HOBO® MX2300 Series Data Logger Manual

The HOBO MX2300 series data loggers record and transmit temperature and/or relative humidity (RH) in outdoor or indoor environments. These Bluetooth® Low Energy-enabled loggers are designed for wireless communication with a mobile device. Using the HOBOmobile® app, you can easily configure the logger, read it out, and view data on your phone or tablet, or export the data for further analysis. The logger can calculate minimum, maximum, average, and standard deviation statistics and be configured to indicate alarms at thresholds you specify. The logger also supports burst logging in which data is logged at a faster interval when sensor readings are above or below certain limits. The Temp and Temp/RH models have internal sensors while the External Temp/RH, External Temp, and 2x External Temp include built-in external sensors, offering a wide range of solutions for monitoring temperature and RH in numerous applications.

HOBO MX2300 Series Data Logger

Models:

- MX2301A, temp/RH
- MX2302A, ext temp/RH
- MX2303, 2 ext temp
- MX2304, ext temp
- MX2305, temp

Included Items:

- Screws
- Cable ties

Required Items:

- HOBOmobile app
- Device with iOS or Android™ and Bluetooth

Accessories:

- Solar radiation shield (RS3-B for use with MX2302A, MX2303, and MX2304 models; RS1 or M-RSA for use with MX2301A and MX2305 models)
- Mounting bracket for solar radiation shield (MX2300-RS-BRACKET), for use with MX2301A and MX2305 models
- Replacement battery (HRB-2/3AA)

Specifications

Temperature Sensor

Range	MX2301A and MX2305 internal sensors: -40 to 70°C (-40 to 158°F) MX2302A external temperature sensor: -40 to 70°C (-40 to 158°F) MX2303 and MX2304 external sensors: -40 to 100°C (-40 to 212°F), with tip and cable immersion in fresh water up to 50°C (122°F) for one year
Accuracy	±0.25°C from -40 to 0°C (±0.45 from -40 to 32°F) ±0.2°C from 0 to 70°C (±0.36 from 32 to 158°F) ±0.25°C from 70 to 100°C (±0.45 from 158 to 212°F), MX2303 and MX2304 only
Resolution	MX2301A and MX2302A: 0.02°C (0.036°F) MX2303, MX2304, and MX2305: 0.04°C (0.072°F)
Drift	<0.01°C (0.018°F) per year

Relative Humidity Sensor* (MX2301A, MX2302A only)

Range	0 to 100% RH, -40° to 70°C (-40° to 158°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	±2.5% from 10% to 90% (typical) to a maximum of ±3.5% including hysteresis at 25°C (77°F); below 10% RH and above 90% RH ±5% typical
Resolution	0.01%
Drift	<1% per year typical

Response Time (typical, to 90% of change)

| Temperature		Without Solar Radiation Shield	With RS1/M-RSA Solar Radiation Shield	With RS3-B Solar Radiation Shield
	MX2301A internal sensor	17 minutes in air moving 1 m/sec	24 minutes in air moving 1 m/sec	NA
	MX2302A external sensor	3 minutes, 45 seconds in air moving 1 m/sec	7 minutes, 45 seconds in air moving 1 m/sec	6 minutes, 30 seconds in air moving 1 m/sec
	MX2303/MX2304 external sensors	3 minutes in air moving 1 m/sec; 20 seconds in stirred water	7 minutes in air moving 1 m/sec	4 minutes in air moving 1 m/sec
	MX2305 internal sensor	17 minutes in air moving 1 m/sec	24 minutes in air moving 1 m/sec	NA
RH		Without Solar Radiation Shield	With RS1/M-RSA Solar Radiation Shield	With RS3-B Solar Radiation Shield
	MX2301A internal sensor	30 seconds in air moving 1 m/sec	40 seconds in air moving 1 m/sec	NA
	MX2302A external sensor	15 seconds in air moving 1 m/sec	30 seconds in air moving 1 m/sec	30 seconds in air moving 1 m/sec

Specifications (continued)

