

HOBO® MX Analog/Temp/RH/Light (MX1104) and MX 4-Channel Analog (MX1105) Data Logger Manual



MX1105 Model Shown

HOBO MX1104 and MX1105 Data Loggers

Models:

- Analog/Temp/RH/Light (MX1104)
- 4-Channel Analog (MX1105)

Included Items:

- Tie wraps
- Two AAA 1.5 V alkaline batteries (installed)

Required Items:

- HOBOconnect app
- Mobile device with Bluetooth and iOS, iPadOS®, or Android™, or a Windows computer with a native BLE adapter or supported BLE dongle

The HOBO MX Analog/Temp/RH/Light (MX1104) and HOBO MX 4-Channel Analog (MX1105) data loggers measure and transmit data wirelessly from indoor environments to a mobile device or computer using Bluetooth® Low Energy (BLE) technology. The MX1104 model has integrated temperature, relative humidity (RH), and light intensity sensors and one analog input while the MX1105 model has four analog inputs. Both models support a wide variety of external sensors (sold separately), including self-describing temperature, split-core AC current transformer, 4-20 mA input, and DC voltage input sensors. The self-describing sensors are designed with integrated strain relief for a secure connection to the loggers and are automatically detected by the HOBOconnect® app for easy setup. Using the app, you can configure the loggers, read out and view data, and export the data for further analysis. The loggers can calculate minimum, maximum, average, and standard deviation statistics and can also be configured to trip audible or visual alarms at thresholds you specify. In addition, both loggers support burst logging in which data is logged at a different interval when sensor readings are above or below certain limits. These compact loggers also have built-in LCD screens to display current sensor readings, logging status, battery use, memory consumption, and more.

Specifications

Temperature Sensor (MX1104)

Range	-20° to 70°C (-4° to 158°F)
Accuracy	±0.20°C from 0° to 50°C (±0.36°F from 32° to 122°F)
Resolution	0.002°C at 25°C (0.004°F at 77°F)
Drift	<0.1°C (0.18°F) per year

RH Sensor* (MX1104)

Range	0% to 100% at -20° to 70°C (-4° to 158°F); exposure to conditions above 95% 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% and above 90% ±5% typical
Resolution	0.01%
Drift	<1% per year typical

Response Time (MX1104)

Temperature	11 minutes in air moving 1 m/s (2.2 mph)
RH	30 seconds to 90% in airflow of 1 m/s (2.2 mph)

Light Sensor (MX1104)



Range	0 to 167,731 lux (15,582 lum/ft ²)
Accuracy	±10% typical for direct sunlight (see <i>Light Measurement</i> on page 4 for more details)

Logger with Cable Type	SD-MA-420 or CABLE-4-20mA	SD-VOLT-2.5 or CABLE-2.5-STEREO	SD-VOLT-05 or CABLE-ADAP5	SD-VOLT-10 or CABLE-ADAP10	SD-VOLT-24 or CABLE-ADAP24
Measurement Range	0 to 20.1 mA	0 to 2.5 V	0 to 5.0 V	0 to 10 V	0 to 24 V
Accuracy	±0.001 mA ±0.2% of reading	±0.1 mV ±0.1% of reading	±0.2 mV ±0.3% of reading	±0.4 mV ±0.3% of reading	±1.0 mV ±0.3% of reading
Resolution	0.3 µA	40 µV	80 µV	160 µV	384 µV

Logger

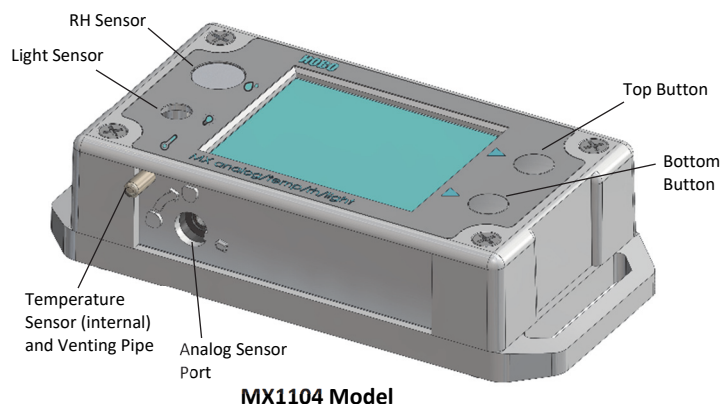
Operating Range	-20° to 70°C (-4° to 158°F)
Radio Power	1 mW (0 dBm)

Specifications (continued)

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
Restart Mode	Push button
Time Accuracy	±1 minute per month at 25°C (77°F)
Battery Type	Two AAA 1.5 V alkaline batteries, user replaceable
Battery Life	1 year, typical with logging interval of 1 minute and Bluetooth Always On enabled; 2 years, typical with logging interval of 1 minute and Bluetooth Always On disabled; and temperatures between 0° and 50°C (32° and 122°F). Faster logging intervals and statistics sampling intervals, burst logging, remaining connected with the app, excessive downloads, and paging may impact battery life.
Memory	4 MB (1.9 million measurements, maximum)
Full Memory Download Time	Approximately 4 to 15 minutes depending on the mobile device; may take longer the further the device is from the logger
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
Size	11.28 x 5.41 x 2.92 cm (4.44 x 2.13 x 1.15 in.)
Weight	123 g (4.34 oz)
Environmental Rating	IP54
	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).
	See last page

