



The HOBO MX pH and Temperature logger is designed for long-term monitoring of pH in aquatic systems. With a replaceable pH electrode and anti-fouling copper guard, this durable logger can be deployed in both fresh salt water environments. This logger is Bluetooth® Low Energy-enabled logger for wireless communication with a mobile device. Using the HOBOmobile® app, you can easily calibrate and configure the logger, download logged data to your phone or tablet, or automatically upload the data to HOBOLink® for further analysis. You can also configure the logger to calculate statistics, set up alarms to trip at specific thresholds, or enable burst logging in which data is logged at a faster interval when sensor readings are above or below certain limits.

## HOBO MX pH and Temperature Logger

MX2501

### Included Items:

- pH electrode in solution
- Electrode storage solution and cap
- Anti-fouling copper guard

### Required Items:

- HOBOmobile app
- Device with iOS and Bluetooth

### Accessories:

- Calibration beaker (MX2500-CAL-BKR)
- Calibration kit with three 250 mL bottles of pH 4.01, 7.01, and 10.01 solution (MX2500-CAL-KIT)
- pH 4.01 calibration solution, 250 mL (MX2500-CAL-4)
- pH 7.01 calibration solution, 250 mL (MX2500-CAL-7)
- pH 10.01 calibration solution, 250 mL (MX2500-CAL-10)
- Electrode cleaning solution (MX2500-CLEAN-SOLN)
- Replacement pH electrode (MX2500-ELECTRODE)
- Replacement end cap (MX2500-END-CAP)
- Replacement anti-fouling copper guard (MX2500-GUARD)
- Additional electrode storage solution (MX2500-STORE-SOLN) and cap (MX2500-STORE-CAP)

## Specifications

### pH Sensor

	in pH	in mV
<b>Range</b>	2.00 to 12.00 pH	-1,000 to 1,000 mV
<b>Accuracy</b>	±0.10 pH	±0.2 mV
<b>Resolution</b>	0.01 pH	0.5 mV


### Temperature Sensor

<b>Range</b>	-2° to 50°C (28.4° to 122°F)
<b>Accuracy</b>	±0.2°C (±0.36°F)
<b>Resolution</b>	0.04°C (0.072°F)

