



DOC026.97.80348

HL4 Sonde

11/2013, Edition 1

User Manual

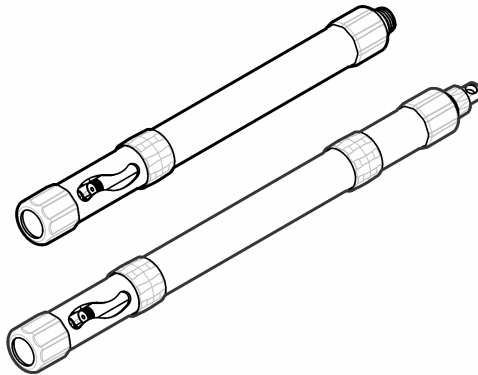


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Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions	Diameter: 4.44 cm (1.75 in.) without rubber bumpers; 5.33 cm (2.1 in.) with rubber bumpers Length: 51.43 cm (20.25 in.) with no internal battery pack and standard sensor guard; 66.358 cm (26.125 in.) with no internal battery pack and extended sensor guard; 62.23 cm (24.5 in.) with internal battery pack and standard sensor guard; 77.787 cm (30.625 in.) with internal battery pack and extended sensor guard
Weight	2.2 kg (5 lb) with internal battery pack and storage/calibration cup
Power requirements	6–24 VDC (12 VDC nominal) applied to the communications module, 12 VDC: 250 mW average, 18 W peak
Internal battery pack (optional)	Internal alkaline D-cell battery, non-rechargeable Approximately 75 days of use with a 15-minute logging interval and a 30-second warm-up time with temperature, conductivity, pH and LDO sensors installed.
Operating temperature ¹	–5 to 50 °C (23 to 122 °F), non-freezing
Storage temperature	1 to 50 °C (34 to 122 °F)
Depth	200 m (656 ft) maximum Note: Some sensors cannot be used at 200 m (656 ft). Refer to the sensor documentation for the sensor depth specifications.
Tensile strength (maximum)	Mooring cap: 68 kg (150 lb); deployment cable: 227 kg (500 lb)
Sensors	Temperature sensor, four external sensor ports and optional internal depth sensor Refer to the sensor documentation for sensor specifications.
Communications	Communications module: USB, SDI-12, RS232 Modbus, RS485 Modbus and RS232 TTY
Logging	4 GB of internal memory ² ; 1 second interval minimum

¹ Operation outside of this temperature range can result in mechanical damage or faulty electronic performance.

² Sufficient memory to keep 5 years of continuous measurements with a 15-minute logging interval

General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Safety information

NOTICE

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

Use of hazard information

⚠ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION



Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	<p>This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.</p>
	<p>Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user.</p> <p><i>Note: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.</i></p>

Certification

Canadian Radio Interference-Causing Equipment Regulation, IECS-003, Class A:

Supporting test records reside with the manufacturer.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe A répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "A" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Disconnect the equipment from its power source to verify that it is or is not the source of the interference.
2. If the equipment is connected to the same outlet as the device experiencing interference, connect the equipment to a different outlet.
3. Move the equipment away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

Product overview

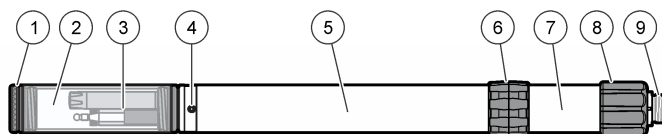
NOTICE

Do not use this instrument in water that contains contamination that will cause damage to the sensors or the housing (e.g., extreme acids or bases, high concentrations of organic solvents, oil/grease, toxic metals or radioactive waters).

This portable instrument is used for spot measuring or unattended monitoring of environmental water sources (fresh and salt water). Refer to [Figure 1](#). The parameters measured by the instrument are identified on the instrument and the Hydrolab Operating Software.

This instrument has a temperature sensor, four external sensor ports and an optional internal depth sensor. The four external sensor ports can include a maximum of four different sensors. Refer to the part numbers on the sensors and the sensor documentation to identify the sensors installed. All sensors are installed at the factory and are not user-replaceable without authorization from the manufacturer.

Figure 1 Instrument overview



1 Calibration cap for the storage/calibration cup	6 Middle rubber bumper (2x) ³
2 Storage/Calibration cup ¹	7 Battery compartment ⁴
3 Sensors in clear pH 4 buffer	8 End rubber bumper (2x) ³
4 Locking screw (2x) ²	9 Connector
5 Housing	

¹ The standard version is shown.