*Per RH sensor manufacturer data sheet

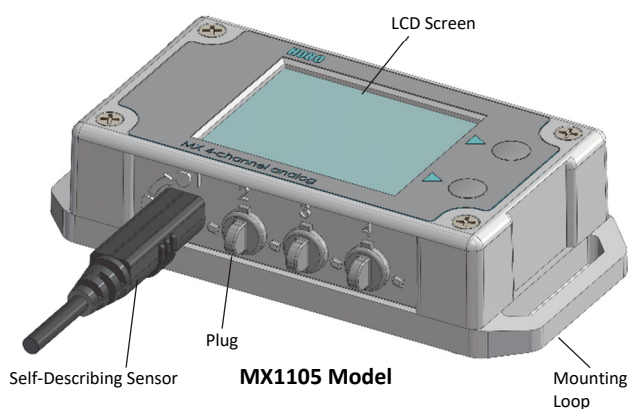
Logger Components and Operation



RH Sensor: This sensor is located in the upper left corner and to the left of the LCD screen in the MX1104 model.

Light Sensor: This sensor is located below the RH sensor and to the left of the LCD screen in the MX1104 model.

Temperature Sensor: This sensor is located in the bottom left corner and to the left of the LCD screen in the MX1104 model. A small pipe protrudes from the bottom side of the logger case to vent the temperature sensor.



Analog Sensor Port: Use this 2.5 mm jack to connect a self-describing sensor or other analog sensor. The MX1104 model has one port and the MX1105 model has four ports.

Top Button: Press this button for 3 seconds to start or stop logging data, or to resume logging on the next even logging interval. This requires configuring the logger in the app with a push button start or stop, and with Allow Button Restart selected (see *Configuring the Logger*).

You can also press the top button for 1 second to wake up the logger, bring the logger to the top of the list in the app, cycle through each channel on the LCD, silence a beeping alarm (see *Setting up Alarms*), and turn the LCD screen on if the option to turn off the LCD has been enabled (see *Configuring the Logger*).

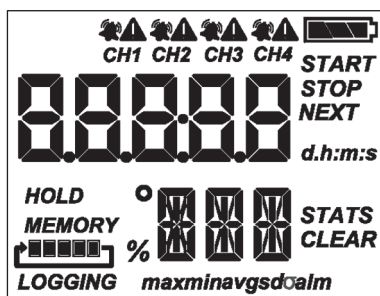
Bottom Button: When you are logging statistics, press this button for 1 second to switch between the latest sensor reading, statistics, and an alarm reading (if applicable) for the channel currently displayed. If you are not logging statistics and a sensor alarm trips, press this button for 1 second to view the alarm reading for the channel currently displayed. You can also press this button for 1 second to wake up the logger, silence a beeping alarm, or turn the LCD screen on if the option to turn off the LCD has been enabled. Press this button for 3 seconds to clear a visual alarm if the logger was configured in the app to maintain the visual alarm until the alarm button was pressed (see *Setting up Alarms*). Press both the top and bottom buttons simultaneously for 10 seconds to reset a logger password.

Self-Describing Sensor: This is a type of external sensor available for MX1104 and MX1105 loggers. Turn the sensor plug one-quarter clockwise when inserting it into an analog sensor port to secure it in place. This sensor also features automatic detection by the logger (see *Working with Sensors*).

Plug: Use this Santoprene® (TPE) plug to fill an empty analog sensor port.






Mounting Loops: Use the two mounting loops (only one visible in the diagrams) to mount the logger with tie wraps (see *Mounting the Logger*).

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



LCD Symbol	Description
START	The logger is waiting to be started or restarted. Press and hold the top button for 3 seconds to start the logger; the logger also displays HOLD during this time.
STOP	The logger has been started with push button stop enabled. Press and hold the top button for 3 seconds to stop the logger; the logger also displays HOLD during this time.
HOLD	The logger displays HOLD when you press the top button for 3 seconds to start, stop, or restart the logger, or while pressing the bottom button for 3 seconds to clear an alarm.
NEXT	The logger displays NEXT when it is logging more than one. Press the top button to cycle through

