# HOBO® MX20L Water Level Logger User Guide

HOBO®
Data Loggers

The HOBO MX20L Water Level Logger monitors changing water levels in a wide range of settings, including streams, lakes, wetlands, tidal areas, and groundwater. Using HOBOconnect® on a mobile or Windows device, you can easily configure this logger to record absolute pressure and temperature data in addition to water level. This logger features a ceramic pressure sensor, durable housing, and a protective end cap for deploying in existing wells or stilling wells. Without cumbersome vent tubes or desiccants to maintain, this easy-to-use logger is an ideal solution for water level studies and research.

**Important:** In normal operation (when not waking the logger), keep the magnetic fob a minimum of 1" away from the logger so that you do not inadvertently drain the logger's battery.

## Specifications

### HOBO Water Level Logger

*Models:*

- MX20L-01 (30-foot depth)
- MX20L-02 (100-foot depth)
- MX20L-04 (13-foot depth)

*Required Items:*

- HOBOconnect app
- Mobile device with Bluetooth and iOS, or Android™, or a Windows computer with Bluetooth

*Included Items*

- Magnetic activation fob

*Accessories:*

- Cable (CABLE-1-300 or CABLE-1-50) and Cable Crimp (CABLE-1-CRIMP)
- Replacement Coupler (COUPLER2-C)
- Well Cap (WELL-CAP-01)

**Pressure (Absolute) and Water Level Measurements MX20L-01**

| | |
|---|---|
| **Operating Range** | 0 to 207 kPa (0 to 30 psia); approximately 0 to 9 m (0 to 30 ft) of water depth at sea level, or 0 to 12 m (0 to 40 ft) of water at 3,000 m (10,000 ft) of altitude |
| **Factory Calibrated Range** | 69 to 207 kPa (10 to 30 psia), 0° to 40°C (32° to 104°F) |
| **Burst Pressure** | 310 kPa (45 psia) or 18 m (60 ft) depth |
| **Water Level Accuracy*** | Typical error: ±0.1% FS, 1.0 cm (0.03 ft) water<br>Maximum error: ±0.2% FS, 2.0 cm (0.06 ft) water |
| **Raw Pressure Accuracy**** | ±0.3% FS, 0.62 kPa (0.09 psi) maximum error |
| **Resolution** | <0.02 kPa (0.003 psi), 0.21 cm (0.007 ft) water |
| **Pressure Response Time (90%)**** | <1 second at a stable temperature; measurement accuracy also depends on temperature response time |

**Pressure (Absolute) and Water Level Measurements MX20L-02**

| | |
|---|---|
| **Operating Range** | 0 to 400 kPa (0 to 58 psia); approximately 0 to 30.6 m (0 to 100 ft) of water depth at sea level, or 0 to 33.6 m (0 to 111 ft) of water at 3,000 m (10,000 ft) of altitude |
| **Factory Calibrated Range** | 69 to 400 kPa (10 to 58 psia), 0° to 40°C (32° to 104°F) |
| **Burst Pressure** | 500 kPa (72.5 psia) or 40.8 m (134 ft) depth |
| **Water Level Accuracy*** | Typical error: ±0.1% FS, 3.0 cm (0.1 ft) water<br>Maximum error: ±0.2% FS, 6.0 cm (0.2 ft) water |
| **Raw Pressure Accuracy**** | ±0.3% FS, 1.20 kPa (0.17 psi) maximum error |
| **Resolution** | <0.04 kPa (0.006 psi), 0.41 cm (0.013 ft) water |
| **Pressure Response Time (90%)**** | <1 second at a stable temperature; measurement accuracy also depends on temperature response time |

