. Click one of the four analog sensor channels from the menu, such as Channel 1 shown in this example.



- g. Select “Enable Graph” if you want the sensor data to be graphed in HOBOLink.
- h. Select “Enable this channel” if you want the station to record data for this channel. If the channel is not enabled, then it will not be part of the channel count shown on the LCD.
- i. Type a label for the sensor (optional).

- j. Select the sensor/input type, which is needed to set the voltage or current range for the analog input.
- k. Click the Enable Scaling checkbox and then enter the raw and scaled unit values as defined in the sensor manual. Type the scaled measurement type.
- l. Click Save. You can also click Next to move from one channel to the next.
- m. Repeat steps f–l for any additional analog sensors you need to configure for the module.

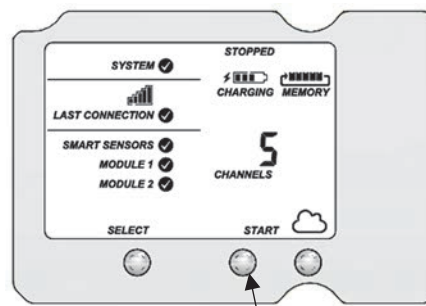
Relay Module Configuration

- a. Click one of the three relays from the menu on the left, such as Relay 1 in the following example.
-
- b. Type a label and select Open or Closed for the Normal Relay State. The label can be used to show what Open or Closed corresponds to in your system (for example, “closed relay turns pump on”).
 - c. Select what should happen on the next connection with the station: open relay, close relay, or leave it at its current state.
 - d. Click Save or click Next.
 - e. Repeat steps a–d for any additional relays you wish to configure.

Tip: Refer to *Setting System and Sensor Alarms* for details on using sensor alarms to activate the relays.

11. Start logging.

After you have finished configuring all the settings in HOBOLink, you can start logging when ready. Press the Start button on the station to start logging. The station will connect to HOBOLink (“Connection” will blink on the LCD) and then logging will begin at the logging interval specified for smart sensors and analog sensors (if applicable).

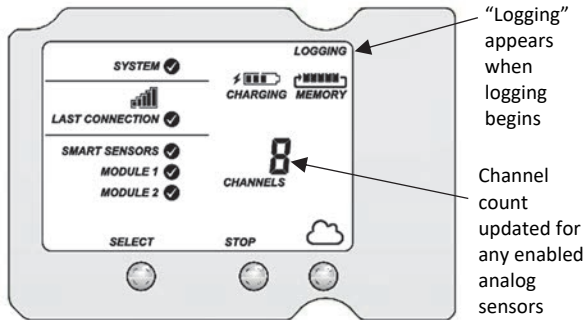


Press this button to start logging

You can also start logging from HOBOLink. Select Start/Stop from the Configure menu in HOBOLink and click Start.

Logging will 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” will blink until the first logging sample is recorded. At that point, it will stop blinking and remain illuminated until logging is stopped. Also note that the channels count on the LCD screen will be 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 using the station outdoors or in harsh indoor conditions, you must install the sensor cable channels and the plates for weatherproofing.

Viewing Data in HOBOLink

Data is uploaded to HOBOLink each time the device connects. For a snapshot of the latest conditions, click Devices and List and click the device name to view the readings from the last connection for smart sensors and logged analog sensors. You can also view any enabled graphs as shown in the following example.



Logged data is saved in a database. You can export this data on demand as needed or set up automatic exports that are delivered to email and/or FTP addresses on a schedule you specify.

To download and export data:

1. In HOBOLink, click Data and Exports.
2. Click Create New Export.
3. Follow the instructions on the screen to select the name, format, time zone, and time frame, and then the devices and sensors to include in the export. Reorder the sensors as needed.

4. Click Save to keep these settings for future use or click Export Data to export immediately.

To set up a scheduled data delivery:

1. Click Data and then click Data Delivery).
2. Click Create New Delivery.
3. Under General Settings, type the name of the delivery schedule and the frequency of delivery. Enable the Active checkbox. Select other settings if desired.
4. Under Select Data to Export, choose the name of the custom data export you want to be delivered (or follow the previous set of steps to set up a custom data export).
5. Under Data Destination, select FTP/SFTP or Email for the delivery method and fill in the appropriate fields.
6. Click Save. Data will then be delivered on the schedule you selected.


For more information on Data Delivery, see the HOBOLink Help. See also HOBOLink Help for other ways to monitor your station, including setting up a map or using dashboards.

Setting System and Sensor Alarms

You can set up both system and sensor alarms in HOBOLink. System alarms can trip when there is a missed connection, the battery is low, or if there is a smart sensor failure. With a sensor alarm, you can configure an alarm to trip at one level and clear at another.

System Alarms

To add a system alarm:

1. In HOBOLink, click Devices and then List, and find the station you want to configure. Click the arrow next to  and select Alarm Configuration.
2. Click Edit System Alarms.
3. For Missed Connection alarms:
 - a. Under Communication, select the Missed Connection checkbox.
 - b. Set the length of time for HOBOLink to wait after the station has missed a connection before an alarm trips.
 - c. Select the action to be taken when this alarm trips: send an email or text. Enter the details and then select “Send on Clear Also” if you want an email or text when the alarm clears as well.

Important: Standard data fees and text messaging rates may apply when using text notifications. Onset does not charge a fee or guarantee delivery of text alerts, which is subject to your carrier’s service and location. See the HOBOLink Help for additional details on alarm notifications.

- d. Click Add Action if you want multiple actions to be taken when the alarm trips (for example send an email and a text).
4. For Battery Low and Sensor Failure alarms:
 - a. Under Device, select the Battery Low and/or Sensor Failure checkboxes.
 - b. Select how you want to be notified when these alarms trip: by email or text. Enter the appropriate addresses

and then select “Send on Clear Also” if you want an email or text when these alarms clear as well.


5. Click Add Action if you want multiple actions to be taken when the alarm trips (for example send an email and a text).
6. Click Save. Changes will take effect the next time the station connects to HOBOLink.

Red alarm symbols will appear in HOBOLink when these alarms trip (if enabled).

Note for wireless sensors: If a wireless sensor mote goes offline from the network for 30 minutes, the station will automatically connect to HOBOLink to report the missing mote regardless of any alarm settings in place. Unless the mote has no battery power, it will continue logging data even if it is offline from the network. Once the mote is back online, any logged data will be uploaded during regular connections to HOBOLink. **Note:** Once a mote is back online, it enters recovery mode as HOBOLink receives the data logged while it was offline. During this period of recovery, data for that mote will temporarily be unavailable for data delivery, dashboards, and data feeds. See the HOBOLink help for additional details.

Sensor Alarms

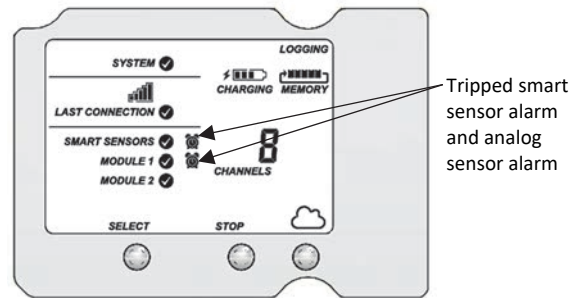
To add a sensor alarm:

1. In HOBOLink, click Devices and then List, and find the station you want to configure. Click the arrow next to  and select Alarm Configuration.
2. Click Add a Sensor Alarm.
3. Select the sensor.
4. Select whether the alarm should trip above or below a value or within a range.
5. Enter the sensor reading(s) for the alarm threshold.
6. Enter the number of logged data points you want the station to record before the alarm trips.
7. If you selected the alarm to trip above or below a specific reading, then select when the alarm should clear: above or below the same value or a different value. Enter the value if necessary.
8. Select the action to be taken when the alarm trips: send an email or text or close, open, or pulse one of the three relays if a relay module is installed. For email or text, enter the details and then select “Send on Clear Also” if you want an email or text when the alarm clears as well.