² For manufacturer use only

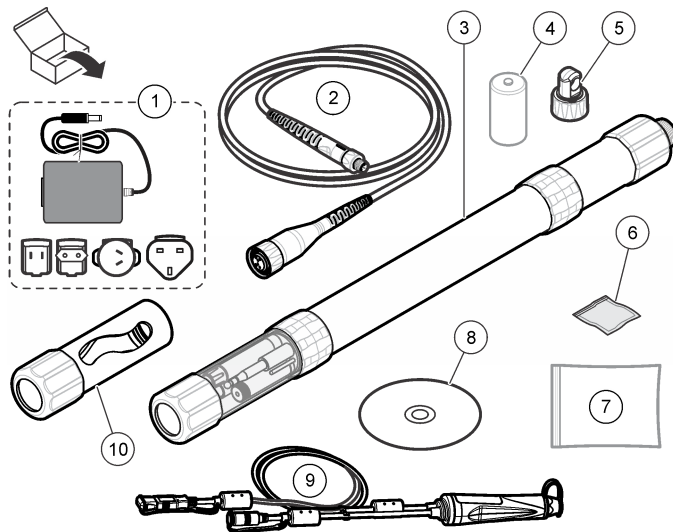
³ Remove the middle bumpers and end bumpers as necessary to use the instrument in a narrow space such as a 5-cm (2-in.) well.

⁴ Units with an internal battery pack only

Product components

Make sure that all components have been received. Refer to [Figure 2](#). If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Figure 2 Instrument components



1 AC power adapter	6 Silicone grease packet
2 Calibration cable ¹	7 Sensor maintenance kit(s) ³
3 HL4 sonde	8 Hydrolab Operating Software CD
4 D-cell battery ²	9 USB communications module
5 Mooring cap	10 Sensor guard with weight ⁴

¹ Not for use in water. Instrument damage will occur.

² Supplied with units with an internal battery pack

³ Supplied with some sensors.

⁴ The standard version is shown.

Startup

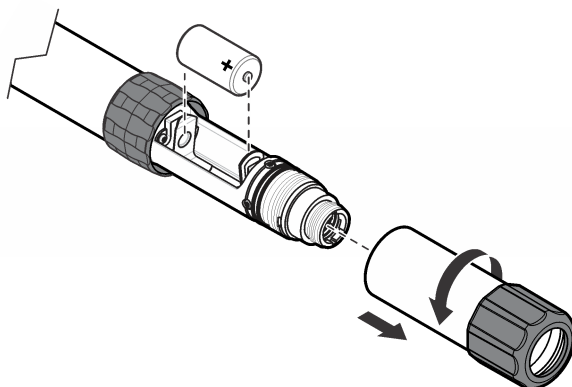
Install the battery

⚠ WARNING



Explosion hazard. Incorrect battery installation can cause the release of explosive gases. Be sure that the battery is of the approved chemical type and is inserted in the correct orientation.

For instruments with an internal battery pack, install the supplied D-cell battery. Refer to [Figure 3](#).

Figure 3 Install the battery

Install the software

Install the Hydrolab Operating Software on a PC.

Items to collect:

- PC with Windows XP SP3 or newer
- Hydrolab Operating Software CD

1. Put the CD in the PC. The installation program starts.
2. Complete the steps in the software prompts to install the software on the PC.

Connect to the PC

Connect the instrument to the PC.

Items to collect:

- PC with Hydrolab Operating Software
- Calibration cable or optional deployment cable
- Communications module
- Power adapter*

1. Connect the instrument to the PC. Refer to [Figure 4](#).

To connect to a different power adapter or communications module than those shown, refer to the documentation supplied with the power adapter or the communications module.

Note: An external power connection is optional for instruments with an internal battery pack. The battery is not used when external power is used.

2. At initial installation and each time a different USB port on the PC is used:
 - a. Windows prompts that a new device is found and opens a wizard window. Select **No, not this time** to search for software, then click **Next**.
 - b. Select **Install the software automatically (Recommended)**, then click **Next**. No CD is necessary.
Windows installs the software driver for the communications module.