**Pressure (Absolute) and Water Level Measurements MX20L-04**

| | |
|---|---|
| **Operation Range** | 0 to 145 kPa (0 to 21 psia); approximately 0 to 4 m (0 to 13 ft) of water depth at sea level, or 0 to 7 m (0 to 23 ft) of water at 3,000 m (10,000 ft) of altitude |
| **Factory Calibrated Range** | 69 to 145 kPa (10 to 21 psia), 0° to 40°C (32° to 104°F) |
| **Burst Pressure** | 310 kPa (45 psia) or 18 m (60 ft) depth |
| **Water Level Accuracy*** | Typical error: ±0.1% FS, 0.4 cm (0.013 ft) water<br>Maximum error: ±0.2% FS, 0.8 cm (0.026 ft) water |
| **Raw Pressure Accuracy**** | ±0.3% FS, 0.43 kPa (0.063 psi) maximum error |
| **Resolution** | <0.014 kPa (0.002 psi), 0.14 cm (0.005 ft) water |
| **Pressure Response Time (90%)**** | <1 second at a stable temperature; measurement accuracy also depends on temperature response time |

## Specifications (continued)

| Temperature Measurements (All Models) | |
|---|---|
| **Operation Range** | -20° to 50°C (-4° to 122°F) |
| **Accuracy** | ±0.2°C from 0° to 50°C (±0.36°F from 32° to 122°F) |
| **Resolution** | 0.10°C at 25°C (0.18°F at 77°F) |
| **Response Time (90%)** | 10 minutes in water (typical) |
| **Stability (Drift)** | 0.1°C (0.18°F) per year |

| Logger | |
|---|---|
| **Wireless Standard** | Bluetooth 5 LE |
| **Transmission Range** | Approximately 30.5 m (100 ft) line-of-sight |
| **Radio Power** | 1mW (0 dBm) |
| **Real-time Clock** | ±1 minute per month 0° to 50°C (32° to 122°F) |
| **Battery** | 2/3 AA, 3.6 Volt lithium, factory-replaceable with recalibration |
| **Battery Life (Typical Use)** | 3 years with 1-minute logging and Bluetooth always on<br>7 years with 1-minute logging and Bluetooth off and LED off<br>10 years with 5-minute logging and Bluetooth off and LED off |
| **Battery Indication** | Battery status shown in app (approximate) |
| **Memory (Non-volatile)** | Approximately 400,000 sets of pressure and temperature measurements |
| **Data Download Time (with Bluetooth 5+ devices)** | Full memory: Approximately 3.5 minutes<br>100,000 measurements: < 1 minute |
| **Weight** | Approximately 154 g (5.43 oz) in air<br>Approximately 53.9 g (1.9 oz) in fresh water |
| **Dimensions** | 3.18 cm (1.25 inches) diameter, 15.24 cm (6.0 inches) length; mounting hole 6.3 mm (0.25 inches) diameter |
| **Wetted Materials** | Polypropylene housing and end cap; Viton and Buna-N O-rings; ceramic sensor in acetal holder; stainless steel screws suitable for saltwater |
| **Logging Modes** | Fixed-interval (normal or statistics), burst or multiple intervals with up to 8 user-defined intervals and durations; logging intervals from 1 second to 18 hours. Refer to the *HOBOconnect Users Guide* for details. |
| **Start Modes** | Immediate, next interval, date & time, button start (fob or app) |
| **Stop Modes** | Memory full, never stop (overwrite oldest data), date & time, or after set logging period |
| **Pause** | Pause and restart with app |
| **Alarms** | Log high- or low-alarm events; alarm status shown in app |
| **Environmental Rating** | IP68 |
| CE | The CE Marking identifies this product as complying with all relevant directives in the European Union (EU). |
| UKCA | The UKCA marking identifies this product as complying with all relevant directives in the UK Declaration of Conformity. |
| (symbol) | This marking identifies this product as complying with all relevant directives in Australia and New Zealand. |
| FC | This marking identifies this product as complying with specific limits defined in the United States by the FCC and identified on the last page of this document. |
| (symbol) | This marking identifies this product as complying with specific limits defined in Taiwan by the NCC and identified on the last page of this document. |
| | See the last page for details on compliance in the United States, Canada, and Taiwan. |

\*    Water Level Accuracy: With accurate reference water level measurement, known water density, accurate barometric pressure data, and a stable temperature environment.

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

\*\*\*  Changes in Temperature: Allow 20 minutes in water to achieve full temperature compensation of the pressure sensor. Maximum error due to rapid thermal changes is approximately 0.5%.