Important: Standard data fees and text messaging rates may apply when using text notifications. Onset does not charge a fee or guarantee delivery of text alerts, which is subject to your carrier’s service and location. See the HOBOLink Help for additional details on alarm notifications.

9. Click Add Action if you want multiple actions to be taken when the alarm trips (for example, close the relay and send an email).
10. Add any optional notes for this alarm.
11. Click Save. Changes will take effect the next time the station connects to HOBOLink.
12. Repeat steps 2 through 11 for each additional sensor alarm you want to add.

A red alarm symbol appears next to that sensor in HOBOLink when it trips. An alarm symbol will also appear on the LCD.

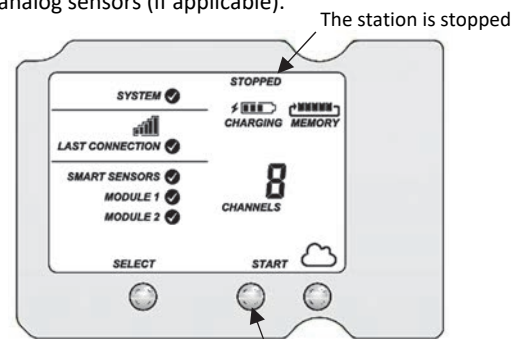


Starting and Stopping Logging

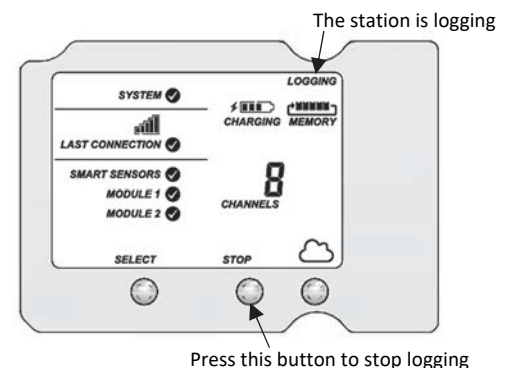
You can start and stop logging with the Start/Stop button on the station or from HOBOLink.

To start and stop logging with the station:


1. When the station is stopped, press the Start button to start logging. The device will connect to HOBOLink (“Connection” will blink on the LCD) and then logging will begin 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 will continue to connect to HOBOLink even if it is not logging.



To start and stop the station from HOBOLink:

1. Click Devices and then List, and find the station you want to start or stop. Click the arrow next to  and select Start/Stop.
2. Click Start or Stop. The station will start or stop 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 offloaded before changing smart sensors.
3. If 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*).

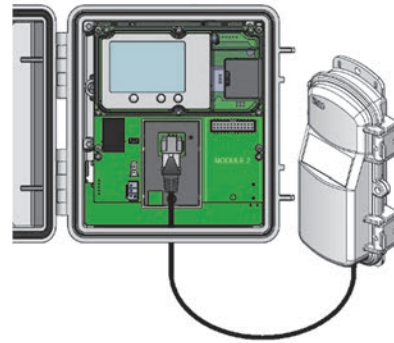
Note that any existing alarms associated with removed sensors will still be listed in HOBOLink. See the HOBOLink Help for details on deleting alarms. Also, if you are using alarms to activate relays, check that the relays are in the proper state.

Adding or Removing Modules

The RX3000 has two slots in which optional analog, relay, 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 offloaded 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 installing 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.



7. Plug in the battery and charging device, and wait for the device to power up. Verify that the new module is listed on the LCD screen with a checkmark.
8. 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.
9. Connect any analog sensors or relays (see step 7 in *Setting up the Station* for details). Add any wireless motes (see *Adding or Removing Motes*). 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 offloaded before adding a new module.
3. Power down the station (disconnect the battery and unplug any charging device).
4. Disconnect any analog sensors or relay devices. 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 will remain 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 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.

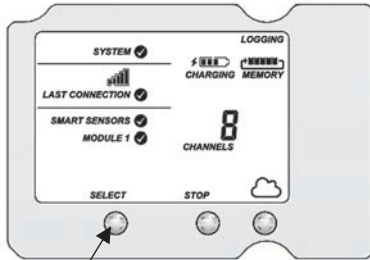
Note that any existing alarms associated with removed modules will be listed in HOBOLink. See the HOBOLink Help for details on deleting alarms. Also, if you are using alarms to activate relays, check that the relays are in the proper state.

Adding or Removing Motes

To add a mote to the RX Wireless Sensor Network:

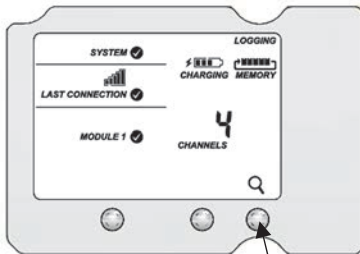
Important: Keep the mote near the RX3000 station while completing these steps.

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 HOBOLink RXW Manager is installed in the left slot (module 1) or twice if it is installed on the right slot (module 2).



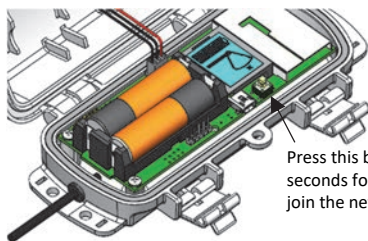
Press this button to view the module where the RXW Manager is installed

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



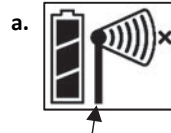
Press this button so the station is ready to have motes join the network

4. Open the 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 will flash and then cycle.



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

6. Watch the LCD on the mote.



This signal strength icon blinks while searching for a network.



Once a network is found, the icon will stop flashing and the bars will cycle from left to right.



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

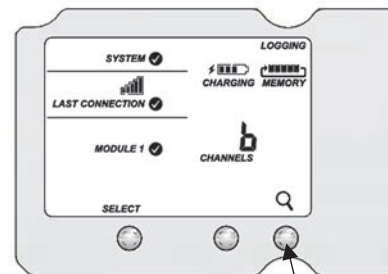


Once the mote has finished joining the network, the "x" icon is removed and the channel count on the station LCD increases by the number of measurement channels for the mote plus the battery.

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.



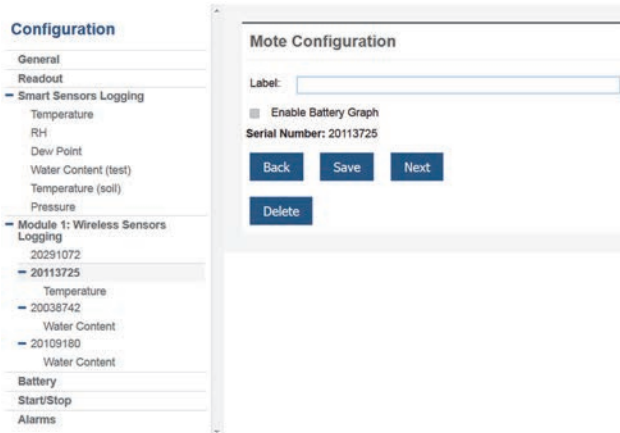
Press this button again to stop searching for motes

Measurements will be 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 RX Wireless Sensor Network:

- a. In HOBOLink, click Devices and then List, and find the station with the mote you want to delete. Click the arrow next to  and select Module/Sensor Configuration.