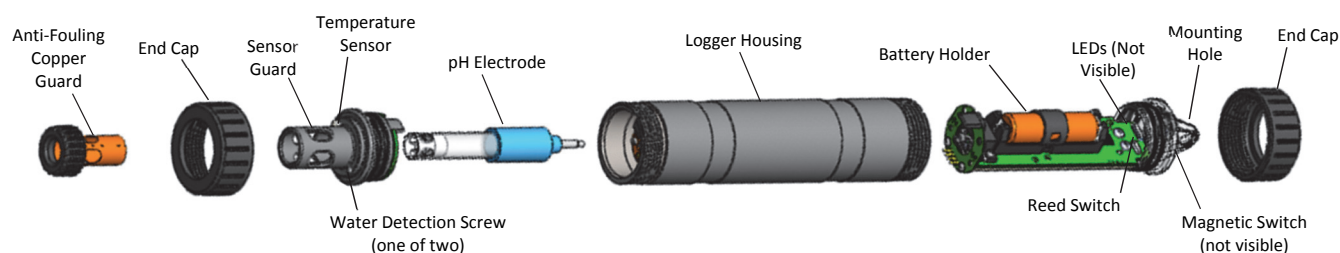
### Logger

<b>Operating Range</b>	-2° to 50°C (28.4° to 122°F)
<b>Waterproof</b>	To 40 m (131.2 ft)
<b>Water Detection</b>	Water conductivity level of 100 µS/cm or greater necessary for reliable detection of water. Deionized water or water below 100 µS/cm may not be detected.  The water conductivity circuit may not reliably detect water that has frozen around the electrodes, i.e. below 0°C (32°F).
<b>Radio Power</b>	1 mW (0 dBm)
<b>Transmission Range</b>	Approximately 30.5 m (100 ft) line-of-sight
<b>Wireless Data Standard</b>	Bluetooth Low Energy (Bluetooth Smart)
<b>Logging Rate</b>	1 second to 18 hours
<b>Logging Modes</b>	Fixed interval (normal, statistics) or burst
<b>Memory Modes</b>	Wrap when full or stop when full
<b>Start Modes</b>	Immediate, push button, date & time, or next interval
<b>Stop Modes</b>	When memory full, push button, date & time, or after a set logging period
<b>Time Accuracy</b>	±1 minute per month 0° to 50°C (32° to 122°F)
<b>Battery Type</b>	One AA 1.5 Volt, user replaceable
<b>Battery Life</b>	1 year typical at 25°C (77°F) with logging interval of 1 minute and Bluetooth Always Off disabled in software. 2 years typical at 25°C (77°F) with logging interval of 1 minute and Bluetooth Off Water Detect enabled in software. 3 years typical at 25°C (77°F) with logging interval of 1 minute and Bluetooth Always Off enabled in software.  Faster logging intervals and statistics sampling intervals, burst logging, remaining connected with the app, excessive downloads, and paging may impact battery life.
<b>pH Electrode Life</b>	6 months
<b>Memory</b>	152 KB (43,300 measurements, maximum)

## Specifications (continued)

<b>Full Memory Download Time</b>	Approximately 60 seconds; may take longer the further the device is from the logger
<b>Dimensions</b>	22.86 x 4.27 cm (9.0 x 1.68 inches)
<b>Weight</b>	268.2 g (9.46 oz)
<b>Wetted Materials</b>	PVC housing and sensor guard, polycarbonate end caps and mounting end with a TPE switch, plastic pH electrode
<b>Environmental Rating</b>	IP68
<b>CE</b>	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).
<b>FC</b> 	See last page

## Logger Components and Operation



**Anti-Fouling Copper Guard:** Use this guard to protect the pH electrode when deploying the logger in flowing water. Do not use when the logger is in still water or when the probe is in storage solution (see *Deploying and Mounting the Logger*).

**End Caps:** There are two end caps that are screwed on to the sensor end and the mounting end of the logger.

**Sensor Guard:** This is a protective guard for the sensor end of the pH electrode.

**Temperature Sensor:** This temperature sensor is located at the base of the sensor guard.

**Water Detection Screws:** These two screws can detect the presence of water. This allows you to configure the logger in a power-saving mode in which Bluetooth advertising is active only when the logger is removed from water. See *Configuring the Logger* for details. **Note:** The logger will check for the presence of water every 15 seconds when the Bluetooth Off Water Detect power-saving mode is selected.

**pH Electrode:** This is the electrode that is plugged into the logger. The clear, plastic end is the pH sensor and must always be in storage solution when not deployed in water. This electrode must be replaced every 6 months.

**Logger Housing:** This is the main body of the logger.

**Battery Holder:** This is where one AA battery is installed under a battery strap (see *Battery Information*).

**Reed Switch:** This is used in conjunction with the magnetic switch on the mounting end of the logger.

**LEDs:** The blue LED blinks every 4 seconds when the logger is logging (unless Show LED is disabled as described in *Configuring the Logger*). The blue LED blinks every 8 seconds if the logger is waiting to start logging because it was configured to start “On Button Push” or with a delayed start. The red LED blinks every 4

seconds when an alarm is tripped (unless the Show LED option is disabled). The blue and red LEDs will blink once when you press the magnetic switch to wake up the logger or will blink four times when you press the switch to start or stop logging. If you select Page Logger LED in the HOBOMobile app, the red LED will be illuminated for 5 seconds.

**Magnetic Switch:** This switch next on the mounting end of the logger (not visible in the diagram) acts as a button and works in conjunction with the reed switch. 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*). Press this button for 1 second to wake up the logger (if configured with Bluetooth Always Off as described in *Configuring the Logger*).

**Mounting Hole:** Use the hole on the mounting end of the logger to attach it to a cable or cord for deployment (see *Deploying and Mounting the Logger*).

### Installing the pH Electrode in the Logger

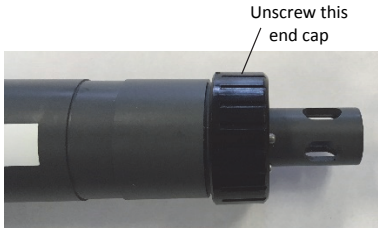
The logger is shipped with the pH electrode uninstalled and the the plastic end housing the pH sensor in storage solution as shown.



**Important:** The pH sensor must be kept in storage solution when not being calibrated or deployed in water. The gel surrounding the sensor will dry out after 10 minutes if the pH sensor is not submersed in storage solution, calibration solution, or water.