LCD Symbol	Description
	each channel to view sensor measurements.
STATS	The logger is logging statistics. Press the bottom button to switch between the current sensor readings, statistics, and any alarm readings for each channel.
max min avg sdo	These symbols show the maximum, minimum, average, and standard deviation values most recently calculated by the logger (if the logging mode is set to Fixed Logging Interval in the app and you have selected each statistic; see <i>Statistics Logging</i>). Press the bottom button to cycle through the available statistics and then back to the current sensor reading (or to the alarm value if applicable).
	The battery indicator shows the approximate battery power remaining.
MEMORY 	The logger is set to Stop When Memory Fills. The memory bar indicates the approximate amount of storage space remaining in the logger. When the logger first starts logging data, all five segments are empty. In this example, the logger memory is almost full (only one segment in the memory bar is empty).
MEMORY 	The logger is set to Never Stop (Overwrites Old Data). The logger continues recording data indefinitely, with newest data overwriting the oldest data until the battery voltage is depleted or the logger is reconfigured. When the logger first starts logging data, all five segments in the memory bar are empty. In this example, the memory is full (all five segments are filled) and new data is now overwriting the oldest data.
LOGGING	The logger is currently logging.
	The bell icon indicates a sensor alarm has tripped. Press the top button to view the channel with the alarm icon. Press the bottom button to view the reading that tripped the alarm. The "alm" symbol (described below) is displayed on the screen with the reading (dashes are displayed if the alarm has already cleared). The alarm symbol clears depending on the setting for Show Visual Alarms in the app. If the it is set to Logger Reconfigured (clears when the logger is reconfigured), this symbol remains until the next time new configuration settings are loaded onto the logger (see <i>Configuring the Logger</i>). Otherwise, it clears when the sensor reading is back within the alarm limits or when you press the bottom button for 3 seconds.
alm	This is displayed with the reading that tripped the alarm. While viewing the channel with the alarm, press the bottom button to see the reading (you may need to cycle through statistics readings first if applicable). If the alarm cleared, dashes (---) appear instead of a reading.
CLEAR	A visual alarm is ready to be cleared. This appears only if the setting for Show Visual Alarms in the app is set to Alarm Button Pressed (maintain the visual alarm until you press the alarm button). While viewing the channel with the alarm on the LCD, press the bottom button for 3 seconds to clear the visual alarm. You can silence an audible alarm by pressing the top or bottom button for 1

LCD Symbol	Description
	second.
	This indicates a problem with an external sensor. See <i>Working with External Sensors</i> for more details.
	This is an example of a sensor reading, with the latest reading displayed above the unit type for that sensor. To switch between US and SI units, change the units in the Settings area of the app (reconfigure the logger to have your units changes take effect). Note: If the sensor value exceeds five digits, the scientific notation E3 is appended to the value on the LCD to signify that the displayed digits are multiplied by 1,000. For example, a value of 100,000 is displayed as 100E3 on the LCD. This only affects the LCD; logged data contains all digits.
	The logger has been configured to start logging on a particular date/time. The display counts down in days, hours, minutes, and seconds until logging begins. In this example, 5 minutes and 38 seconds remain until logging begins.
	The configuration settings are being loaded onto the logger from the app.
	The logger was stopped by the app or because the memory is full.

Notes:

- You can disable the LCD screen when logging. Deselect “Show LCD” when setting up the logger as described in the next section. When this option is disabled, you can still temporarily view the LCD screen by pushing the top or bottom button for 1 second. The LCD then remains on for 10 minutes.
- The LCD screen refreshes at the same rate as the logging interval.
- When the logger has stopped logging, the LCD screen remains on with “STOP” displayed until you download data from the logger to your mobile device (unless the logger was configured with the “Show LCD” option disabled). Once you have downloaded data from the logger, the LCD turns off automatically after 1 hour. The LCD turns back on the next time you press the top or bottom button to wake up the logger.
- The LCD screen flashes “HELLO” when you page the logger from the app (see *Downloading the App and Connecting to a Logger*).
- The LCD screen flashes “BOOT” when a firmware upgrade is underway.
- The LCD screen flashes “CHIRP OFF” when you clear an audible alarm.

Button Functionality Quick Reference

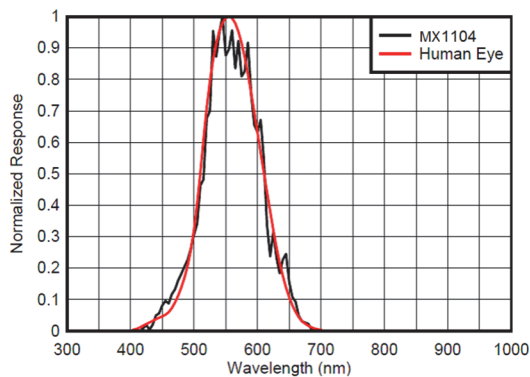
Button	Press for 1 second to:	Press and hold for 3 seconds to:	Press and hold for 10 seconds to:
Top button	<ul style="list-style-type: none"> Cycle through each channel to view the 	Start, stop, or resume	NA

Button	Press for 1 second to:	Press and hold for 3 seconds to:	Press and hold for 10 seconds to:
	latest sensor readings <ul style="list-style-type: none"> Wake up the logger Bring the logger to the top of the list in the app Silence a beeping alarm Turn on LCD 	logging (depending on settings chosen in the app)	
Bottom button	<ul style="list-style-type: none"> Cycle through any statistics and alarm readings for the channel currently displayed (if applicable) Wake up the logger Silence a beeping alarm Turn on LCD 	Clear an alarm for the channel currently displayed (depending on the settings chosen in the app)	NA
Both buttons	NA	NA	Reset a password

Light Measurement (MX1104)