## Logger Overview

The MX20L Water Level logger requires HOBOconnect. The Water Level Data Assistant in HOBOconnect transforms the logger's pressure and temperature data to water level data based on the reference water level, water density, and either a fixed barometric pressure or barometric pressure data file that you reference.

An LED in the clear window inside the end cap of the logger confirms that the logger is operating. The LED blinks every 4 seconds when the logger is logging (unless Show LED is disabled as described in *Configuring and Starting the Logger*.). The LED blinks multiple times when you hold the magnetic fob on the WAKE icon to wake up the logger or use Bluetooth communication. If you select *Illuminate Logger* in HOBOconnect, the logger illuminates the LED for 5 seconds.



Mounting hole

Removable end cap

Warning: Do not overtighten the cap.

Wake icon.

Sensor face. Make sure the sensor face is in the water when you deploy the logger (the sensor is located inside the logger case as represented by dashed lines in this diagram).

16.8 mm (0.66 in.)
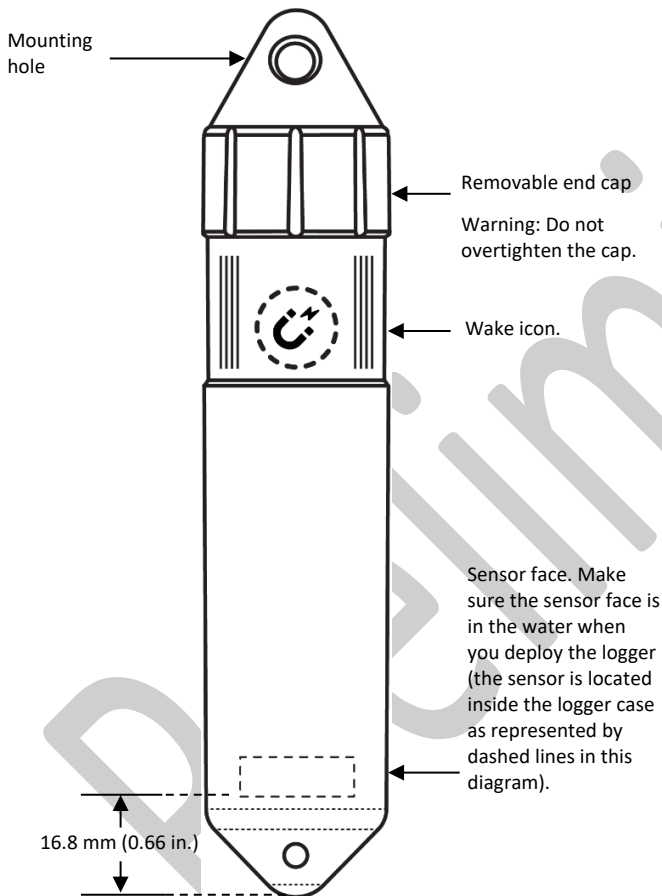
The logger can record two types of data: samples and events. Samples are the sensor measurements recorded at each logging interval (for example, the pressure every minute). Events are independent occurrences triggered by a logger activity, such as Bad Battery or Host Connected. Events help you determine what was happening while the logger was logging.

## About Obtaining Water Level Data

The logger records absolute pressure, which HOBOconnect later converts to water level readings. In this application, the absolute pressure includes atmospheric pressure and pressure

of the water column above the sensor. Atmospheric pressure is nominally 100 kPa (14.5 psi) at sea level, but it changes with weather and altitude. Left uncompensated, barometric variations may result in errors of 0.6 m (2 ft) or more.

To compensate for barometric pressure changes, you can use another HOBO MX20L Water Level logger deployed above the water in air. You may also use HOBO MX802 or MX2001 loggers as the source for barometric pressure data or you can import a barometric pressure file in CSV format. See *Obtaining Water Level Data using the Water Level Assistant* for details.

Barometric pressure readings are consistent across a region (except during fast-moving weather events), so you can generally use barometric pressure readings within 15 km (10 miles) of the logger without significantly degrading the accuracy of the compensation. Because of this, you can use one barometric data file to compensate all the water level loggers in an area. The MX20L-01 model with its 0–9 m (0–30 ft) range or the MX20L-04 with its 0–4 m (0–13 ft) range are both good barometric references due to their smaller range and temperature-compensated accuracy. HOBOconnect includes the Water Level Data Assistant for easy and accurate barometric compensation. See *Obtaining Water Level Data using the Water Level Assistant* for more details.