Logger

Operating Range	-40° to 70°C (-40° to 158°F)
Radio Power	1 mW (0 dBm)
Transmission Range	Approximately 30.5 m (100 ft) line-of-sight
Wireless Data Standard	Bluetooth Low Energy (Bluetooth Smart)
Logging Rate	1 second to 18 hours
Logging Modes	Fixed interval (normal, statistics) or burst
Memory Modes	Wrap when full or stop when full
Start Modes	Immediate, push button, date & time, or next interval
Stop Modes	When memory full, push button, date & time, or after a set logging period
Time Accuracy	±1 minute per month 0° to 50°C (32° to 122°F)
Battery Type	2/3 AA 3.6 Volt lithium, user replaceable
Battery Life	2 years, typical with logging interval of 1 minute and Bluetooth Always Off disabled; 5 years, typical with logging interval of 1 minute and Bluetooth Always Off enabled. Faster logging intervals and statistics sampling intervals, burst logging, remaining connected with the app, excessive downloads, and paging may impact battery life.
Memory	MX2301A and MX2302A: 128 KB (63,488 measurements, maximum) MX2303, MX2304, and MX2305: 128 KB (84,650 measurements, maximum)
Full Memory Download Time	Approximately 60 seconds; may take longer the further the device is from the logger
Dimensions	Logger housing: 10.8 x 5.08 x 2.24 cm (4.25 x 2.0 x 0.88 in.) External temperature sensor diameter: 0.53 cm (0.21 in.) External temperature/RH sensor diameter: 1.17 cm (0.46 in.) External sensor cable length: 2 m (6.56 ft) Solar radiation shield bracket: 10.8 x 8.3 cm (4.25 X 3.25 in.)
Weight	Logger: 75.5 g (2.66 oz) Solar radiation shield bracket: 20.4 g (0.72 oz)
Materials	Acetal, silicone gasket, stainless steel screws
Environmental Rating	NEMA 6 and IP67
CE	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).
FC ⚠ K ⊕	See last page

*Per RH sensor manufacturer data sheet

Logger Components and Operation

MX2303 model shown

MX2301A model shown
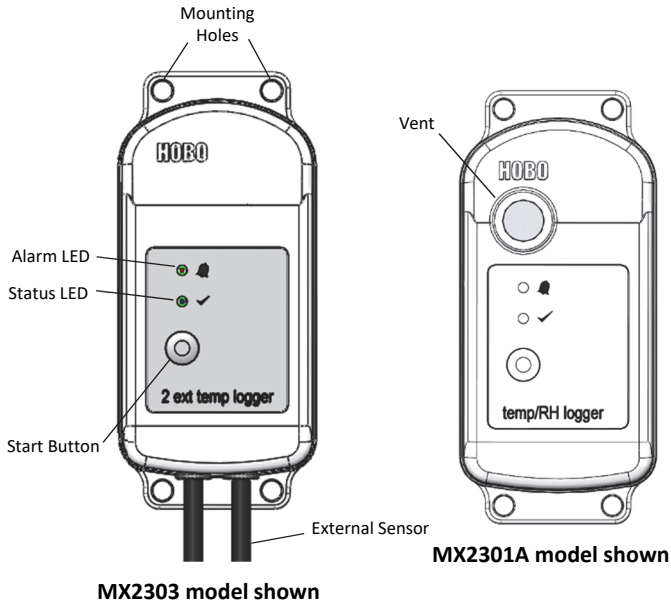
Mounting Holes: Use the holes at the top and bottom of the logger to mount it (see *Deploying and Mounting the Logger*).

Alarm LED: This LED blinks red every 4 seconds when an alarm is tripped (unless Show LED is disabled as described in *Configuring the Logger*).

Status LED: This LED blinks blue every 4 seconds when the logger is logging (unless Show LED is disabled as described in *Configuring the Logger*). If the logger is waiting to start logging because it was configured to start "On Button Push" or with a delayed start, it will blink every 8 seconds.

Start Button: Press this button to wake up the logger; both the alarm and status LEDs will blink. Once the logger is awake, press this button to move it to the top of the loggers list in HOBOmobile. Press this button for 3 seconds to start or stop the logger when it is configured to start or stop "On button push" (see *Configuring the Logger*). Both LEDs will blink four times when you press the button to start or stop logging. Press this button for 10 seconds to reset a password (see *Setting a Password*).

External Sensor: This is the external probe attached to the bottom of the logger that measures temperature or temperature/RH. The MX2302A logger has one external sensor that measures both temperature and RH and the MX2304 logger has one sensor that measures temperature only. The MX2303 logger (shown at left above) has two external temperature sensors; the left sensor is channel 1 and the first temperature shown in HOBOmbile, and the right sensor is channel 2 and the second in HOBOmobile.

Vent: The RH sensor is located behind the vent (MX2301A model only).

Downloading HOBOmobile and Connecting to a Logger

Install the HOBOmobile app to connect to and work with the logger.