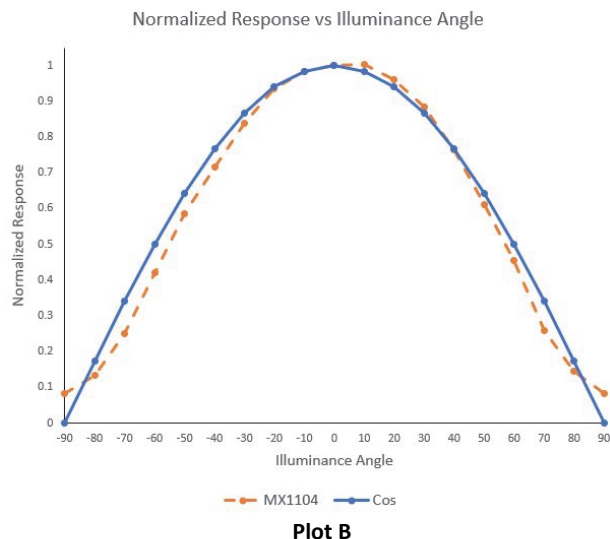
The MX1104 logger measures light intensity in units of lumens/ft² or lux. The light sensor in the MX1104 has a spectral response that tightly matches the photopic response of the human eye as illustrated in Plot A.

The light sensor has a range of 0 to 167,731 lux (15,582 lum/ft²). The resolution of the light measurement varies from 1 unit of lux or lum/ft² in very dim light to 40 lux (4 lum/ft²) for a full scale measurement.

**Plot A****Light Measurement Accuracy**

Although the MX1104 is factory calibrated to account for the light attenuation of the plastic enclosure, you may notice a difference in the MX1104 reading compared to a commercially available lux meter. Ideally, a light meter’s response should be proportional to the cosine of the angle at which the light is incident. The MX1104 does not collect light exactly according to this rule. Plot B illustrates the difference between an ideal cosine response and the approximate response of the MX1104.

The MX1104 is calibrated to give best results for direct illumination, but this is not always the case.



The MX1104 is also calibrated to give best results in sunlight. Because artificial indoor and outdoor lights have spectral properties that differ from sunlight, the MX1104 may show an error of greater than $\pm 10\%$ when compared to a commercially available lux meter in these situations. Multiple MX1104 loggers, however, typically exhibit $\pm 10\%$ agreement with each other in any type of light.

Downloading the App and Connecting to a Logger

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

1. Download HOBObconnect to a phone or tablet from the App Store® or Google Play™.

Download the app to a Windows computer from www.onsetcomp.com/products/software/hobobconnect.










2. Open the app and enable Bluetooth in your device settings if prompted.
3. Press either button on the logger to wake it up.
4. Tap Devices and then tap the logger tile in the app to connect to the logger.

If the logger does not appear or if it is having trouble connecting, follow these tips:

- If the logger is configured with Bluetooth Always On disabled (see *Configuring the Logger*), make sure the logger is “awake” by pressing the top or bottom button. Press the top button again to bring the logger to the top of the list if you are working with multiple loggers.
- Make sure the logger is within range of your mobile device or computer. The range for successful wireless communication is approximately 30.5 m (100 ft) with full line-of-sight.
- If your device can connect to the logger intermittently or loses its connection, move closer to the logger, within sight if possible.

- Change the orientation of your device to ensure the antenna is pointed toward the logger. Obstacles between the antenna in the device and the logger may result in intermittent connections.
- If the logger appears in the app, but you cannot connect to it, close the app and then power down your device to force the previous Bluetooth connection to close.

Once the logger is connected, you can:

Tap this:	To do this:
	Specify logger settings and save them onto the logger to start logging. See <i>Configuring the Logger</i> .
	Tap to view live data.
	Stop a beeping alarm on the logger if audible alarms are enabled as described in <i>Setting up Alarms</i> .
	Lock the logger. Set a password for the logger so that it is not mistakenly stopped or reconfigured. Tap the icon, enter a password, and then tap Set. Once a password is entered on a phone or tablet, that mobile device is the only one to “remember” it. This means you can connect to the logger without entering a password on that mobile device, but you must enter a password on all other mobile devices. 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 must enter the password on the phone but not with your tablet. Similarly, if others attempt to connect to the logger with different devices, they are also required to enter the password. To reset a password: <ul style="list-style-type: none"> • Simultaneously press both the Start/Stop button and the Alarm/Stats button for 3 seconds, or • Tap Manage Password and then tap Reset.
	Manage Password. Reset your existing password or set a new password for the logger.
	Stop logging data (this overrides any Stop Logging settings described in <i>Configuring the Logger</i>).
	Start logging if the logger was configured to start with a button push. See <i>Configuring the Logger</i> .
	Download logger data. See <i>Downloading Data From the Logger</i> .
	Mark the logger as a favorite. You can then filter the list of devices to show only loggers marked as favorites.



Make the logger beep one time to help you locate it. "HELLO" also appears on the LCD when the logger is paged.



Update the firmware on the logger. A logger readout will be completed automatically at the beginning of the firmware update process

Important: Before updating the firmware on the logger, check the remaining battery level 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.

Configuring the Logger

Use the app to set up the logger, including setting alarms, selecting the options to start and stop logging, and choosing a logging mode. These steps provide an overview of setting up the logger. For complete details, see the HOBOnnect User Guide.