## Factory Calibration

The pressure sensor in each HOBO MX20L Water Level logger is individually calibrated at the factory. During factory calibration, raw pressure sensor data is collected at multiple pressures and temperatures over the calibrated range of the logger (see the specifications table). This data generates calibration coefficients that are stored in its non-volatile memory. The factory calibration system then checks the calibration coefficients to be sure that it meets its stated accuracy over the calibrated range.

You can use the logger at pressures and temperatures that are outside of the calibrated range, but we cannot guarantee its accuracy.

**Important: Never exceed the burst pressure of the sensor!**

## Waking the Logger and Bluetooth Communication

To communicate with the logger, you may need to wake it up using the magnetic fob. To do so, hold the magnetic fob on the WAKE magnet icon. This wakes the logger if it is asleep and turns on Bluetooth communication if it is off.

## Configuring and Starting the Logger

Before deploying the HOBO MX20L Water Level Logger in the field, perform the following steps:

1. Start HOBOconnect.
2. Wake the logger as described in the previous section *Waking the Logger*.
3. Select Devices, select the tile of the MX20L you want to configure, and select Customize Configuration & Start. Select Logger Settings to enter the Logging Interval and other settings.
4. Select any other settings that you need, including when to start logging and the logging interval.
5. To maximize battery life, confirm that the Power Saving Mode is set to Bluetooth Always Off.
6. Make sure that Temperature and Absolute Pressure are enabled. Once the logger configuration is what you want.
7. Tap the Start button.

# Deploying the Logger

The HOBO Water Level Logger is designed to be easy to deploy in many environments. The logger uses an absolute pressure sensor, so no vent tube is required. The small size of the logger is convenient for use in small wells and allows the logger to be mounted and/or hidden in the field. Follow these guidelines when deploying the logger:

- The pressure sensor is temperature compensated over the range of 0° to 40°C (32° to 104°F). To obtain the highest level of accuracy, allow the logger to come to full temperature equilibrium (approximately 20 minutes) before you record the reference water level.

- Avoid locations where the logger could experience sudden temperature changes, such as direct sun. When deploying a HOBO MX20L Water Level Logger for barometric pressure, choose a location that minimizes the rate of temperature fluctuations. Ideally, you should hang the barometric pressure reference logger several feet below ground level in an observation well where ground temperatures are stable (while making sure the logger remains above the water level). If that is not possible (or if you are not using a well), try to put the logger in a shaded location where it is not subject to rapid temperature changes.

- When deploying a HOBO Water Level logger in a well, make sure the well is vented to the atmosphere. Typically, you can drill a small hole in the well cap to ensure that the pressure inside and outside the well is at equilibrium. If this is not possible, use the barometric pressure reference logger in the same well.

- Use a no-stretch wire to hang the water level logger. Any change in length of the wire results in a 1-to-1 corresponding error in the depth measurement. Always pull-test a cable prior to deploying a logger in a well to make sure it does not stretch.

- If you are deploying the logger in a lake, river, or stream, you must first build a stilling well to protect the logger from vibration, shock, and movement. A simple stilling well can be constructed with PVC or ABS pipe. A properly constructed stilling well helps to protect the logger from currents, wave action, and debris. Suspend the logger in the stilling well so it is always underwater, but not on the bottom to be buried by silt.

  For more information, see the Technical Application Note called *How to Build a Stilling Well*.

- To prevent the logger from moving in currents and to ensure the support cable remains straight during deployment, you may need to add a weight to the suspension cable or hang a weight below the logger. Alternatively, you could deploy the logger in a stilling well as described above.

- Be very careful not to exceed the burst pressure for the logger. The pressure sensor will burst if the maximum depth is exceeded (see specifications table). Position the logger at a depth that allows the logger to remain in the water for the duration of the deployment, but does not exceed the rated bursting depth.