1. Download the HOBOmobile app from the App Store® or Google Play™.

2. Open the app and enable Bluetooth in the device settings if prompted.

3. Press the button on the logger to wake it up.

4. Tap the HOBOs icon (on Android devices) or tap the Devices icon and then tap Loggers at the top of the screen (on Apple® devices). Tap the logger in the list to connect to it.
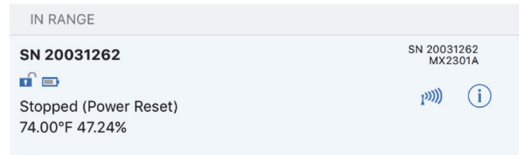
If the logger does not appear in the list or if it is having trouble connecting, follow these tips:

- Make sure the logger is "awake" by pressing the start button. The alarm and status LEDs will blink once when the logger wakes up. You can also press the button a second time to bring it to the top of the list if you are working with multiple loggers.

- Make sure the logger is within range of your mobile device. The range for successful wireless communication is approximately 30.5 m (100 ft) with full line-of-sight.

- If there are several loggers in the area, move the logger to a location with fewer loggers. Interference can sometimes occur when numerous loggers are in one location.

- If your device can connect to the logger intermittently or loses its connection, move closer to the logger, within sight if possible.

- If the logger appears in the list, but you cannot connect to it, close HOBOmobile and power cycle the mobile device. This forces the previous Bluetooth connection to close.

Once connected to the logger you can select one of the following actions:

- **Configure.** Select logger settings and load them onto the logger to start logging. See *Configuring the Logger*.

- **Readout.** Download logger data. See *Reading Out the Logger*.

- **Full Status Details.** Check the battery level and view the configuration settings currently selected for the logger.

- **Start Logging.** Select this option to begin logging (if the logger is configured to start "On Button Push" as described in *Configuring the Logger*).

- **Stop Logging.** Stop the logger from recording data. This overrides any Stop Logging settings described in *Configuring the Logger*.

- **Page Logger LED.** Press and hold this option to illuminate the alarm and status LEDs for 4 seconds.

- **Logger Password.** Select this to create a password for the logger that will be required if another mobile device

attempts to connect to it. To reset a password, connect to the logger, tap Set Logger Passkey, and select Reset to Factory Default. You can also press the button on the logger for 10 seconds to reset a password.

Update Firmware. When new logger firmware is available, this action appears in the list. Select it and follow the instructions on the screen. A logger readout will be completed automatically at the beginning of the firmware update process. If the connection is lost between the logger and the mobile device during the firmware update, a Firmware Update Pending Status displays for the logger in the HOBOs list. Connect to the logger and select Restore Logger (or Update Firmware if that option is available) to continue updating the firmware.

> **Important:** Before updating the firmware on the logger, check the remaining battery level by selecting Full Status Details and make sure it is no less than 30%. Make sure you have the time to complete the entire update process, which requires that the logger remains connected to the device during the upgrade.

- **Force Offload.** This may appear if an error was encountered when loading configuration settings. Select this to offload all the data on the logger before reconfiguring it.

Configuring the Logger

Use HOBOmobile to set up the logger, including selecting the logging options, configuring alarms, and other settings. These steps provide an overview of setting up the logger. For complete details, see the *HOBOmobile User's Guide*.

1. Press the button on the logger to wake it up.

2. Find the logger in the list and tap it to connect to it. If you are working with multiple loggers, you can press the button on the logger a second time to bring it to the top of the list. The logger name (or serial number if no name has been assigned) turns green when the logger moves to the top of the list. Note that the current readings are displayed even when the logger is not logging.
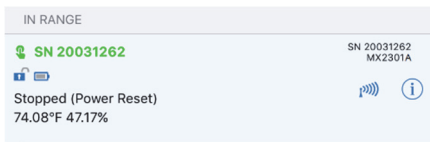
3. Once connected, tap Configure.
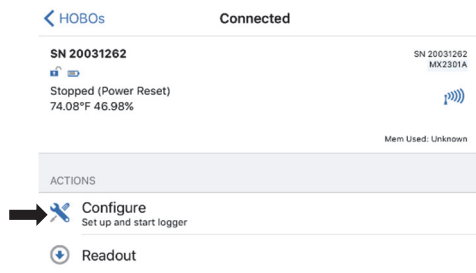
4. Tap Name and type a name for the logger up to 20 characters (optional). Tap Done. If no name is selected, the logger serial number is used as the name.

5. Tap Group to add the logger to the Favorites group, an existing custom group, or create a new group name with up to 20 characters (optional). Tap Done.

6. Tap Logging Interval and choose how frequently the logger will record data unless operating in burst logging mode (see *Burst Logging*). **Note:** If you configure an alarm, the logger will use the logging interval you selected as the rate to check for alarm conditions (alarms are not available if burst logging is configured). See *Setting up Alarms* for more details.