- b. Select the mote serial number or name from the Configuration menu as shown in the following example.




- 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 will connect to HOBOLink on the connection interval you selected in Readout Configuration.

To change the connection schedule:

1. Click Devices and then List, and find the station you want to configure. Click the arrow next to  on the Devices page and select Readout Configuration.
2. Set the connection interval. For the RX3003 and RX3004 cellular models, the minimum connection interval depends on your communication plan.
3. If you wish to set up a second connection interval, select the “Night Mode” checkbox. Select when night mode should begin and end and then enter the connection interval you want to use during that part of the day.
4. Click Save. The changes to the connection interval will take place the next time the station connects to HOBOLink.

You can also 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 night mode connection interval, the normal connection schedule will then restart 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 will then be about 11:15 based on the one-hour connection interval. Similarly, if a station misses a connection, the connection schedule will shift depending on the time of the next successful connection. While the station is using a second, night mode schedule, all connections will follow that schedule only; any


extra connections while the station is in night mode will not cause a shift in the connection schedule.

Also note that the station will connect to HOBOLink when the device is powered up and when you press the Start button.

For RX3003 and RX3004 cellular models: All connections to HOBOLink count toward your communications plan. If the station is nearing its limit for monthly cell use, minimize unscheduled connections. This includes any connections for alarms or changes you make to the connection schedule. You can also increase the connection interval to reduce the number of connections to HOBOLink per day. Check the Device Information section on your station page in HOBOLink to check the status of the monthly communications plan usage for the station.

Checking Latest Conditions with HOBOWare

The RX3000 Manager within HOBOWare and HOBOWare Pro 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 RX3000. 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 RX3000 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 RX3000 Manager when done and disconnect the USB cable.

Note: The Latest Conditions and Device Information available in the RX3000 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.

Deployment Guidelines

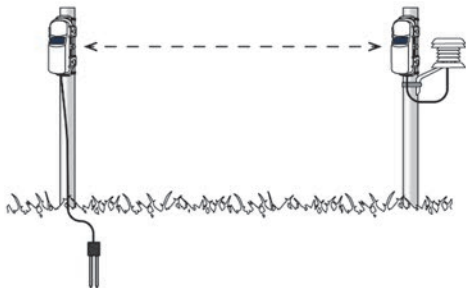
When deploying the station:

- 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.

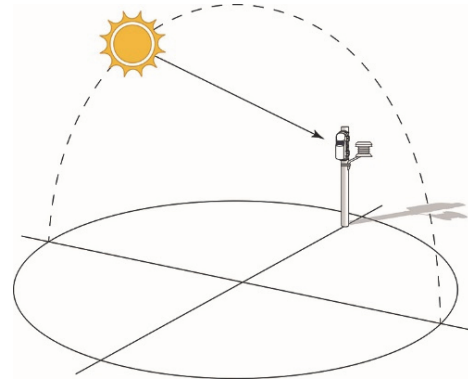
When setting up the RX Wireless Sensor Network:

- 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.
- 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.

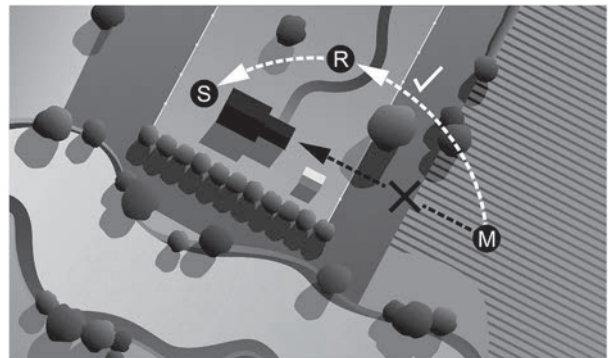


- Consider using a plastic pole such as PVC to mount the motes.

- 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.



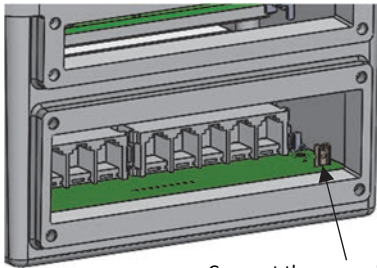
S Station R Repeater M Mote

- 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 Help 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.

Installing the Grounding Wire

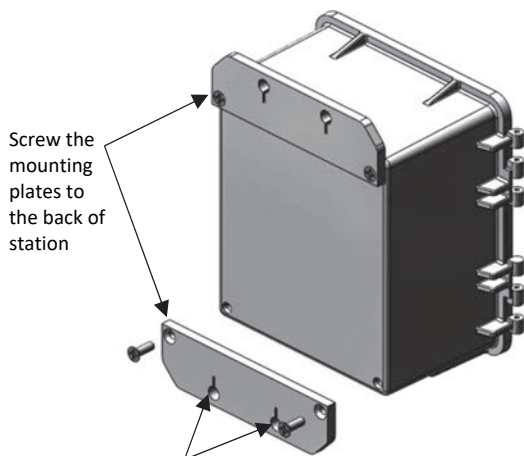
Insert the grounding wire through the larger of the two cable access openings and plug it into the ground connector. You may need pliers to connect it to the station. The grounding wire must be connected to a properly grounded mast (typically on one side of the U-bolt) when the station is mounted.



Connect the grounding wire here

Mounting the Station

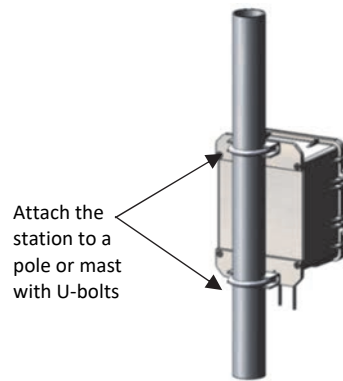
Attach the mounting plates with a Phillips-head screwdriver to the back of the station to mount it on a flat surface. Mount the station vertically to a wall or board using screws.



Screw the mounting plates to the back of station

Use the holes on the mounting plates to affix the station to a board or flat surface

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.

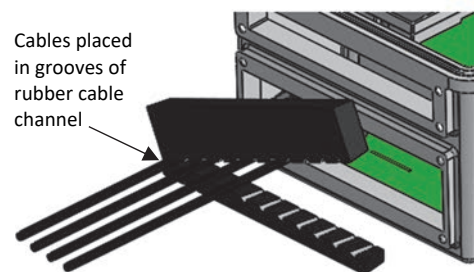


Attach the station to a pole or mast with U-bolts

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.

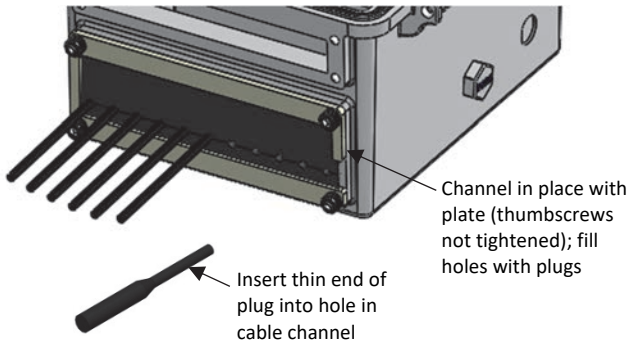
1. Make sure all sensors and cables are installed, including the solar panel, AC adapter cable, or external DC power cable, and the grounding wire.
2. Grease one of the two rubber cable channels.
 - a. Apply a small amount of silicone grease (about the size of a pea) onto your fingertip.
 - b. Lightly 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).
3. Lightly coat each cable with grease.
4. Place the greased cables in the channel 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).
 - For the small cable channel, 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.