To deploy the logger:

1. Cut the wire to suspend logger.
   a. Measure the physical depth to the surface of the water from the suspension point.
   b. Cut a piece of stranded, stainless steel wire (Teflon coated is best) so that the logger is deep enough to always remain in the water. Estimate the low water level and make the cable long enough so that the logger is about 2 feet below that level.
2. Attach the wire to the suspension point and to the logger cap.
3. Restart the logger if desired.
4. Lower the logger into the well or stilling well.
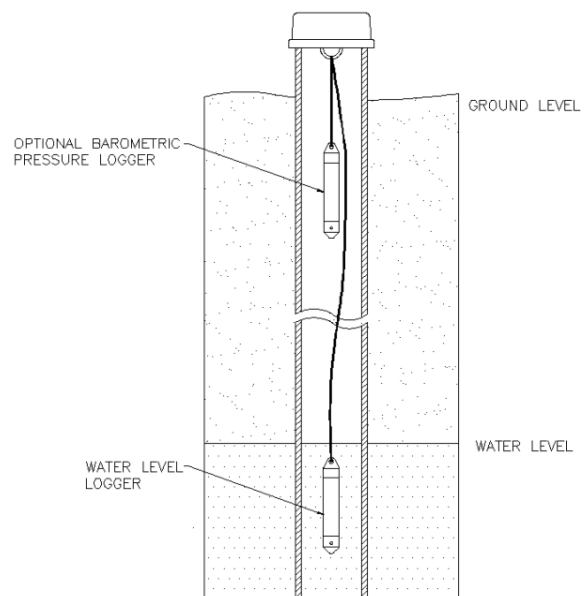


5. Measure the water level from the desired reference point (top of pipe, ground level, or sea level).

- To maximize accuracy, allow 20 minutes after deploying the logger before measuring water level to allow the logger to reach temperature equilibrium with the water.

- If the well is too small in diameter to measure the water level after deployment, measure the water level before deployment, then deploy the logger immediately and record deployment time.

6. Record the reference measurement date and time.

## Deploying a Water Level Logger for Barometric Pressure Data (Optional)

If you are using an MX20L logger to record barometric pressure data, it is best to start this logger before or at the same time as you start the water level loggers. This ensures that you have barometric pressure readings for compensating all of you water level logger data. To install a barometric pressure logger in a well:

1. Cut the wire for suspending the logger.
   a. Measure the physical depth to the surface of the water from the suspension point.
   b. Cut a piece of stranded, stainless steel wire (Teflon coated is best) so that the logger hangs about 2 feet below the ground surface but always above the water surface.
2. Attach the wire to the suspension point and to the logger cap.
3. Configure and start the logger using HOBOconnect, the same as described in *Configuring and Starting the Logger*. Note that the barometric logger does not have to log at the same rate as the water level logger because HOBOconnect can interpolate between barometric pressure readings if needed.
4. Lower the logger into the well or stilling well. Make sure the logger does not go below the water surface. See the diagram in the previous section.
5. Record the deployment time.

## Downloading Data From Loggers

**Don't forget to bring the magnetic fob with you to offload data! You will need this to wake the Bluetooth communication in the logger. Keep a spare in your car or truck in case you forget to bring one. In a pinch you can use a strong magnet.**

Note that you typically want to download the data from your water level loggers first and the associated barometric pressure logger after those. This ensures that you have barometric readings for all of your water level readings.

1. Measure the water level as described earlier. You can use it to verify that your logger has not shifted during the deployment. Record this water level with the date and time.
2. Pull the logger out of the well.
3. Download the data using HOBOconnect.
   a. Wake Bluetooth communication if necessary. See *Waking the Logger.*

   b. In HOBOconnect, select Devices.
   c. Select the tile for the device.
   d. Select Download Data. When HOBOconnect is done downloading data, you can choose Done or Export & Share. If you choose Export & Share, HOBOconnect prompts you for the location to save the file. Note that you may want to wait to export and share the data until after you have added the water level data using the Water Level Assistant.
4. Redeploy the logger (optional) as described later in this section.

To download data from an MX20L logger used for barometric pressure data:

1. Remove the logger from the well or housing if you need to wake Bluetooth communication.
2. Download the data using HOBOconnect as described above.
3. Redeploy the logger (optional) as described below.