7. Tap Start Logging and select when logging will begin:

   - **Now.** Logging will begin immediately after tapping Start in the Configure screen.
   - **On Next Logging Interval.** Logging will begin at the next even interval as determined by the selected logging interval.
   - **On Button Push.** Logging will begin once you press the button on the logger for 3 seconds.
   - **On Date/Time.** Logging will begin on a date and time you specify. Select the Date and time and tap Done.

   Tap Done in the Start Logging screen.

8. Tap Stop Logging and select the options for when logging will end.

   a. Choose one of two memory options:

      - **When Memory Fills.** The logger will continue recording data until the memory is full.
      - **Never (Wrap When Full).** The logger will continue recording data indefinitely, with newest data overwriting the oldest. This option is not available if the Logging Mode is set to Burst (see *Burst Logging*).

   b. Select On Button Push if you want to be able to stop logging by pushing the button on the logger for 3 seconds. Note that if you also choose On Button Push for the Start Logging option, then you will not be able to stop logging until 30 seconds after logging begins.

   c. Select one of the following time options for when to stop logging:

      - **Never.** Select this if you do not want the logger to stop at any predetermined time frame.
      - **On Date/Time.** Select this if you want the logger to stop logging on a specific date and time. Select the date and time and then tap Done.
      - **After.** Select this if you want to control how long the logger should continue logging once it starts. Choose the amount of time you want the logger to log data and then tap Done. For example, select 30 days if you want the logger to log data for 30 days after logging begins.

   d. Tap Done in the Stop Logging screen.

9. Select the sensor measurement types that will be logged. Both the temperature and RH sensors are required to calculate dew point, which is an additional data series available for plotting after reading out the logger. You can also set up alarms to trip when a sensor reading rises above

or falls below a specified value. See *Setting up Alarms* for details on enabling sensor alarms. **Note for MX2303 models only:** The first temperature sensor listed is channel 1 and the second is channel 2 (and "-1" and "-2" is used in the column headings in the data file to differentiate the two sensors).

10. Tap Logging Mode. Select either fixed interval logging or burst logging. With fixed interval logging, the logger records data for all enabled sensors and/or selected statistics at the logging interval selected (see *Statistics Logging* for details on choosing statistics options). In burst mode, logging occurs at a different interval when a specified condition is met. See *Burst Logging* for more information. Tap Done.

11. Enable or disable Show LED. If Show LED is disabled, the alarm and status LEDs on the logger will not be illuminated while logging (the alarm LED will not blink if an alarm trips). You can temporarily turn on LEDs when Show LED is disabled by pressing the button on the logger for 1 second.

12. Enable or disable Bluetooth Always Off. If Bluetooth Always Off is disabled, the logger will "advertise" or regularly send out a Bluetooth signal for the phone or tablet to find via HOBOmobile while it is logging, which uses battery power. When Bluetooth Always Off is enabled, the logger will only advertise during logging when you press the button on the logger to wake it up, thereby preserving as much battery power as possible.

13. Tap Start in the upper right corner of the Configure screen to load the settings onto the logger.

Logging will begin based on the settings you selected. See *Deploying and Mounting the Logger* for details on mounting and see *Reading Out the Logger* for details on downloading.

Setting up Alarms

You can set up alarms for the logger so that if a sensor reading rises above or falls below a specified value, the logger alarm LED will blink and an alarm icon will appear in the app. This can alert you to problems so you can take corrective action.

To set an alarm:

1. Tap the HOBOs icon (on Android devices) or tap the Devices icon and then tap Loggers at the top of the screen (on Apple devices). Tap the logger to connect to it. If the logger was configured with Bluetooth Always Off enabled, press the button on the logger to wake it up. When working with multiple loggers, you can also press the button on the logger to bring it to the top of the list.

2. Once connected, tap Configure.

3. In Sensor & Alarm Setup, tap an enabled sensor.

4. Enable the High Alarm if you want an alarm to trip when the sensor reading rises above the high alarm value. Drag the slider to the reading that will trip the alarm or tap the value field and type a specific reading. In the example, an alarm will trip when the temperature rises above 85°F.
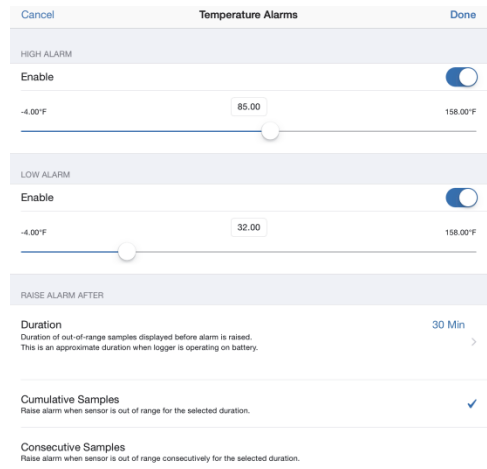
5. Enable the Low Alarm if you want an alarm to trip when the sensor reading falls below the low alarm value. Drag the slider to the reading that will trip the alarm or tap the value field and type a specific reading. In the example, an alarm is configured to trip when the temperature falls below 32°F.