To install the pH electrode in the logger:

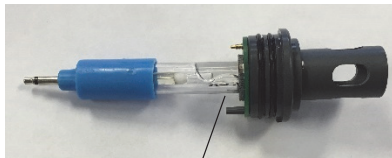
1. Unscrew the end cap over the sensor end of the logger.



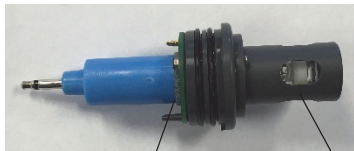
2. Pull the sensor guard straight out from the logger housing without twisting it.



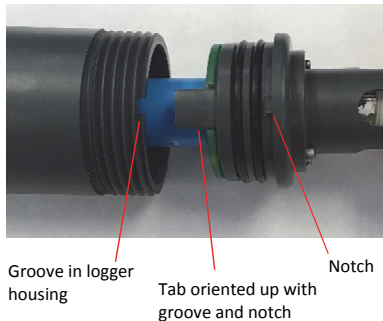
3. Remove the pH electrode from the shipping bottle and insert the pH sensor into the sensor guard as shown.



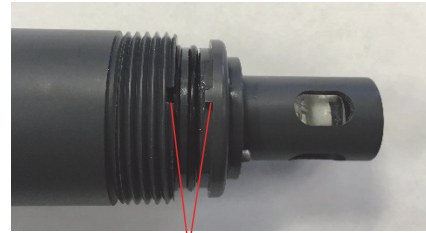
Gently push the pH electrode into the guard until the clear plastic is fully seated in the sensor guard as shown.



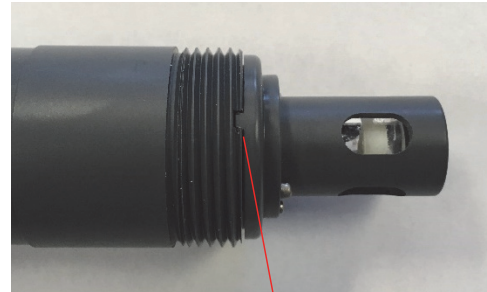
4. Plug the pH electrode into the logger, using the tab as a guide to make sure it is installed in the correct orientation with the notch in the guard fitting into small groove in the logger housing.



Do not twist or turn the sensor guard as you push the pH electrode straight into position.



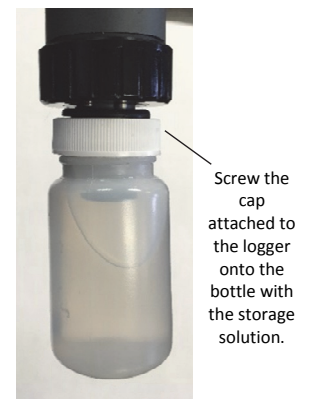
Push the sensor guard until the notch is fully seated in the groove as shown.



5. Screw the end cap back on this end of the logger and then screw the storage solution cap on as shown.



6. Unscrew the cap on the storage solution bottle. Insert the sensor guard into the bottle and screw the cap that is installed on the guard onto the bottle.



**Important:** Do not install the copper anti-fouling guard in the sensor guard while the pH sensor is in the storage solution. The copper in the guard can affect the properties of the storage solution.

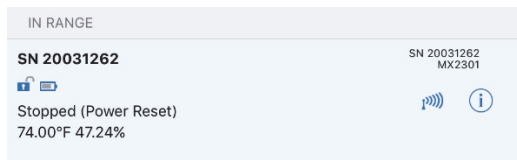
- Keep the sensor in the storage solution as shown until you are ready to calibrate it and deploy the logger.



## Downloading HOBOMobile and Connecting to a Logger

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

- Download the HOBOMobile app from the App Store®.
- Open the app and enable Bluetooth in the device settings if prompted.
- Press the button on the logger to wake it up.
- Tap the HOBOMobile icon at the bottom of the screen. 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*.
- pH Calibration.** Calibrate the logger following the instructions in the app.

- 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 logger LEDs for 5 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 HOBOMobile 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.

## Calibrating the Logger

The logger needs to be calibrated for accurate pH readings. You can calibrate the logger using a 4.01, 7.01, and 10.01 buffer. It is recommended that you calibrate the logger immediately before deploying it.