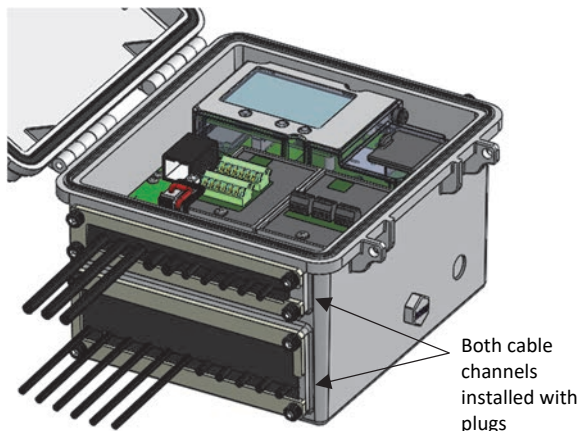
Cables placed in grooves of rubber cable channel

Important: The cable diameter must be 4.0 mm (0.156 in.) to fit through one of the five smaller holes or 6.4 mm (0.25 in.) to fit through one of the five 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.

5. Close the rubber cable channel making sure the cables and wires remain in their grooves.
6. 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.
7. 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.*
8. Lightly coat rubber plugs with a small amount of grease and use the plugs to fill any empty holes in the two cable channels. There are large and small plugs; use the large plugs in the larger holes and the small plugs in the smaller holes. Insert the thin part of the plug into the hole and push it in until the thick part of the plug fills the hole.



9. Repeat steps 2 through 8 with the other rubber cable channel.
10. 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 nodes are free of visible damage or cracks.
- Make sure the station or node enclosure is clean. Wipe any dust or grime off with a damp cloth.
- Wipe any water off the station or node 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 node 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.

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 <i>Adding or</i>

Fault Code #	Description	Action to Take
		<i>Removing Smart Sensors</i>). 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 will stop if the battery voltage drops below 3.9 V. The station will stop 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 will take for power to return. Also note that it will take longer for power to return with a solar panel than with an AC adapter. If the charging device is not recharging a dead battery,

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.



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' manuals 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.

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

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.



Temperature/RH Smart Sensor (S-THB-M00x) Manual



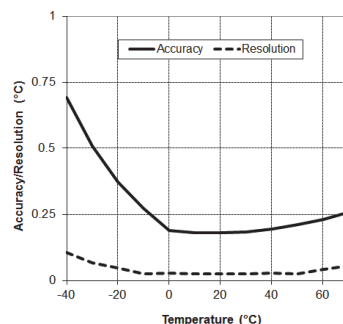
The temperature/RH smart sensor is designed to work with smart sensor-compatible HOBO® data loggers and stations. All sensor parameters are stored inside the smart sensor, which automatically communicates configuration information to the logger without any programming, calibration or extensive user setup.

Specifications

	Temperature	RH
Measurement Range	-40°C to 75°C (-40°F to 167°F)	0-100% RH at -40° to 75°C (-40° to 167°F); exposure to conditions below -20°C (-4°F) or above 95% RH may temporarily increase the maximum RH sensor error by an additional 1%
Accuracy	±0.21°C from 0° to 50°C (±0.38°F from 32° to 122°F); see Plot A	±2.5% from 10% to 90% RH typical to a maximum of ±3.5% including hysteresis at 25°C (77°F); below 10% and above 90% ±5% typical
Resolution	0.02°C at 25°C (0.04°F at 77°F); see Plot A	0.1% RH
Bits Per Sample	12	10
Drift	<0.1°C (0.18°F) per year	<1% per year typical
Response Time (typical, to 90% of change)	5 minutes in air moving 1 m/sec	5 minutes in air moving 1 m/sec with protective cap
Operating Temperature Range	-40°C to 75°C (-40°F to 167°F)	
Environmental Rating	Weatherproof: 0 to 100% RH intermittent condensing environments. For best results, the temp/RH smart sensor should be mounted inside a protective enclosure, such as a solar radiation shield.	
Housing	PVC cable jacket with ASA styrene polymer RH sensor cap; modified hydrophobic polyethersulfone membrane	
Sensor Dimensions	10 x 35 mm (0.39 x 1.39 in)	
Weight	S-THB-M002: 110 g (3.88 oz); S-THB-M008: 180 g (6.35 oz)	
Number of Data Channels*	2	
Measurement Averaging Option	No	
Cable Lengths Available	2.5 m (8.2 ft); 8 m (26.2 ft)	
Length of Smart Sensor Network Cable*	0.5 m (1.6 ft); 6 m (19.6 ft)	

CE The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

* A single HOBO station can accommodate 15 data channels and up to 100 m (328 ft) of smart sensor cable (the digital communications portion of the sensor cables).



Plot A: Temperature Accuracy and Resolution

Temperature/RH Smart Sensor

Models: S-THB-M002
S-THB-M008

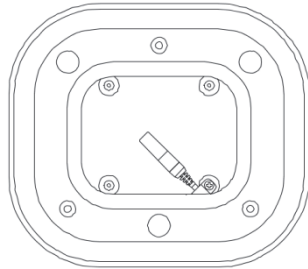
Accessories:

- Solar radiation shield (M-RSA or RS3-B)
- Replacement RH sensor (HUM-RHPCB-2)

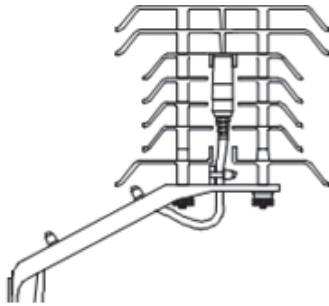
Mounting

Typical Mounting

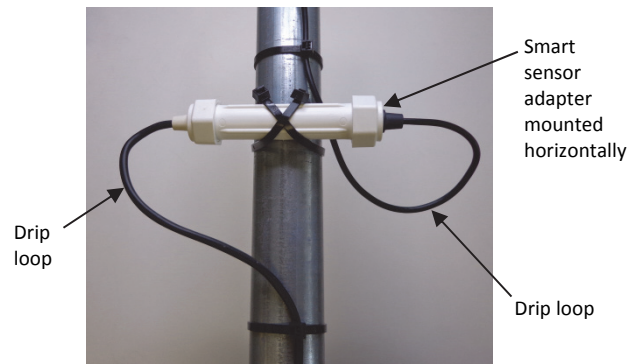
Solar Radiation Shield: Use the washer and screw (included with the M-RSA radiation shield) or cable clamps (included with the RS3-B radiation shield) to secure the smart sensor in the radiation shield as shown at right and below.



Temp/RH Sensor mounted in the Solar Radiation Shield M-RSA



Temp/RH Sensor mounted in Solar Radiation Shield RS3-B (cross-section)



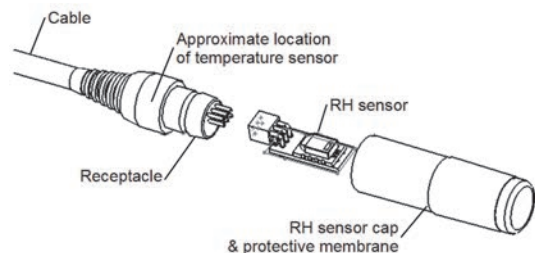
Connecting the Sensor to a Station or Logger

To connect the sensor to a station or logger, stop the station or logger from logging and insert the smart sensor's modular jack into an available smart sensor port. See the station manual for details on operating stations or loggers with smart sensors.