   Note: The actual values for the high and low alarm limits are set to the closest value supported by the logger.

6. Under Raise Alarm After, select the duration before an alarm is tripped and tap Done in the Alarm Duration screen.

7. Select either Cumulative or Consecutive Samples. If you select Cumulative Samples, then the alarm will trip when the time the sensor is out of range over the course of the deployment is equal to the selected duration. If you select Consecutive Samples, then the alarm will trip when the time the sensor is continuously out of range is equal to the selected duration. For example, the high alarm for temperature is set to 85°F and the duration is set to 30 minutes. If Cumulative is selected, then an alarm will trip once a sensor reading has been at or above 85°F for a total of 30 minutes since the logger was configured; specifically, this could be 15 minutes above 85°F in the morning and then 15 minutes above 85°F again in the afternoon. If Consecutive is selected, then an alarm will trip only if all sensor readings are 85°F or above for a continuous 30-minute period.

8. Tap Done and repeat steps 3–8 for the other sensor if desired. Note that when both alarms are configured, an alarm is raised when either sensor is in an alarm condition.

9. Back in the Configure screen, select one of the following options to determine how the alarm indications are cleared:

   • **Logger Reconfigured.** The alarm indication will display until the next time the logger is reconfigured.

   • **Sensor in Limits.** The alarm icon indication will display until the sensor reading returns to the normal range between any configured high and low alarm limits.

10. Tap Start in the Configure screen to load the alarm settings onto the logger if you are ready to start.

When an alarm trips, the logger alarm LED blinks every 4 seconds (unless Show LED is disabled), an alarm icon appears in the app, and an Alarm Tripped event is logged. The alarm state will clear when the readings return to normal if you selected

Sensor in Limits in step 9. Otherwise, the alarm state will remain in place until the logger is reconfigured.

Notes:

* Alarm limits are checked at every logging interval. For example, if the logging interval is set to 5 minutes, then the logger will check the sensor readings against your configured high and low alarm setting every 5 minutes.

* The actual values for the high and low alarm limits are set to the closest value supported by the logger. For example, the closest value to 85°F that the logger can record is 84.990°F and the closest value to 32°F is 32.043°F. In addition, alarms can trip or clear when the sensor reading is within the logger specifications of 0.072°F resolution. This means the value that triggers the alarm may differ slightly than the value entered. For example, if the High Alarm is set to 75.999°F, the alarm can trip when the sensor reading is 75.994°F (which is within the 0.072°F resolution).

* When you read out the logger, alarm events can be displayed on the plot or in the data file. See *Logger Events*.
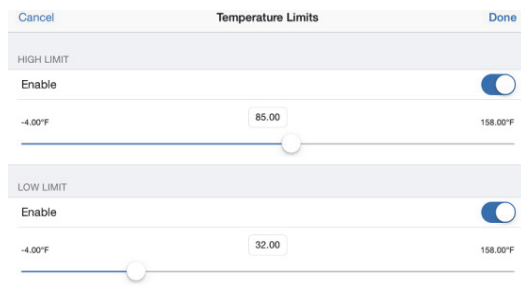
Burst Logging

Burst logging is a logging mode that allows you to set up more frequent logging when a specified condition is met. For example, a logger is recording data at a 5-minute logging interval and burst logging is configured to log every 30 seconds when the temperature rises above 85°F (the high limit) or falls below 32°F (the low limit). This means the logger will record data every 5 minutes as long as the temperature remains between 85°F and 32°F. Once the temperature rises above 85°F, the logger will switch to the faster logging rate and record data every 30 seconds until the temperature falls back to 85°F. At that time, logging then resumes every 5 minutes at the normal logging interval. Similarly, if the temperature falls below 32°F, then the logger would switch to burst logging mode again and record data every 30 seconds. Once the temperature rises back to 32°F, the logger will then return to normal mode, logging every 5 minutes. **Note:** Sensor alarms, statistics, and the Stop Logging option "Wrap When Full" are not available in burst logging mode.