**Important:** The pH sensor must be kept in storage solution when not being calibrated or deployed in water. The gel surrounding the sensor will dry out after 10 minutes if the pH sensor is not submerged in storage solution, calibration solution, or water.

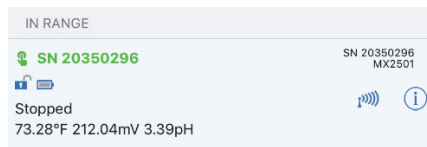
- Open HOBOMobile and tap the HOBOMobile icon.
- Find the logger in the list and tap it to connect to it. If the logger was previously configured with Bluetooth Always Off, press the switch on the logger to wake it up. If the logger was previously configured with Bluetooth Off Water Detect and it is deployed in water, remove it from water.
- Tap pH Calibration.

- Follow the instructions in the app.
- Once calibrated, follow the instructions in the next section for Configuring the Logger.

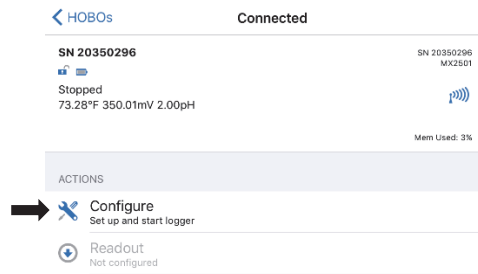
## Configuring the Logger

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*.

- Open HOBOMobile and tap the HOBOS icon.
- Find the logger in the list and tap it to connect to it. If the logger was previously configured with Bluetooth Always Off, press the switch on the logger to wake it up. If the logger was previously configured with Bluetooth Off Water Detect and it is deployed in water, remove it from water. If you are working with multiple loggers, pressing the button also brings the logger to the top of the list (and the logger name will turn green). Note that the current sensor readings are displayed even when the logger is not logging.



- Once connected, tap Configure.



- 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.
- 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.
- 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.
- 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.

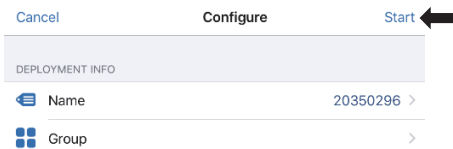
Tap Done in the Start Logging screen.

- Tap Stop Logging and select the options for when logging will end.
  - 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*).
  - 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.
  - 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.
- Tap Done in the Stop Logging screen.
- Select the sensor measurement types that will be logged: temperature and pH. 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.
- 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.
- 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.
- Select the power saving mode, which determines when the logger will “advertise” or regularly send out a Bluetooth signal for the phone or table to find via HOBOMobile.
  - Bluetooth Always Off.** The logger will only advertise during logging when you push the switch on the logger.

This will wake up the logger when you need to connect to it. This option uses the least battery power.

- **Bluetooth Off Water Detect.** The logger will not advertise when the presence of water is detected. Once the logger is removed from the water, advertising will automatically turn on, thereby not requiring you to push the switch to wake up the logger when you need to connect to it. This option preserves some battery power. **Note:** The logger will check for the presence of water every 15 seconds when this is option is selected.
- **Bluetooth Always On.** The logger will always advertise. You will never need to push a switch to wake up the logger. This option uses the most battery power.

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



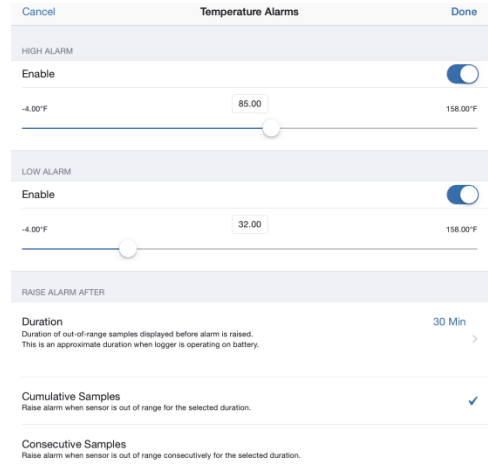
Logging will begin based on the settings you selected. See *Deploying and Mounting the Logger* for details on mounting and see *Reading Out the Logger* for details on downloading.

### 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 and tap the logger to connect to it. . If the logger was configured with Bluetooth Always Off enabled, push the switch on the logger to wake it up. If the logger was configured with Bluetooth Off Water Detect and is currently underwater, remove it from the water.
  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 red logger 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 specified 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 specified resolution).