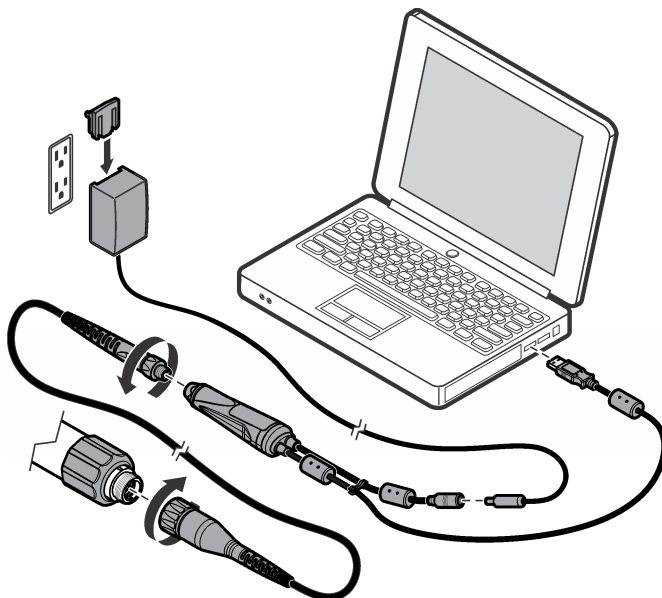
* Optional for instruments with an internal battery pack

3. Start the Hydrolab Operating Software. The connected instrument shows in the Connect to Device field.

Note: If step 2 is not done at initial installation, the instrument will not be shown in the Connect to Device field.

4. Select the instrument, then click **Connect**.

Figure 4 Connect the instrument to the PC



Operation

Configuration

Configure the software, instrument and sensor settings. Refer to *Configuration* in the online help.

Calibration

Calibrate the sensors before initial use, at regular intervals and after sensor maintenance or modifications. Refer to *Calibration* in the online help.

Periodically, do a calibration check to make sure that measurements are still within tolerance range. Refer to *Calibration* in the online help.

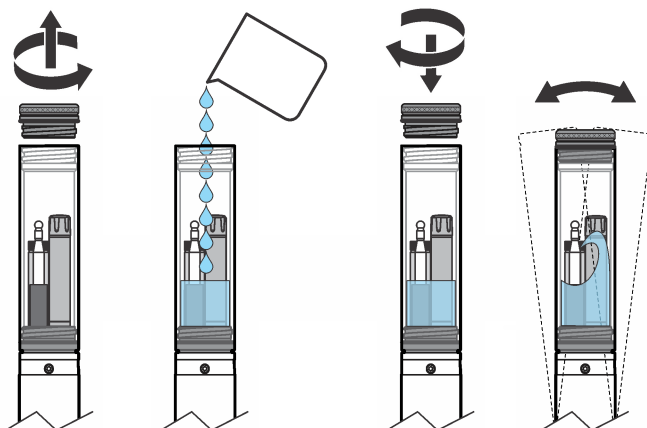
Prepare the sensors for calibration

Before calibration, always rinse the storage/calibration cup and clean the sensors to prevent contamination of the calibration standards.

1. Rinse the storage/calibration cup with clean water.
2. Clean the sensors. Refer to the sensor documentation for instructions.
3. Rinse the sensors at least three times with deionized water. Refer to [Figure 5](#).
4. Rinse the sensors at least two times with a calibration standard. Refer to [Figure 5](#).

For the best results, discard the deionized water and calibration standard after each rinse.

Figure 5 Rinse the sensors



Deployment guidelines

NOTICE

Always install the mooring cap or connect the deployment cable to the instrument before deployment to keep the connector dry. Do not use the calibration cable for deployment because the connector will get wet.

NOTICE

Always install the sensor guard before deployment or sensor damage can occur.

- Do not apply more than 68 kg (150 lb) of additional weight to the instrument when the mooring cap is used.
- Do not apply more than 113 kg (250 lb) of additional weight to the instrument when the deployment cable is used.
- Do not hang weight from the sensor guard. Refer to [Specifications](#) on page 3 for the tensile strength of the mooring cap and deployment cable.

Cable care

- Lubricate the sealing surface of the mooring cap and the optional deployment cable with silicone grease on a cotton swab at regular intervals and as necessary.
- Keep all non-waterproof cables (all cables except the deployment cable) in a clean, dry and non-corrosive environment. If a cable gets dirty or wet, clean and/or air dry the cable before use.
- Do not put non-waterproof cables in a coil any tighter than 30.5 cm (12 in.) in diameter or cable damage can occur.
- Do not put a knot in cables or use clips to mark a depth.
- Do not bend or pull the deployment cable over pulleys with less than 10 cm (4 in.) radius or 20 cm (8 in.) in diameter.
- Use a powered or hand-cranked reel with electrical slip-rings to lower and raise the instrument if the cables are very long. A lighter reel without slip-rings for shorter cables can be used.