To set up burst logging:

1. Tap the HOBOs icon (on Android devices) or tap the Devices icon and then tap Loggers at the top of the screen (on Apple devices). Tap the logger to connect to it. If the logger was configured with Bluetooth Always Off enabled, press the button on the logger to wake it up. When working with multiple loggers, you can also press the button on the logger to bring it to the top of the list.

2. Once connected, tap Configure.

3. Tap Logging Mode and then tap Burst Logging.

4. Tap a sensor under Burst Sensor Limits.

5. Enable High Limit if you want burst logging to occur when the sensor reading rises above a specific reading. Drag the slider to the reading that will trigger burst logging or tap the value field and type a specific reading. In this example, the

logger will switch to burst logging when the temperature rises above 85°F.

6. Enable Low Limit if you want burst logging to occur when the sensor reading falls below a specific reading. Drag the slider to the reading that will trigger burst logging or tap the value field and type a specific reading. In the example, the logger will switch to burst logging when the temperature falls below 32°F.

7. Tap Done and repeat steps 4–7 for the other sensor if desired.

8. Tap Burst Logging Interval and select an interval faster than the logging interval. Keep in mind that the faster the burst logging rate, the greater the impact on battery life and the shorter the logging duration. Because measurements are being taken at the burst logging interval throughout the deployment, the battery usage is similar to what it would be if you had selected this rate for the normal logging interval. Tap Done.

9. Tap Done to exit the Logging Mode screen.

10. Tap Start in the Configure screen to load the burst settings onto the logger if you are ready to start.

Notes:

* The high and low burst limits are checked at the burst logging interval rate whether the logger is in normal or burst condition. For example, if the logging interval is set to 1 hour and the burst logging interval is set to 10 minutes, the logger will always check for burst limits every 10 minutes.

* If high and/or low limits have been configured for more than one sensor, then burst logging will begin when any high or low condition goes out of range. Burst logging will not end until all conditions on all sensors are back within normal range.

* The actual values for the burst logging limits are set to the closest value supported by the logger. For example, the closest value to 85°F that the logger can record is 84.990°F and the closest value to 32°F is 32.043°F.

* Burst logging can begin or end when the sensor reading is within the logger specifications of 0.072°F resolution. This means the value that triggers burst logging may differ slightly than the value entered. For example, if the high limit for a temperature alarm is set to 75.999°F, burst logging can start when the sensor reading is 75.994°F (which is within the 0.072°F resolution).

* Once the high or low condition clears, the logging interval time will be calculated using the last recorded data point in burst logging mode, not the last data point

recorded at the normal logging rate. For example, the logger has a 10-minute logging interval and logged a data point at 9:05. Then, the high limit was surpassed and burst logging began at 9:06. Burst logging then continued until 9:12 when the sensor reading fell back below the high limit. Now back in normal mode, the next logging interval will be 10 minutes from the last burst logging point, or 9:22 in this case. If burst logging had not occurred, the next data point would have been at 9:15.

- A New Interval event is created each time the logger enters or exits burst logging mode. See *Logger Events* for details on plotting and viewing the event. In addition, if the logger is stopped with a button push while in burst logging mode, then a New Interval event is automatically logged and the burst condition is cleared, even if the actual high or low condition has not cleared.

Statistics Logging

During fixed interval logging, the logger records data for enabled sensors and/or selected statistics at the logging interval selected. Statistics are calculated at a sampling rate you specify with the results for the sampling period recorded at each logging interval. The following statistics can be logged for each sensor:

- The maximum, or highest, sampled value,

- The minimum, or lowest, sampled value,

- An average of all sampled values, and

- The standard deviation from the average for all sampled values.

For example, a logger is configured with both the temperature and RH sensors enabled, and the logging interval set to 5 minutes. The logging mode is set to fixed interval logging with Normal and all four statistics enabled and with a statistics sampling interval of 30 seconds. Once logging begins, the logger will measure and record the actual temperature and RH sensor values every 5 minutes. In addition, the logger will take a temperature and RH sample every 30 seconds and temporarily store them in memory. The logger will then calculate the maximum, minimum, average, and standard deviation using the samples gathered over the previous 5-minute period and log the resulting values. When reading out the logger, this would result in 10 data series (not including any derived series, such as dew point): two sensor series (with temperature and RH data logged every 5 minutes) plus eight maximum, minimum, average, and standard deviation series (four for temperature and four for RH with values calculated and logged every 5 minutes based on the 30-second sampling).