1. In the app, tap Devices and then tap the logger tile to connect to it.
2. Tap Configure & Start to configure the logger.
3. Tap Name and type a name for the logger (optional). If you do not enter a name, the app uses logger serial number as the name.
4. Tap Group to add the logger to a group (optional).
5. Tap Logging Interval and choose how frequently the logger will record data unless operating in burst logging mode (see *Burst Logging*).
6. Tap Start Logging and select when logging begins:
 - **On Save.** Logging begins immediately after configuration settings are saved.
 - **On Next Interval.** Logging begins at the next even interval as determined by the selected logging interval.
 - **On Button Push.** Logging begins when you press either the Start/Stop logging button on the logger for 3 seconds or start logging with the app.
 - **On Date/Time.** Logging begins at a date and time you specify. Select the Date and Time.
7. Tap Stop Logging and specify when logging ends.
 - **Never Stop (Overwrites Old Data).** The logger does not stop at any predetermined time. The logger continues recording data indefinitely, with newest data overwriting the oldest.
 - **On Date/Time.** The logger stops logging on a specific date and time that you specify.
 - **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. For example, select 30 days if you want the logger to log data for 30 days after logging begins.
8. Tap Pause Options, then select Pause On Button Push to specify that you can pause the logger by pressing its Start/Stop button for 3 seconds. Select Allow Button Resume to specify that you can press the Start/Stop button on the logger to resume logging.

Important: When you select Allow Button Resume and you use the Start/Stop button on the logger to stop and restart logging, logging restarts on the next even logging interval, not at the time you pushed the button. For example, a logger started logging at 7:00 AM with a logging interval set to 1 hour. If you press the Start/Stop button to stop the logger at 8:45 AM and then press the button again at 10:15 AM, logging will not begin immediately at 10:15 AM. Instead, logging will begin again at 11:00 AM, which is the next even interval time based on your 1-hour logging interval. Depending on the logging interval, the gap between the time you press the button to resume logging and the time actual logging begins could be significant. The faster the logging interval, the less time elapses before logging resumes.
9. Tap Logging Mode. Select either fixed or burst logging. With fixed 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.
10. Enable or disable Show LCD, which controls whether the LCD on the logger remains illuminated while the logger is logging. If you disable Show LCD, the LCD on the logger does not show the current reading, status, or other information while the logger is logging. You can temporarily turn the LCD screen on by pressing the Start/Stop button on the logger for 1 second. In addition, you can always view the status of any in-range logger on your mobile device regardless of the logger's LCD setting (may require a logger password as applicable).
11. Enable or disable Bluetooth Always On. If Bluetooth Always On is enabled, the logger advertises or regularly sends out a Bluetooth signal for the phone, tablet, or computer to find via the app while it is logging, which uses battery power. When Bluetooth Always On is disabled, the logger only advertises during logging when you press either button on the logger to wake it up, thereby preserving as much battery power as possible.
12. Select whether to upload data to HOBOLink® via the gateway or the app (optional and requires an active HOBOLink account).
13. Make sure all channels you want to log are enabled and then do the following:
 - For self-describing sensors, the sensor type is automatically detected. Tap the sensor if you want to enter a label, set up alarms, or add scaling.

- For other external sensors, the sensor type is not automatically detected. Enable the channel (if necessary) and then tap it to enter a label (optional). Select the type of sensor or cable from the list. Set up alarms and add scaling if needed and then tap Save.
- See *Working with External Sensors* and *Setting up Alarms* for additional details.

14. Tap Start to save the configuration settings.

Logging begins based on the settings you selected. Deploy the logger using the mounting materials (see *Mounting the Logger*). After logging begins, you can download data from the logger at any time (see *Downloading Data From the Logger* for details).

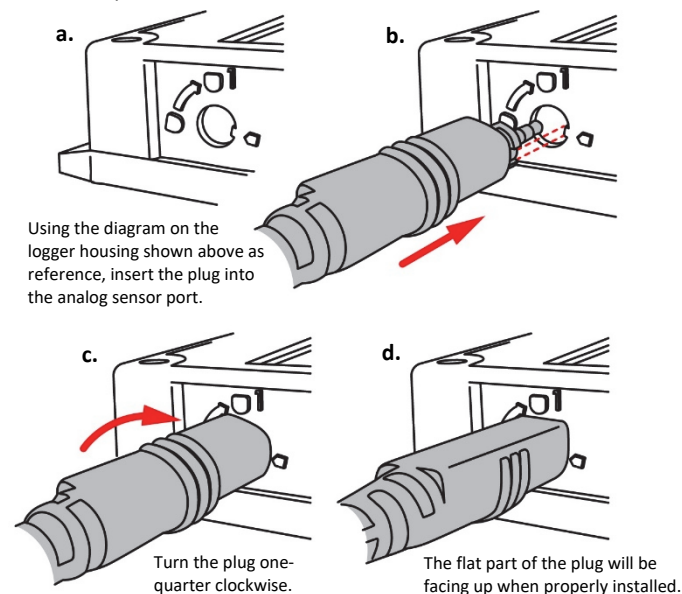
Note: If an “Error Configuring Logger” message appears in the app, an error occurred while loading the configure settings onto the logger. Try reconfiguring the logger.