Replacing the RH Sensor

The RH sensor is protected by an ASA styrene polymer cap and a modified hydrophobic polyethersulfone fluid barrier membrane that allows vapor to penetrate while protecting the sensor from condensation. RH sensor performance may degrade over time. To replace the RH sensor, take the following steps:

1. Remove the tape fastening the sensor cap to the receptacle. Discard the tape.
2. Grasp the cap and membrane and pull firmly to remove them. Discard them.
3. **Note the orientation of the small circuit board containing the RH sensor.** Pull it out and discard it in compliance with local disposal guidelines for circuit boards.



4. Push gently but firmly to install the new sensor (HUM-RHPCB-2) **in the same orientation.**
5. Put the new sensor cap and membrane on. Do not force the cap. If it does not go on easily, the sensor may be installed backwards. Reverse the sensor and try again.

Maintenance

The temperature/RH smart sensor is sensitive to dust, salts and other airborne contamination. Periodically inspect the RH sensor. If contamination is present on the protective cap, gently rinse it with cool fresh water. If the sensor itself is contaminated, you can rinse it with distilled water. Do not use hot water, organic solvents, or detergents. Dry before use.

Mounting Considerations

- A solar radiation shield is strongly recommended when measuring air temperature in direct sunlight. Solar radiation can be a significant source of error in the temperature and RH readings.
- When mounting the probe, care should be taken to thermally isolate the sensor from the mounting surface to ensure accurate air temperature and humidity readings. The probe's temperature sensor is at the end of the cable, just below the cup.
- It is recommended that the probe be protected from direct exposure to the weather. This will prolong the sensor accuracy.
- If you are running sensor cables along the ground, it is recommended that you use conduit to protect against animals, lawn mowers, exposure to chemicals, and so on.
- To provide long-term protection from moisture entry, the smart sensor adapter must be mounted horizontally and with the cable wires routed with drip loops so that water drains away from the cable entry point as shown in the next column. When mounted properly, the housing is weatherproof (but not waterproof).
- Refer to the station manual and Tripod Setup Guide for more information regarding setting up stations.

Wind Speed Smart Sensor (S-WSB-M003) Manual



Wind Speed Smart Sensor

S-WSB-M003

Item included:

- Mounting rod

Accessories:

- Full cross arm (M-CAA)
- Half cross arm (M-CAB)

The wind speed smart sensor is designed to work with HOBO® stations. The smart sensor has a plug-in modular connector that allows it to be added easily to a HOBO station. All sensor parameters are stored inside the smart sensor, which automatically communicates configuration information to the logger without the need for any programming or extensive user setup.

Specifications

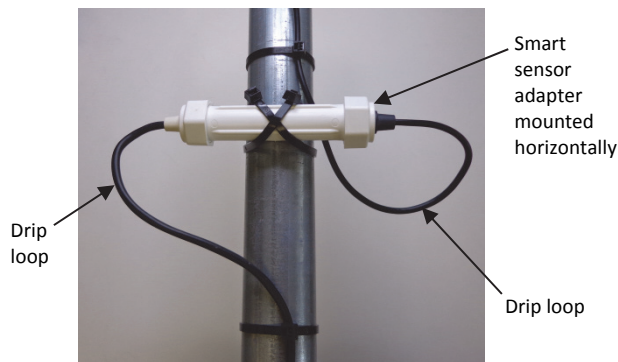
Measurement Range	0 to 76 m/sec (0 to 170 mph)
Accuracy	±1.1 m/sec (2.4 mph) or ±4% of reading, whichever is greater
Resolution	0.5 m/sec (1.1 mph)
Service Life	>5 year life typical, factory replaceable mechanism
Distance Constant	3 m (9.8 ft)
Starting Threshold	≤1 m/sec (2.2 mph)
Maximum Wind Speed Survival	76 m/sec (170 mph)
Measurements	Wind speed: Average wind speed over logging interval Gust: Highest 3-second gust during the logging interval See <i>Measurement Operation</i> for more information
Operating Temperature Range	-40° to 75°C (-40° to 167°F)
Environmental Rating	Sensor and Cable Jacket: Weatherproof
Housing	Three cup polycarbonate anemometer: Modified Teflon® bearings and hardened beryllium shaft with ice shedding design
Dimensions	41 x 16 cm (16 x 6.5 in.) including 1.27 cm (0.5 in) diameter mounting rod; 5.5 cm (2.1 in.) drip overhang
Weight	300 g (10 oz)
Bits per Sample	8 for each channel, 16 total
Number of Data Channels*	2
Measurement Averaging	Automatic averaging (see <i>Measurement Operation</i>)
Cable Length Available	3.5 m (11.5 ft)
Length of Smart Sensor Network Cable*	0.5 m (1.6 ft)
CE	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

* A single HOBO station can accommodate 15 data channels and up to 100 m (328 ft) of smart sensor cable (the digital communications portion of the sensor cables).

Mounting

Placement and Mounting Considerations

- The wind speed smart sensor should be mounted vertically in a location free of wind shadows.
- For accurate wind speed measurements, mount the sensor at a distance of at least five times the height of the nearest tree, building, or other obstruction.
- Be sure to secure the sensor cable with cable ties to protect the cable from damage.
- To provide long-term protection from moisture entry, the smart sensor adapter must be mounted horizontally and with the cable wires routed with drip loops so that water drains away from the cable entry point as shown in the example below. When mounted properly, the housing is weatherproof (but not waterproof).

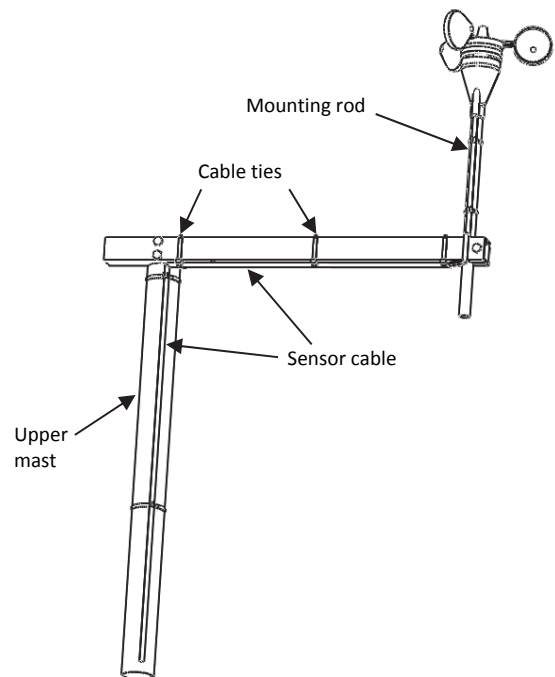


- The tripod or mounting mast must be properly grounded. For field installations, you can use Onset's grounding kit (M-GKA).
- Secure the mast the wind sensor is mounted on so that it does not vibrate. If you are using Onset masts or tripods, secure them with guy wires.
- Although the wind sensor is designed to operate in 100+ mph winds, it can be damaged with improper handling. Store the sensor in its shipping box until you are ready to install it.
- Refer to the Tripod Setup Guide for more information.