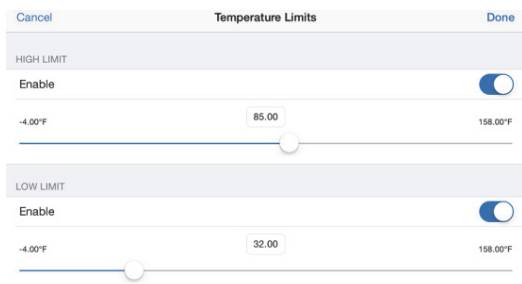
- When you read out the logger, alarm events can be displayed on the plot or in the data file. See *Logger Events*.

## 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 and tap the logger to connect to it. If the logger was configured with Bluetooth Always Off enabled, push the switch on the logger to wake it up. If the logger was configured with Bluetooth Off Water Detect and is currently underwater, remove it from the water.
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 specified 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 specified 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 pH 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 pH sensor values every 5 minutes. In addition, the logger will take a temperature and pH 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 the mV series): two sensor series (with temperature and pH data logged every 5 minutes) plus eight maximum, minimum, average, and standard deviation series (four for temperature and four for pH with values calculated and logged every 5 minutes based on the 30-second sampling).

To log statistics:

1. Tap the HOBOS icon and tap the logger to connect to it. If the logger was configured with Bluetooth Always Off enabled, push the switch on the logger to wake it up. If the logger was configured with Bluetooth Off Water Detect and is currently underwater, remove it from the water.
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 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. Open HOBOMobile.
2. If the logger was configured with Bluetooth Always On, continue to step 3.

If the logger was configured with Bluetooth Always Off, press the button on the logger for 1 second to wake it up.

If the logger was configured with Bluetooth Water Detect and it is deployed in water, remove it from the water.



3. Tap the HOBOS icon and tap the logger to connect to it.
4. Once connected, tap Readout.
5. Tap the Data Files icon to view a mini-graph of the downloaded data.



6. 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. Tap the Settings icon to enable the HOBOLink Upload Data option (this requires a HOBOLink account at [www.hobolink.com](http://www.hobolink.com)). See the *HOBOMobile User's Guide* for more details on this setting and see the HOBOLink help for details on working with data in HOBOLink.

## 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.

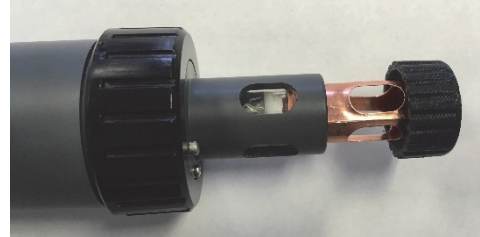
Internal Event Name	Definition
Host Connect	The logger was connected to the mobile device.
Started	The logger started logging.
Stopped	The logger stopped logging.
Calibration End	The pH calibration ended.
Calibration Cancel	The pH calibration was cancelled.
Calibration Values	The values set during the pH calibration process.
Calibration Buffers	The buffers used during the pH calibration process.
Alarm Tripped/Cleared	An alarm has occurred because the reading was outside the alarm limits or back within range. <b>Note:</b> 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.
Water Detect	The logger has been placed in water or removed from water.
Low Power	The battery level dropped below 2.3 V.
Safe Shutdown	The battery level dropped below a safe operating voltage and the logger performed a safe shutdown.

## Deploying and Mounting the Logger

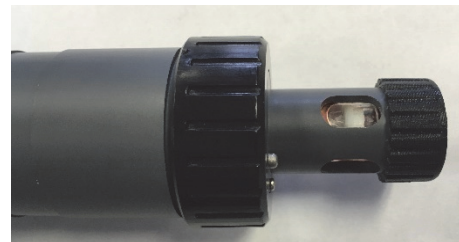
**Important:** The pH sensor must be kept in storage solution when not being calibrated or deployed in water. The gel surrounding the sensor will dry out after 10 minutes if the pH sensor is not submersed in storage solution, calibration solution, or water. Do not remove the pH sensor from the storage solution until you are ready to deploy the logger.