Use HOBOconnect to restart the logger if desired. If you want the data to be in one data file and there is enough memory in the logger, you can just allow the logger to continue to log and the new data will be appended to the data in logger memory. If you want to maximize the memory available for the next deployment, stop the logger and start a new deployment.

You can reuse the existing mounting method. Check that the water level logger remained in the water and the barometric logger remained out of the water for the previous deployment. Take a new reference reading with the date and time as described in this section. Record this information in your field notebook to use later to process the data with the water level assistant. Note that this new reference reading zeroes out any measurement drift error.

## Obtaining Water Level Data using the Water Level Assistant

To derive the water level data using barometric pressure data, use the Water Level Assistant in HOBOconnect as described below.

For barometric pressure data from sources other than Onset products, see *Barometric Data from Other Sources* below.

1. In HOBOconnect, select the Data tab and tap the data file from the water level logger. The Data File Viewer opens, showing a graph of the logger data.
2. Run the Water Level Assistant.
   a. Tap the water level assistant icon (the one that looks like a ruler.)
   b. Select the water density that best describes the water that you are measuring or enter the actual water density. Select the units.
   c. Select Use a Reference Water Level and enter the Reference Water Level that you measured at the beginning of the deployment.

      Enter the water level as a positive number if it is measured upward from a reference point below the water's surface, such as the water's height above sea

level. This illustration shows an example of when to enter the water level as a positive number.
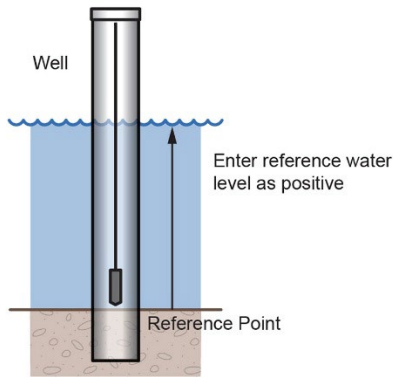


Enter the water level as a negative number if it is measured downward from a reference point above the water's surface, such as the top of the well. This illustration shows an example of when to enter the water level as a negative number.
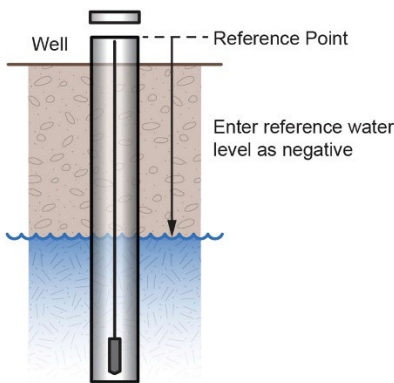


d. Select the Reference Time from the pull-down menu that is closest to the recorded date/time for the reference water level measurement. If you measured the level before deployment because of pipe size, then select a date/time after the start of the deployment.

3. To view the newly created water level data, tap Proceed.

Measurement error can be caused by manual measurement error, sensor drift, or change in the suspension cable length.

To quantify measurement error (which is ideally zero), compare the calculated water level at the end of the plot with the water level measured just before you removed the water level logger.

## Barometric Pressure Data from Other Sources

If you choose to use barometric pressure data from a third-party weather station or barometric pressure logger, you need to convert the date, time, and pressure data to a CSV file with special header and format requirements. It is easiest to do this work in Microsoft® Excel® and then save the data as a CSV file. For information on how to format the CSV file, see the *HOBOconnect User Guide*.

If you choose to use barometric pressure data from an online weather station, such as the National Weather Service, the

measured barometric pressure data is modified to be at sea level. This sea level pressure is useable since all pressure offsets are zeroed when you enter the reference measurement.

When you select the barometric data file in the Water Level Assistant (see previous section), select the CSV file that you generated.

## Maintenance

The logger requires the following periodic maintenance to ensure optimal operation:

* **Protect the logger. This logger can be damaged by shock.** Always handle the logger with care. The logger may lose its calibrated accuracy or be damaged if it is dropped. Use proper packaging when transporting or shipping the logger.