Working with External Sensors

The MX1104 has one analog sensor port and the MX1105 has four analog sensor ports that can accept self-describing and other external sensors. Refer to www.onsetcomp.com for a current list of supported sensors.

To connect an external sensor:

1. Make sure the logger is stopped.
2. For self-describing sensors, insert the plug into an analog sensor port as shown.



3. For other external sensors, insert the sensor into an analog sensor port and make sure it is firmly seated.
4. If you need to connect a sensor to the sensor cable, complete any wiring before logging begins. Refer to the sensor or cable manual for more information on connecting the sensor and wiring, if applicable.
5. Tap Devices. Press either button on the logger to wake it up (if necessary).
6. Tap the logger tile in the app to connect to the logger and tap Configure & Start.

7. Make sure all external sensor channels are enabled.
8. For self-describing sensors, the sensor type is automatically detected. Tap the Sensor/Channel Name in the app to enter a label (optional). To set up scaling (if it is present), tap Scaling and then enter the Series Name, Unit, and values for High and Low and then tap Save. See *Setting up Alarms* for details on adding alarms.

For other external sensors, the sensor type is not automatically detected. Tap the sensor and enable the channel (if necessary). Enter a label (optional). Select the type of sensor or cable from the list. To set up scaling (if it's present), tap Scaling and then enter the Series Name, Unit, and values for High and Low and then tap Save. See *Setting up Alarms* for details on adding alarms.

Notes:

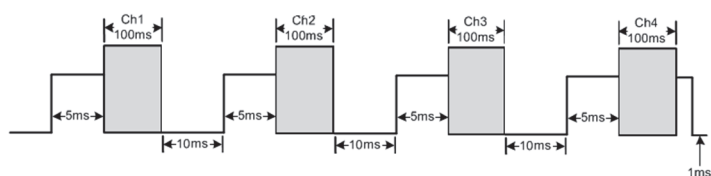
- For MX1104 loggers, an external sensor is channel 1. For MX1105 loggers, the sensor channel number is listed above the analog sensor port where the external sensor is connected.
- The configuration screen in the app automatically updates to show when a sensor is disconnected or connected.
- Make sure you select the correct sensor type in the app if you are not using self-describing sensors. If you select the wrong type, incorrect data is logged. The app automatically detects the sensor type only for self-describing sensors.
- If you disconnect a sensor or if it is not fully inserted into the analog sensor port while the logger is logging, a warning icon appears on the LCD and the logger beeps once. Use the top button on the logger to view the channel with the warning, which also displays dashes instead of a valid current reading. Erroneous readings are displayed in the app and logged depending on the logging interval while the sensor is disconnected (e.g., if a sensor is disconnected for 5 minutes and the logging interval is set to 1 minute, there are 5 erroneous data points while the sensor was disconnected). When the sensor is reconnected, the warning icon clears, the correct value replaces the dashes for the channel on the LCD, and the correct readings are logged.
- Do not swap out sensors or move sensors to empty ports while the logger is logging. Stop the logger before making any physical changes to the sensors.
- If a warning icon appears for a self-describing sensor and you have checked that the correct sensor is properly installed, the sensor might be faulty. Contact Onset Technical Support.
- The 4-20mA input cable (SD-MA-420 or CABLE-4-20mA) measures current from 0 to 20.1 mA. Do not expose it to current above 20 mA or to negative current. Do not cut off the end of the gray cable where it connects to the blue and yellow wires as it contains the precision resistor required for current measurement.
- If you are using the SD-VOLT-2.5 or CABLE-2.5-STEREO voltage input cable, the input line must not be exposed

to signals below 0 V or above 2.5 V. The voltage input cable connections are as follows:

Wire	Connection
Red	Switched 2.5 V output
White	Voltage input
Black	Ground

- The external input channels have a switched 2.5 V output. This signal can be used to power a sensor directly or to trigger an external circuit. External sensors should draw no more than 4 mA total when powered.

The switched 2.5 V output turns on about 5 ms before the external channels are measured as shown in the following diagram for an MX1105 logger. The shaded area shows the 100 ms period for each enabled channel during which the logger samples the input signals.



When using multiple voltage and/or current inputs, the (-) from the current source(s) and the 0 V line from the voltage source(s) are tied together at the logger. If these lines are at different voltage potentials, this may cause inaccurate readings or even damage your logger.



WARNING: Analog channel input cannot exceed 2.5 V DC. For sensor outputs up to 24 V DC, use the appropriate voltage adapter cable (SD-VOLT-xx or CABLE-ADAPX).