Mounting the Sensor to a Tripod Cross Arm

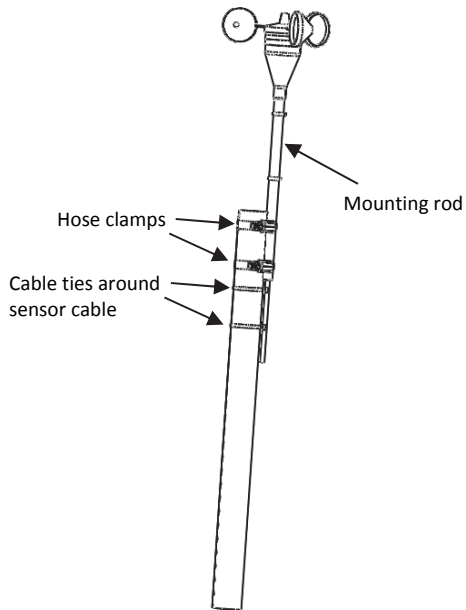
1. Insert a 1/4-20 x 1-3/4 inch hex head bolt with a flat washer on it through the 1/4 inch hole on the end of the cross arm. Tighten with a 7/16 inch wrench until snug.
2. Install another flat washer and nylock nut on the bolt, allowing the black mounting rod to protrude 1/2 inch (1.3 cm) from the bottom of the cross arm.
3. Insert the sensor mounting rod into the cross arm. Secure the ground wire to the lug nut on the cross arm.
4. Tighten the nut and bolt until the rod is clamped in place.
5. Adjust the height of the sensor in the cross arm as necessary using one of the following methods and then tighten the nut and bolt until the cross arm just starts to deform.

- a. Loosen the tri-clamp bolts and raise or lower the entire mast so that the wind sensor is close to the desired height. Make sure there is at least 5 cm (2 inches) of mast extending below the lower tri-clamp.
 - b. Make sure the upper mast dimple is still facing north (if in northern hemisphere) and then re-tighten the tri-clamps. Once the tri-clamp bolts are tight, tighten the lock nuts to lock the bolts in place. This requires two wrenches: one to hold the bolt and one to tighten the lock nut against the tri-clamp.
 - c. Loosen the bolt holding the wind sensor mounting rod and raise or lower it as necessary so the center of the wind sensor anemometer cups is at the desired height. Re-tighten the bolt.
6. Use cable ties to secure the sensor cables to the cross arm, bracket, and mast. The sensor cables should run below the cross arm and brackets to minimize the chance of birds pecking and damaging the cables. Cable ties should be spaced no more than .3 m (1 foot) apart. Make sure there are drip loops on both sides of the smart sensor housing, which must also be mounted horizontally, as described under *Placement and Mounting Considerations*.



Mounting the Sensor to a Pole

1. Loosely secure the sensor mounting pole with two hose clamps (not included) as shown below. Adjust the height of the sensor as necessary, but make sure the hose clamps are separated by at least 4 inches (10 cm).
2. Secure the sensor cable with cable ties. See diagram on next page. Make sure there are drip loops on both sides of the smart sensor housing, which must also be mounted horizontally, as described under *Placement and Mounting Considerations*.



3. Tighten the hose clamps making sure the mounting rod remains vertical.

Connecting the Sensor to a Station

To connect the sensor to a station, stop the station from logging and insert the smart sensor's modular jack into an available smart sensor port on the station. See the station manual for details on operating stations with smart sensors.

Measurement Operation

Wind speed measurements are averaged over the logging interval or a 3-second timeframe (whichever is greater). If you set up the sensor to log faster than every 3 seconds, the same sensor reading will be recorded until a new 3-second average is calculated. For example, if the sensor is logging at a 1-second interval, the sensor will report the same wind speed (its calculated average) for three samples before calculating and reporting a new value for another three samples. Gust speed is the highest three-second wind recorded during the logging interval. Measurement averaging for this sensor is independent of the logger's measurement averaging. Therefore the automatic measurement averaging for this sensor is not affected by any sampling intervals entered for averaging on other sensors.

Maintenance

The sensor does not require any maintenance other than an occasional cleaning. If dust, cobwebs, salt or other contaminants collect in the cups of the anemometer, rinse the sensor with mild soap and fresh water.

Verifying Sensor Accuracy

Onset recommends that you check the accuracy of the sensor annually. The Wind Speed smart sensor cannot be calibrated. Onset uses precision components to obtain accurate measurements. If the smart sensor is not providing accurate data, then it may be damaged or possibly worn out if it has been in use for several years.

Wind Direction Smart Sensor (S-WDA-M003) Manual



Wind Direction Smart Sensor

S-WDA-M003

Item included:

- Mounting rod

Accessories:

- Full cross arm (M-CAA)
- Half cross arm (M-CAB)

The Wind Direction smart sensor is designed to work with HOBO® stations. The smart sensor has a plug-in modular connector that allows it to be added easily to a HOBO station. All sensor parameters are stored inside the smart sensor, which automatically communicates configuration information to the logger without the need for any programming or extensive setup.

Specifications

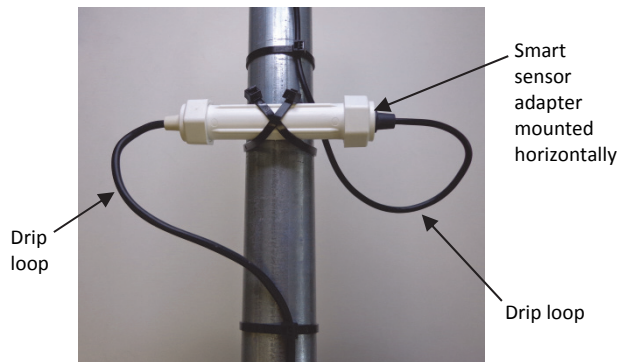
Measurement Range	0 to 355 degrees, 5 degree dead band
Accuracy	±5 degrees
Resolution	1.4 degrees
Starting Threshold	1 m/s (2.2 mph)
Maximum Wind Speed Survival	67 m/s (150 mph)
Measurement Definition	Unit vector averaging used; vector components for each wind measurement are calculated every three seconds for duration of logging interval (see <i>Measurement Operation</i>)
Operating Temperature Range	-40°C to 70°C (-40°F to 158°F)
Environmental Rating	Weatherproof
Service Life	4 to 6 years typical depending upon environmental conditions
Housing	Injection-molded plastic housing and vane, static dissipating base, lead-free silicon bronze nose and aluminum mounting rod
Bearing Type	Two shielded stainless steel ball bearing
Turning Radius	Approximately 13.5 cm (5.25 in.)
Dimensions	46 x 20 cm (18 x 8.5 in.) including 1.27 cm (0.5 in) diameter mounting rod; 2.5 mm (0.1 in.) drip overhang
Weight	370 g (13 oz)
Bits per Sample	8
Number of Data Channels*	1
Measurement Averaging Option	Automatic averaging (see <i>Measurement Operation</i>)
Cable Length Available	3.5 m (11.5 ft)
Length of Smart Sensor Network Cable*	0.5 m (1.6 ft)
CE	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

* A single HOBO station can accommodate 15 data channels and up to 100 m (328 ft) of smart sensor cable (the digital communications portion of the sensor cables).