Short-term (attended) deployment

NOTICE

Do not put the instrument where the deployment cable could be cut or damaged by boat propellers or other moving objects.

Deployment with a PC

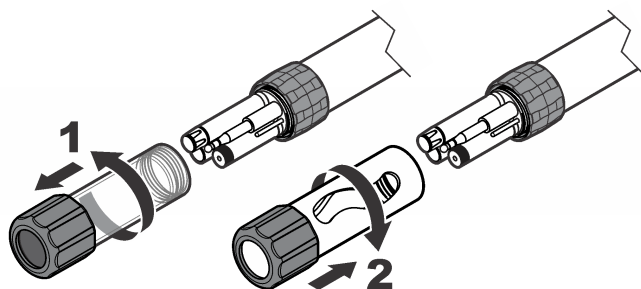
Items to collect:

- PC with Hydrolab Operating Software
- Sensor guard
- Deployment cable
- USB communications module
- Power adapter**

1. Connect the instrument to the PC. Refer to [Connect to the PC](#) on page 7. Make sure to use the deployment cable and not the calibration cable.
2. Remove the storage/calibration cup and install the sensor guard. Keep the storage/calibration cup for later use. Refer to [Figure 6](#). Do not let the sensors become dry.
3. Lower the instrument into the water to be measured. For the best results, make sure that all of the instrument is in the water.
4. Click **Monitoring** to view real-time measurements. Refer to *Monitoring* in the online help.

When measurements are complete, prepare the instrument for travel. Refer to [Prepare for storage or travel](#) on page 16.

Figure 6 Install the sensor guard



Long-term (unattended) deployment

Deployment with a mooring cap

Only instruments with an internal battery pack can be deployed with a mooring cap.

Items to collect:

- PC with Hydrolab Operating Software
- Sensor guard
- Mooring cap
- Rope or wire line
- Calibration cable
- USB communications module
- Power adapter***

1. In the office or the field, add a new log to the instrument.
Measurements are saved to the new log according to the selected measurement interval and date range.
 - a. Connect the instrument to a PC. Refer to [Connect to the PC](#) on page 7.

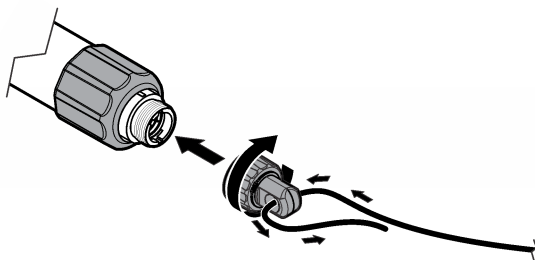
** Optional for instruments with an internal battery pack

*** Optional for instruments with an internal battery pack

- b. Click **Logging**, then add a new log. Refer to *Logging* in the online help.
 - c. Select **File>Disconnect from Device** to disconnect the instrument from the PC.
*Note: As an alternative, click **Devices**, select the instrument, then click **Disconnect**.*
 - d. Disconnect the calibration cable from the instrument.
2. Install the mooring cap on the instrument. Refer to [Figure 7](#). Turn the bottom of the mooring cap to install it.
Note: To remove the mooring cap, turn the bottom of the mooring cap. The top of the mooring cap will not turn when the mooring cap is installed.
 3. In the field, attach a rope or wire line to the mooring cap. Refer to [Figure 7](#).
 4. Remove the storage/calibration cup and install the sensor guard. Refer to [Figure 6](#) on page 10. Keep the storage/calibration cup for later use. Do not let the sensors become dry.
 5. Lower the instrument into the water to be measured. For the best results, make sure that all of the instrument is in the water.
 6. Attach the instrument to a buoy, anchor or structure. Refer to [Attach to a buoy, anchor or structure](#) on page 12.

When deployment is complete, prepare the instrument for travel. Refer to [Prepare for storage or travel](#) on page 16.

Figure 7 Install the mooring cap



Deployment with a data acquisition system or controller

To remotely collect real-time measurements from the instrument, connect the instrument to a data acquisition system (i.e., data logger or modem) or a controller with an applicable communications module.