To log statistics:

1. Tap the HOBOs icon (on Android devices) or tap the Devices icon and then tap Loggers at the top of the screen (on Apple devices). Tap the logger to connect to it. If the logger was configured with Bluetooth Always Off enabled, press the button on the logger to wake it up. When working with multiple loggers, you can also press the button on the logger to bring it to the top of the list.

2. Once connected, tap Configure.

3. Tap Logging Mode and then select Fixed Interval Logging.

4. Select Normal to record the current reading for each enabled sensor at the logging interval shown at the top of the screen. Do not select this if you only want to log statistics.

5. Select the statistics you want the logger to record at each logging interval: Maximum, Minimum, Average, and Standard Deviation (average is automatically enabled when selecting Standard Deviation). Statistics will be logged for all enabled sensors. In addition, the more statistics you record, the shorter the logger duration and the more memory is required.

6. Tap Statistics Sampling Interval and select the rate to use for calculating statistics. The rate must be less than, and a factor of, the logging interval. For example, if the logging interval is 1 minute and you select 5 seconds for the sampling rate, then the logger will take 12 sample readings between each logging interval (one sample every 5 seconds for a minute) and use the 12 samples to record the resulting statistics at each 1-minute logging interval. Note that the faster the sampling rate, the greater the impact on battery life. Because measurements are being taken at the statistics sampling interval throughout the deployment, the battery usage is similar to what it would be if you had selected this rate for the normal logging interval.

7. Tap Done.

8. Tap Done again to exit the Logging Mode screen.

9. Tap Start in the Configure screen to load the statistics settings onto the logger if you are ready to start.

Setting a Password

You can create an encrypted password for the logger that will be required if another phone or tablet attempts to connect to it. This is recommended to ensure that a deployed logger is not mistakenly stopped or purposely altered by others. This password uses a proprietary encryption algorithm that changes with every connection.

To set a password:

1. Tap the HOBOs icon (on Android devices) or tap the Devices icon and then tap Loggers at the top of the screen (on Apple devices) and connect to the logger.

2. Tap Logger Password.

3. Type a password up to 10 characters.

4. Tap Save.

Only the phone or tablet used to set the password can then connect to the logger without entering a password; all other mobile devices will be required to enter the password. For example, if you set the password for the logger with your tablet and then try to connect to the device later with your phone, you will be required to enter the password on the phone but not with your tablet. Similarly, if others attempt to connect to the logger with different devices, then they would also be required to enter the password. To reset a password, connect to the logger, tap Set Logger Passkey, and select Reset to Factory Default or press the button on the logger for 10 seconds.

Reading Out the Logger

To offload data from the logger:

1. Tap the HOBOs icon (on Android devices) or tap the Devices icon and then tap Loggers at the top of the screen (on Apple devices). Tap the logger to connect to it. If the logger was configured with Bluetooth Always Off enabled, press the button on the logger to wake up communications. When working with multiple loggers, you can also press the button on the logger to bring it to the top of the list.

2. Once connected, tap Readout.

3. Tap the Data Files icon to view a mini-graph of the downloaded data.

4. Tap the mini-graph to view a larger version of the graph or to share the file. See the *HOBOmobile User's Guide* for details on viewing graphs and sharing data.

Data can also be uploaded automatically to HOBOlink, Onset's web-based software, via HOBOmobile or the HOBO MX Gateway. For details on uploading data to HOBOlink, see the *HOBOmobile User's Guide*.

Logger Events

The logger records the following internal events to track logger operation and status. To plot events in HOBOmobile, tap a mini-graph and then tap ≡. Select the events you wish to plot and then tap ≡ again. You can also view events in shared or exported data files.

| Internal Event Name	Definition
Host Connected	The logger was connected to the mobile device.
Started	The logger started logging.
Stopped	The logger stopped logging.
Alarm Tripped/Cleared	An alarm has occurred because the reading was outside the alarm limits or back within range. **Note:** Although the reading may have returned to a normal range during logging, an alarm cleared event will not be logged if the logger was set up to maintain alarms until reconfigured.
New Interval	The logger has switched to logging at the burst logging rate or back to the normal rate.
Safe Shutdown	The battery level dropped below a safe operating voltage and the logger performed a safe shutdown.

Deploying and Mounting the Logger

Follow these guidelines when deploying the logger:

- A solar radiation shield is required if the MX2301A or MX2305 logger or the external sensors from an MX2302A, MX2303, or MX2304 logger will be in sunlight at any time.

- When using a solar radiation shield with an MX2301A or MX2305 model, the logger must be mounted using the solar radiation shield bracket (MX2300-RS-BRACKET) to

the underside of the mounting plate as shown on the next page.