Mounting

Placement and Mounting Considerations

- The Wind Direction smart sensor should be mounted vertically in a location free of wind shadows.
- For accurate wind direction measurements, mount the sensor at a distance of at least five times the height of the nearest tree, building, or other obstruction.
- Be sure to secure the sensor cable with cable ties to protect it from damage.
- The tripod or mounting mast must be properly grounded. For field installations, you can use Onset's Grounding Kit (M-GKA).
- Secure the mast the wind sensor is mounted on so that it does not vibrate. If you are using Onset masts or tripods, secure them with guy wires.
- The sensor can be damaged with improper handling. Store the sensor in its shipping box until you are ready to install it.
- To minimize measurement errors due to ambient RF, use the shortest possible probe cable length and keep the probe cable as far as possible from other cables carrying high frequency or high-current signals.
- To provide long-term protection from moisture entry, the smart sensor adapter must be mounted horizontally and with the cable wires routed with drip loops so that water drains away from the cable entry point as shown in the example below. When mounted properly, the housing is weatherproof (but not waterproof).

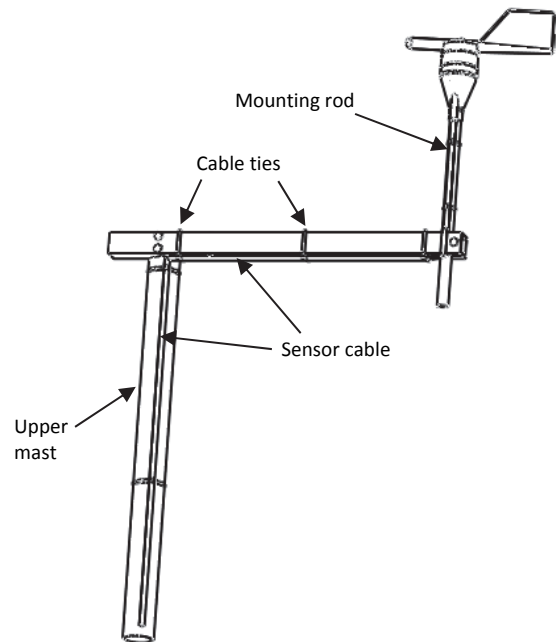


- Refer to the Tripod Setup Guide for more information.

Mounting the Sensor to a Tripod Cross Arm

1. Insert a 1/4-20 x 1 3/4 inch hex head bolt with a flat washer on it through the 1/4 inch hole on the end of the cross arm. Install a lock washer and nut on the bolt. Tighten with a 7/16 inch wrench until snug.
2. Insert the sensor mounting rod into the cross arm allowing the mounting rod to protrude 1.3 cm (1/2 inch) from the bottom of the cross arm.
3. Tighten the nut and bolt until the rod is slightly clamped in place.

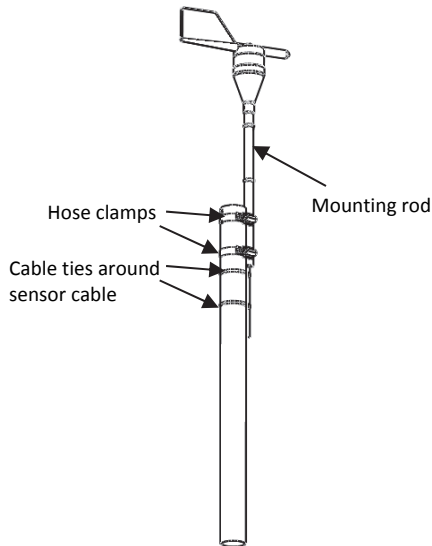
4. Adjust the height of the sensor in the cross arm as necessary using one of the following methods and then tighten the nut and bolt until the cross arm just starts to deform.
 - a. Loosen the tri-clamp bolts and raise or lower the entire mast so the sensor is close to the desired height. Make sure there is at least 5 cm (2 inches) of mast extending below the lower tri-clamp.
 - b. Make sure the upper mast dimple is still facing north (if in northern hemisphere) and then re-tighten the tri-clamps. Once the tri-clamp bolts are tight, tighten the lock nuts to lock the bolts in place. This requires two wrenches: one to hold the bolt and one to tighten the lock nut against the tri-clamp.
 - c. Loosen the bolt holding the sensor mounting rod and raise or lower it as necessary to the desired height. Re-tighten the bolt.
5. Use cable ties to secure the sensor cables to the cross arm, bracket, and mast. The sensor cables should run below the cross arm and brackets to minimize the chance of birds pecking and damaging the cables. Cable ties should be spaced no more than 0.3 m (1 foot) apart. Make sure there are drip loops on both sides of the smart sensor housing, which must also be mounted horizontally, as described under *Placement and Mounting Considerations*.



Mounting the Sensor to a Pole

1. Loosely secure the sensor with two hose clamps (not included). Adjust the height as necessary, but make sure the hose clamps are separated by at least 4 inches (10 cm).

- Secure the sensor cable with cable ties. Make sure there are drip loops on both sides of the smart sensor housing, which must also be mounted horizontally, as described under *Placement and Mounting Considerations*.



- Tighten the hose clamps making sure the mounting rod remains vertical.
- Follow the steps in the *North Alignment* section.

North Alignment

The wind direction sensor must be oriented properly to obtain meaningful data. This involves aligning the north markings on the base of the sensor with true north. There are two methods to align the sensor:

- Compass Alignment
- Global Positioning Satellite (GPS) alignment.

Note: The magnetic declination must be known to align the direction sensor to true north using a magnetic compass. Worldwide declination information is available from the National Space Science Data Center at:

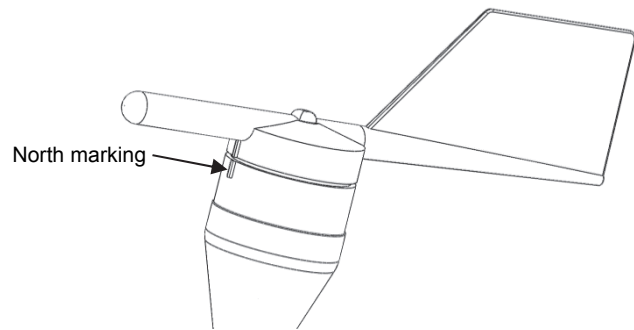
Compass Alignment

Tools required:

- Compass
- Binoculars
- Tape (such as electrical, packing, or duct tape)

Two people are required to complete this procedure.

- Align bronze tip of the wind vane with the north markings on the base.



- Secure the base and vane shaft with a piece of tape so that the vane cannot rotate.
- While standing 150 to 200 feet south of the sensor, use the compass to determine magnetic north. If true north is the same as magnetic north, align yourself so the compass points north and directly at the sensor. If you are in area with an east variation, align yourself so that the station is that number of degrees to the east of magnetic north. If you are in an area with a west variation, align yourself so that the station is that number of degrees to the west of magnetic north.
- While viewing the sensor through binoculars, instruct another person to rotate the sensor mounting rod to point the vane north. The vane should seem to disappear from sight when properly aligned.
- Once you've obtained the correct position, secure the mounting rod and remove the tape.

GPS Alignment

Tools required:

- Handheld GPS with WAAS-enabled receiver or any similar high accuracy GPS device
- Flag, orange cone, or other temporary marker
- Laptop computer with logger software installed

This procedure requires only one person, but is easier to complete with two people. In this procedure, you will be using the GPS receiver first to create an arbitrary waypoint and then to determine the bearing from the sensor to that waypoint. You will then align the sensor so that when the vane is pointed at the waypoint, the direction reported by the logger software matches the GPS receiver's bearing to the waypoint.

- Connect the sensor to the logger (refer to the *Connecting to the Logger* section below).
- Connect the laptop to the logger with the PC interface cable.
- Pick a visible location that is at least 100 meters (110 yards) away from the wind direction sensor and walk to it. Establish a waypoint with the handheld GPS receiver. You may want to use averaging to minimize the waypoint position error if your GPS receiver is so equipped. (For best results, the estimated position error of the waypoint should be less than 10 feet if the distance to the sensor is 100 meters, and less than 20 feet for a distance of 200 meters. Mark the waypoint with a flag, orange cone, or other suitable marker.