Follow these guidelines when deploying the logger:

- Use the copper anti-fouling guard when deploying the logger in moving water. Do not use the copper guard when the pH sensor is being calibrated, placed in storage solution, or deployed in still water as the copper can affect the properties of those liquids. To install the copper guard, insert it into the sensor guard over the pH sensor as shown below.



The windows in the copper guard should line up with the windows in the sensor guard as shown below.



- Attach a nylon cord or other strong cable to the mounting hole to deploy the logger.
- The logger should be appropriately weighted, secured, and protected depending on water conditions and desired measurement location.

## Maintaining the Logger

Periodically inspect the logger for biofouling. To clean the logger housing, rinse the logger in warm water. Use a mild dishwashing detergent if necessary. Do not use harsh chemicals, solvents, or abrasives.

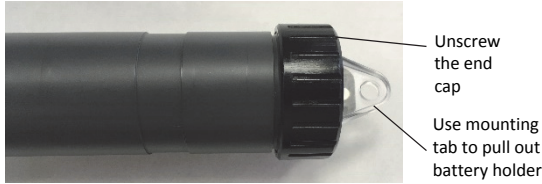
Use electrode cleaning solution (MX2500-CLEAN-SOLN) to clean the pH electrode.

## Battery Information

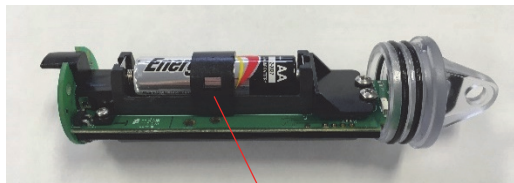
The logger requires one user-replaceable AA 1.5 V alkaline or lithium battery. With a logging interval of 1 minute and at 25°C (77°F), battery life is 1 year with Bluetooth Always On selected, 2 years with Bluetooth Off Water Detect selected, and 3 years with Bluetooth Always Off selected. Expected battery life varies based on the ambient temperature where the logger is deployed, the logging interval, the frequency of connections, downloads, and paging, and the use of burst mode or statistics logging. Deployments in extremely cold or hot temperatures or a 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:

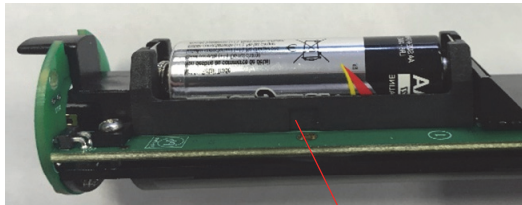
1. Unscrew the end cap on the mounting end of the logger.



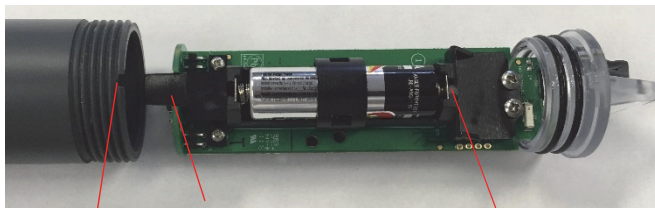
2. Use the mounting tab to pull the top end with the battery out from the logger. Use a flat-head screwdriver inserted through the mounting hole for leverage.
3. Use a flat-head screwdriver to pop out the battery strap holding the battery in place.



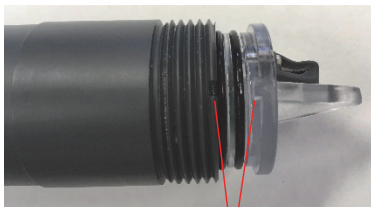
4. Remove the battery and install a new one, observing polarity.
5. Place the battery strap back in place, using the notches in the holder to align it.



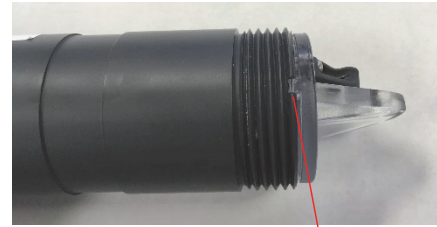
6. Reinstall the top end, using the tab as a guide to make sure it is installed in the correct orientation with the notch in the guard fitting into small groove in the logger housing.



Do not twist or turn the top end as you push it into position.



Push the mounting tab until the notch is fully seated in the groove as shown.



7. Screw the end cap back.

**⚠ 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.

**NCC Statement**

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

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

**Translation:****Article 12**

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

**Article 14**

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