Setting up Alarms

You can set an alarm to trip on the logger when a sensor reading rises above or falls below a specified value. Alarms alert you to problems so you can take corrective action. To set an alarm:

1. Tap Devices.
2. Tap the logger tile in the app to connect to the logger and tap Configure & Start.
3. Tap a Sensor/Channel.
4. Tap Enable Logging, if necessary.
5. Tap Alarms to open that area of the screen.
6. Select Low if you want an alarm to trip when the sensor reading falls below the low alarm value. Enter a value to set the low alarm value.
7. Select High if you want an alarm to trip when the sensor reading rises above the high alarm value. Enter a value to set the high alarm value.
8. For the Duration, select how much time should elapse before the alarm trips and select one of the following:

- **Cumulative Samples.** The alarm trips once the sensor reading is out of the acceptable range for the selected duration any time during logging. For example, if the high alarm is set to 85°F and the duration is set to 30 minutes, the alarm trips once the sensor readings have been above 85°F for a total of 30 minutes since the logger was configured.
- **Consecutive Samples.** The alarm trips once the sensor reading is out of the acceptable range continuously for the selected duration. For example, the high alarm is set to 85°F and the duration is set to 30 minutes, the alarm trips only if all sensor readings are 85°F or above for a continuous 30-minute period.

9. Repeat steps 2–8 for the other sensor.

10. In the Alarm Settings area, enable Audible Alarm if you want the logger to beep every 30 seconds when the sensor alarm trips. The beeping continues until you clear the alarm in the app, press either button on the top of the logger, or 7 days have passed. Battery life is slightly reduced when this setting is enabled. It is recommended that you enable this feature only if you have regular access to the logger so that you can easily turn off the beeping.

11. For Show Visual Alarms Until, select one of the following options to determine how long the alarm icon remains illuminated on the logger LCD screen after an alarm trips:

- **Logger Reconfigured.** The alarm icon remains visible on the LCD until the next time the logger is reconfigured.
- **Sensor in Limits.** The alarm icon remains visible on the LCD until the sensor reading returns to the normal range between any configured high and low alarm limits.
- **Alarm Button Pressed.** The alarm icon remains visible until you press the Alarm/Stats button on the logger.

Notes:

- The alarm icon is illuminated on the logger LCD when the alarm trips. You can also press the Alarms/Stats button on the logger to view the farthest out-of-range value during the deployment. Dashes appear instead of a value once the alarm is cleared on the channel. The logger checks alarm limits at the same rate as the logging interval.
- The actual values for the high and low alarm limits are set to the closest value supported by the logger. In addition, alarms can trip or clear when the reading is within the resolution specifications. This means the value that triggers the alarm may differ slightly from the value entered.
- When you download data from the logger, alarm events can be displayed on the plot or in the data file. See *Logger Events*.
- Once cleared, an audible alarm will start beeping again if the sensor values go out of the normal range. Even if you clear an audible alarm, a visual alarm may remain on the logger LCD and in the app depending on the settings selected for Show Visual Alarms Until or because the alarm condition may still be in effect. In addition, an

audible alarm continues beeping when the sensor values have returned to the normal range until it is cleared.

- Although an audible alarm and a visual alarm can occur at the same time when a sensor alarm is tripped, you clear them different ways. The audible alarm can be cleared as described in step 10. Meanwhile, a visual alarm is cleared as determined by the setting selected for Show Visual Alarms Until configuration setting. This means you could clear a beeping audible alarm and the visual alarm remains on the LCD and in the app until the logger is reconfigured, the sensor is in limits, or the bottom button on the logger is pressed--whichever setting you selected.
- If the logger is configured to stop logging with a button push, any tripped alarms are cleared automatically when logging is stopped and no Alarm Cleared event is logged in the data file. This ensures that the logger starts checking for alarm conditions when logging resumes (if the logger was configured with Allow Button Resume selected).

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 records 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 switches to the faster logging rate and records data every 30 seconds until the temperature falls back to 85°F. At that time, logging then resumes every 5 minutes at the fixed logging interval. Similarly, if the temperature falls below 32°F, then the logger switches to burst logging mode again and record data every 30 seconds. Once the temperature rises back to 32°F, the logger then returns to fixed mode, logging every 5 minutes. **Note:** Sensor alarms, statistics, and the Stop Logging option Never Stop (Overwrites Old Data) are not available in burst logging mode.

To set up burst logging:

1. Tap Devices. Press the Start/Stop button on the logger to wake it up, if necessary.
2. Tap the logger tile in the app to connect to the logger and tap Configure & Start.
3. Tap Logging Mode and then tap Burst Logging.
4. Set the burst logging interval, which must be 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.
5. Select Low and/or High and type a value to set the low and/or high values.
6. Repeat step 5 for other sensors as necessary.

Notes:

- The logger checks burst limits at the same rate as the logging interval. When the logger enters burst logging mode, the LCD updates at the same rate as the new burst logging interval.
- If high and/or low limits are configured for more than one sensor, burst logging begin when any high or low condition goes out of range. Burst logging does 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.
- Burst logging mode can begin or end when the sensor reading is within the resolution specifications. This means the value that triggers burst logging may differ slightly from the value entered.
- Once the high or low condition clears, the logging interval time is calculated using the last recorded data point in burst logging mode, not the last data point recorded in fixed mode. For example, let's assume the logger has a 10-minute logging interval and logged a data point at 9:05. The high limit is surpassed and burst logging begins at 9:06. Burst logging then continues until 9:12 when the sensor reading falls back below the high limit. Now back in fixed mode, the next logging interval is 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, a New Interval event is automatically logged and the burst condition is cleared, even if the actual high or low condition has not cleared. The logger checks the high and low conditions when logging resumes (if the logger was configured with Allow Button Resume selected).