4. Walk back to the sensor and determine the bearing to the waypoint you just created with the GPS receiver. Again you may need to determine the average value of the bearing to keep the errors to a minimum.
5. Start the logger software and select Status to get the current reading (refer to the software manual or online help for details about operating the software).
6. Point the sensor vane directly at the waypoint flag or marker and rotate the sensor mounting rod until the wind direction sensor value in the logger software matches the angle obtained with the GPS receiver.
7. Once the vane is in position, secure the mounting rod and then double-check that the reported angle is correct.

Connecting the Sensor to a Station

To connect the sensor to a station, stop the station from logging and insert the smart sensor's modular jack into an available smart sensor port on the station. See the station manual for details on operating stations with smart sensors.

Measurement Operation

Wind direction measurements are averaged over the logging interval or a 3-second timeframe (whichever is greater). If you set up the sensor to log faster than every 3 seconds, the same sensor reading will be recorded until a new 3-second average is calculated. For example, if the sensor is logging at a 1-second interval, the sensor will report the same wind direction (its calculated average) for three samples before calculating and reporting a new value for another three samples. Measurement averaging for this sensor is independent of the logger's measurement averaging. Therefore the automatic measurement averaging for this sensor is not affected by any sampling intervals entered for averaging on other sensors.

Direction Averaging

Unit vector averaging is used to determine wind direction because traditional averaging would produce inaccurate results. For example, three measurements of 350, 11, and 12 degrees—which are all winds from the north—averaged together would result in 126 degrees, which incorrectly indicates a southeasterly wind. Instead, the vector components (North/South and East/West) for each wind measurement are calculated every three seconds for the duration of the logging interval. At the conclusion of the logging interval, the North/South and East/West components are averaged and then re-combined to calculate the average wind direction for the logging interval.

Maintenance

The sensor does not normally require any maintenance other than an occasional cleaning. If the vane becomes dirty, rinse the sensor with mild soap and fresh water. Do not immerse the sensor in water or use any organic solvents to clean the unit.

Verifying Sensor Accuracy

It is recommended that you check the accuracy of the sensor annually. The wind direction sensor cannot be calibrated. Onset uses precision components to obtain accurate measurements. If the smart sensor is not providing accurate data, then it is damaged or possibly worn out if it has been in use for several years.

Solar Radiation Shield (RS3-B)



Items included:

- One assembled solar radiation shield
- One mounting bracket
- Six cable ties
- Two knurled nuts
- Two screws
- One hose clamp

Specifications

Wind Resistance Tested in sustained winds up to 129 kph (80 mph)
Tested in gusts up to 161 kph (100 mph)

Materials Shield: ASA styrene (UV-stable)
Bracket: Glass-filled nylon (UV-stable)
Mounting hardware: Stainless steel and brass

Temperature -40° to 75°C (-40° to 167°F)

Weight 113 g (4 oz)

Height 89 mm (3.5 inches); 159 mm (6.25 inches) with bracket

Diameter 102 mm (4 inches); bracket protrudes an additional 102 mm (4 inches) from shield

Mounting Up to 51 mm (2 inches) mast diameter with hose clamp;
unlimited with screws

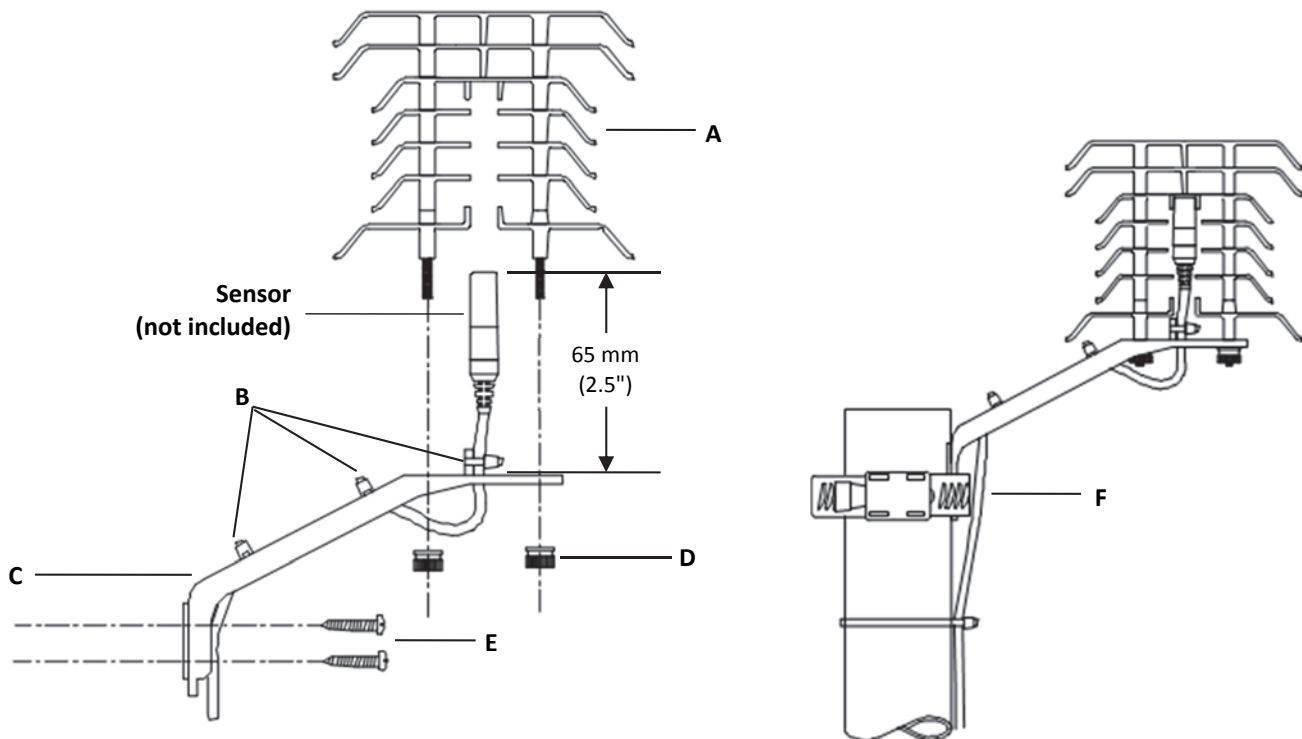
Compatible Sensors S-THB-00x, S-TMB-M0xx, TMCx-HB, TMCx-HD, and external sensors from U23-00x or MX230x

Maximum Sensor Diameter 1.22 cm (0.48 inches)

Mount temperature or temp/RH sensor in shield as shown. Clearance between mounting bracket and radiation shield ceiling is 65 mm (2.5 in.). Measure the sensor's placement accordingly and secure the cable to the mounting bracket (C) with cable ties (B). Carefully place the radiation shield (A) over the sensor and attach to mounting bracket with knurled nuts (D), being careful not to over-tighten.

Attach mounting bracket to wall, post, or station mast. To use included screws (E) as shown in the diagram on the left, pre-drill 2.4 mm (3/32 in.) holes in wood, or 2.75 mm (7/64 in.) holes in metal.

Or, fasten with hose clamp (F) as shown in diagram on the right.



Note: This shield does not protect sensors from light reflected from below the shield at some angles. Avoid deploying this shield next to reflective surfaces if possible.