For more details on the solar radiation shield, refer to the *Solar Radiation Shield Installation Guide* at www.onsetcomp.com/manuals/rs1.
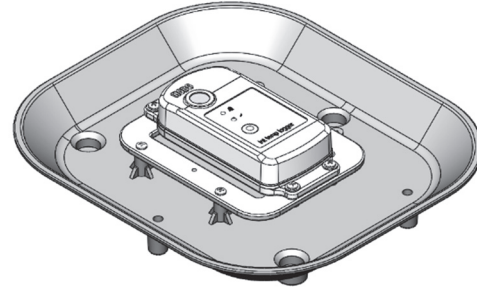
- When deploying an MX2302A logger, it is recommended that the sensor must be mounted vertically. If it must be mounted horizontally, then make sure the vent on the side of the sensor is vertical or facing down. If the sensor is being deployed in an RS3-B solar radiation shield, mount it vertically as shown below.
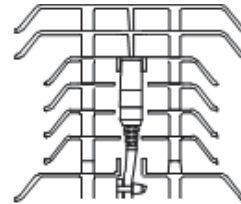
- When deploying a logger with external sensors (MX2302A, MX2303, and MX2304), mount the logger so the sensor cable is not being pulled. Leave about 5 cm (2 in.) of drip loop in the cable where it comes out of the logger to prevent water from entering the logger housing.

Drip Loop
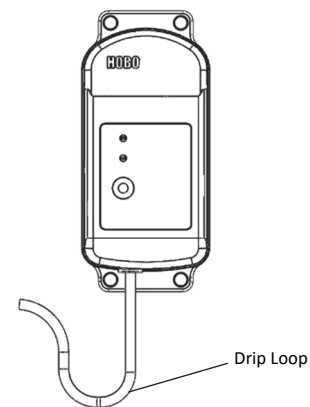
- For MX2301A and MX2305 loggers that are not being deployed with a solar radiation shield or for loggers with external sensors (MX2302A, MX2303, and MX2304), you can either use the included large screws or cable ties to mount the logger via the mounting holes. Use the screws to attach the logger to a wall or flat surface. Use the cable ties to affix the logger to a PVC pipe or mast. The MX2301A logger must also be mounted vertically or with the sensor vent facing down when not using the solar radiation shield.

Protecting the Logger

Note: Static electricity may cause the logger to stop logging. The logger has been tested to 8 KV, but avoid electrostatic discharge by grounding yourself to protect the logger. For more information, search for "static discharge" on onsetcomp.com.

Battery Information

The logger requires one user-replaceable 2/3 AA 3.6 V lithium battery (HRB-2/3AA). Battery life is 2 year, typical with a logging interval of 1 minute, but may be extended to 5 years when the logger is configured with Bluetooth Always Off enabled. Expected battery life varies based on the ambient temperature where the logger is deployed, the logging or sampling interval, frequency of offloading and connecting to the mobile device, number of channels that are active, and use of burst mode or statistics logging. Deployments in extremely cold or hot temperatures or logging interval faster than 1 minute can impact battery life. Estimates are not guaranteed due to uncertainties in initial battery conditions and operating environment.

To install or replace the battery:

1. Use a Phillips-head screwdriver to unscrew the four screws from the back of the logger.

Unscrew these four screws to replace the battery
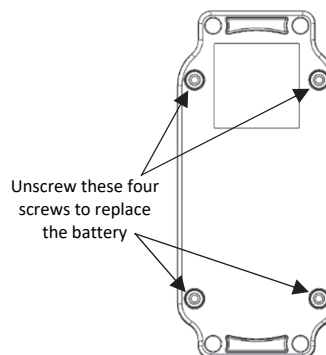
2. Carefully separate the top and bottom of the logger enclosure.

3. Remove the old battery and insert the new battery observing polarity. It is recommended that you replace the desiccant (DESICCANT2) when replacing the battery.

4. Make sure the rubber seal is clean and free of any debris and then carefully reassemble the logger enclosure and screw in the four screws.

⚠ **WARNING:** Do not cut open, incinerate, heat above 85°C (185°F), or recharge the lithium battery. The battery may explode if the logger is exposed to extreme heat or conditions that could damage or destroy the battery case. Do not dispose of the logger or battery in fire. Do not expose the contents of the battery to water. Dispose of the battery according to local regulations for lithium batteries.

Federal Communication Commission Interference Statement

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

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

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

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

Industry Canada Statements

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

Avis de conformité pour l'Industrie Canada

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

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

KC Statement

해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없음

Translation:

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