> **Important: Do not attempt to open the logger housing!** Trying to take apart the logger causes serious damage to the pressure sensor and logger electronics. There are no user serviceable parts inside the case. If your logger requires servicing, contact Onset Technical Support by calling 1-508-759-9500 or by clicking Onset Technical Support.

* **Periodically, inspect the logger for biofouling**. Biological growth on the face of the pressure sensor will throw off the pressure sensor's accuracy. Organisms that grow inside the sensor nose cone and on the sensor itself can interfere with the sensor's operation and eventually make the sensor unusable. If the deployment area is prone to biofouling, check the logger periodically for marine growth.

* **Be careful of solvents.** Check a materials-compatibility chart against the wetted materials listed in the Specifications table before deploying the logger in locations where untested solvents are present. The logger has Viton and Buna-N O-rings, which are sensitive to polar solvents (acetone, ketone), ammonia, chlorine, and brake fluids. The sensor is mounted in an acetal holder. Acetal is resistant to most solvents, fuels, and lubricants. The mounting end cap is polypropylene. The logger is still waterproof with this end cap removed.

* Compensating for Drift

All pressure sensors drift over time. The drift for the pressure sensor and electronics in the HOBO MX20L Water Level logger is less than 0.5% FS (worst case) per year. In most applications, drift is not a significant source of error, because the offset created by any drift is zeroed out when you take a manual reference level measurement and use the logger software to automatically calculate the level readings relative to the reference measurement. In effect, you are re-zeroing the sensor each time you apply a reference reading to the data file.

Pressure sensor drift matters only when absolute pressure values are needed, or if there are no recent reference level or depth measurements available. For example, if the logger is deployed for one year and no new reference level readings are taken during the deployment, it is possible that the sensor could have drifted as much as 0.5% FS by the end of the deployment.

It is possible to determine the actual amount of drift during a deployment if a reference level is taken at the beginning and the end of a long-term deployment. The results of applying the two different reference levels (once at the beginning of the data file, and again at the end of the data file) can be compared. Any difference between the files indicates the amount of sensor drift (assuming accurate reference levels).

## Verifying Accuracy

You can check the *differential accuracy* of your loggers for water level measurements by deploying the loggers at two depths and comparing the difference in level readings. When verifying the accuracy this way, be sure to allow the loggers' temperature to stabilize at each depth. Use the logger software to convert the readings from pressure to level. The level readings should be taken close enough together that the barometric pressure does not change.

You can check the *absolute pressure accuracy* of your HOBO MX20L Water Level Logger by comparing its ambient pressure readings to a second HOBO logger. Their readings should be within each other's specified accuracy. Alternatively, you can check the pressure reading against an accurate local barometer. If you use a non-local source of barometric information, such as the NOAA website, adjust for altitude.

## Battery Guidelines

The battery in the HOBO MX20L Water Level Logger is a 3.6 Volt lithium battery.

- **Battery Life.** Refer to the Specifications to learn about battery life. Actual battery life is a function of the number of deployments, logging interval, and operation/storage temperature of the logger. Frequent deployments with

logging intervals of less than one minute, and continuous storage/operation at temperatures above 35°C result in significantly lower battery life. For example, continuous logging at a one-second logging interval results in a battery life of approximately one month.

To obtain the specified battery life, operate and store the logger at temperatures between 0° and 25°C (32° and 77°F).

- **Battery Level:** The battery level shown for these loggers is based on the battery voltage. The Lithium batteries in these loggers maintain a flat voltage until they are near the end of their capacity. Therefore, it is best to replace the batteries or loggers based on how long they have been deployed. Once they have been used for 90% of the specified battery life, you should not use the loggers for extended deployments. If the loggers are deployed beyond this time, schedule frequent site visits to minimize the risk of data loss. Once the battery indication goes below 50% (when checked at room temperature), you should replace the loggers or return them to Onset or an authorized Onset service center for battery replacement and logger tune-up/recalibration.

⚠ **WARNING:** Do not cut open, incinerate, heat above 100°C (212°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.

**FC** **Federal Communication Commission Interference Statement (United States)**

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 (Canada)**

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 HOBO MX1101 loggers must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

**NCC Statement (Taiwan)**

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.