Statistics Logging

During fixed 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. You can log the following statistics for each sensor:

- The maximum, or highest, sampled value
- The minimum, or lowest, sampled value
- An average of all sampled values
- 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 logger is set to Fixed Logging Mode and all four statistics are enabled and with a statistics sampling interval of

30 seconds. Once logging begins, the logger measures and records the actual temperature and RH sensor values every 5 minutes. In addition, the logger takes a temperature and RH sample every 30 seconds and temporarily stores them in memory. The logger then calculates the maximum, minimum, average, and standard deviation using the samples gathered over the previous 5-minute period and logs the resulting values. When downloading data from the logger, this results 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 Devices. Press either button **on the logger** to wake it up, if necessary.
2. Tap the logger tile in the app to connect to the logger and tap Configure & Start.
3. Tap Logging Mode and select Fixed Logging Mode.
4. Tap to turn on Statistics.

Note: Fixed Logging Mode records sensor measurements taken at each logging interval. The selections you make in the Statistics section add measurements to the recorded data.

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 are logged for all enabled sensors. In addition, the more statistics you record, the shorter the logger duration and the more memory is required.
6. Enter a value in Statistics Sampling Interval 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, the logger takes 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.

Once logging begins, click the bottom button on the logger to cycle through the current maximum, minimum, average, and standard deviation data for the current channel displayed on the LCD screen. Note that the logger always displays the current sensor readings in the app even if they are not being logged. You can plot the statistics series once you read out the logger.

Setting a Password

You can create an encrypted password for the logger that is required if another device 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 Devices. Press the Start/Stop button **on the logger** to wake it up, if necessary. Tap the logger tile in the app to connect to it.
2. Tap Lock Logger.
3. Type a password and then tap Set.

Only the device used to set the password can then connect to the logger without entering a password; all other devices are 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 logger later with your phone, you must enter the password on the phone but not with your tablet. Similarly, if others attempt to connect to the logger with different devices, they are also required to enter the password. To reset a password, press both buttons on the logger for 10 seconds or connect to the logger and tap Manage Password and tap Reset.

Downloading Data From the Logger

To download data from the logger:



1. Tap Devices. Press either button **on the logger** to wake it up, if necessary. Tap the logger tile in the app to connect to the logger.
2. Tap Download Data. The logger downloads data to the phone, tablet, or computer.
3. Once the download is complete, tap Done to return to the previous page or tap Export and Share to save the file in the specified format.
4. When the export file has successfully been created, tap Done to return to the previous page or tap Share to use your device's usual modes of sharing.

You can also upload data automatically to HOBOLink, Onset's web-based software, using the app or the MX gateway. For details, see the HOBOLink User Guide 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. You can view events in exported files or plot events in the app.

To plot events, tap Data and select a file to open.

Tap  (if applicable) and then tap . Select the events you want to plot and tap OK.

Internal Event Name	Definition
Host Connected	The logger was connected to the mobile device.

Internal Event Name	Definition
Started	The top button on the logger was pressed to begin or resume logging.
Stopped	The logger received a command to stop recording data (from the app or by pushing the top button on the logger).
Chan <#> Alarm Tripped	A sensor alarm has tripped; <#> is the sensor number, 1 through 4.
Chan <#> Alarm Cleared	A sensor alarm has cleared; <#> is the sensor number, 1 through 4. This event also contains the value that was furthest out of range for the sensor before the alarm cleared, which is only available in a shared or exported file.
New Interval	The logger has entered or exited burst logging mode.
Safe Shutdown	The battery level dropped below 1.6 V; the logger performs a safe shutdown.

Mounting the Logger

Use the four magnets on the back of the logger to mount it to a magnetic surface or insert the tie wraps through the mounting loops to attach it to other surfaces. Insert a Santoprene plug into any empty analog sensor ports if necessary.

Protecting the Logger

The logger is designed for indoor use and can be permanently damaged by corrosion if it gets wet. Protect it from condensation.

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 two user-replaceable AAA 1.5 V alkaline or optional lithium batteries for operation at the extreme ends of the logger operating range. Battery life is 1 year, typical with a logging interval of 1 minute, but may be extended to 2 years when the logger is configured with Bluetooth Always On disabled. Expected battery life varies based on the ambient temperature where the logger is deployed, the logging or sampling interval, frequency of offloading and connection to the mobile device, number of channels that are active, audible alarms duration, use of burst mode or statistics logging, and battery performance. 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.

To replace the batteries:

1. Use a Phillips-head screwdriver to unscrew the four screws on the front of the logger.
2. Carefully separate the top and bottom of the logger enclosure.
3. Remove any old batteries and insert new batteries observing polarity.
4. Make sure the rubber seal on the bottom part of the logger enclosure is clean and free of any debris.
5. 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 lithium batteries. The batteries may explode if the logger is exposed to extreme heat or conditions that could damage or destroy the battery cases. Do not dispose of the logger or batteries in fire. Do not expose the contents of the batteries to water. Dispose of the batteries according to local regulations 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.