The instrument stays in low-power (sleep) mode until it receives a command from the external device to switch on, complete a measurement and transmit the measured parameters back to the external device. Refer to the online help for SDI-12 commands and TTY commands supported by the instrument. Refer to the manufacturer's website for Modbus commands.

Configure the communications module

Items to collect:

- PC with Hydrolab Operating Software
 - Communications module
1. In the office or the field, connect the applicable communications module to a USB port on the PC.
 2. Start the Hydrolab Operating Software. The connected communications module shows in the Connect to Device field.
 3. Select the communications module, then click **Connect**. The configuration windows for the communications module shows.
 4. Configure the communications module. Refer to *Configuration* in the online help.

5. When configuration is completed, disconnect the communications cable from the PC.
 - a. Select **File>Disconnect from Device** to disconnect the communications cable from the PC.

*Note: As an alternative, click **Devices**, select the communications cable, then click **Disconnect**.*
 - b. Disconnect the communications cable from the PC.

Connect the communications module

Items to collect:

- Data acquisition system or controller
 - Communications module (configured)
 - External power source, 6-24 VDC (12 VDC nominal) ****
1. In the field, connect the communications module to the data acquisition system or controller. Refer to the documentation supplied with the communications module for wiring information. Refer to [Data transmission and power wiring](#) on page 12 for the wiring requirements for data transmission.
 2. If the data acquisition system or controller cannot supply power to the communications module, connect an external power source to the communications module. Refer to [Data transmission and power wiring](#) on page 12 for the wiring requirements for external power.

Data transmission and power wiring

To connect data transmission lines to the communications module, make sure that the transmission cable is sufficient for the operating current and will transfer the data without distortion. For up to 305 m (1000 ft) of cable, three 26 AWG wires are sufficient.

To connect external power to the communications module, make sure to use two 18 AWG wires for power. Smaller power wires can be used if the power supply is near the instrument.

Instrument deployment

Items to collect:

- Deployment cable
 - Sensor guard
1. Connect the deployment cable to the communications module. Make sure to use the deployment cable and not the calibration cable.
 2. Connect the deployment cable to the instrument.
 3. Remove the storage/calibration cup and install the sensor guard. Keep the storage/calibration cup for later use. Refer to [Figure 6](#) on page 10. Do not let the sensors become dry.
 4. Lower the instrument into the water to be measured. For the best results, make sure that all of the instrument is in the water. Do not put the communications module in the water.
 5. Attach the instrument and cabling to a structure. Refer to [Attach to a buoy, anchor or structure](#) on page 12.

When deployment is complete, prepare the instrument for travel. Refer to [Prepare for storage or travel](#) on page 16.

Attach to a buoy, anchor or structure

NOTICE

Do not use pipe clamps to attach the instrument because instrument damage can occur.

For unattended monitoring, attach the instrument to a buoy, anchor or structure.

**** Optional for instruments with an internal battery pack. Not used when the data acquisition system or the controller can supply power to the communications module.

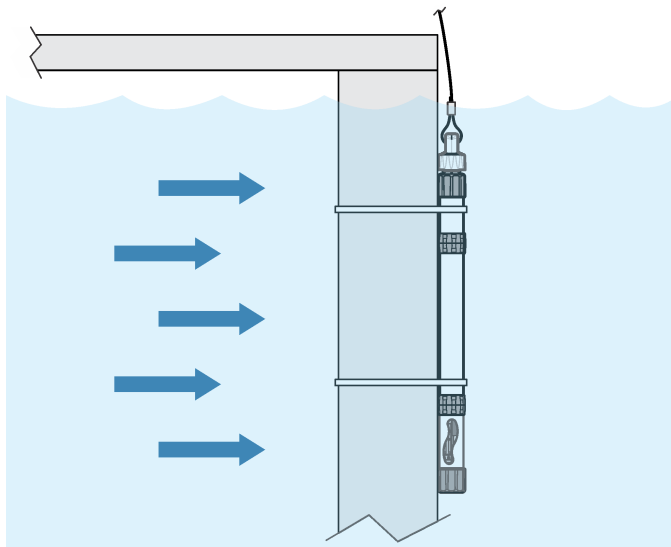
Install in a location:

- Where instrument damage will not occur such as from floating material, sand, gravel, silt, navigation or vandalism
- Where the instrument will not come in contact with mud such as after the water recedes
- Where ice will not form around the instrument or sensors

To attach the instrument to a:

- Buoy—use a marking buoy that will not attract vandalism.
- Structure—attach the instrument to the downstream side of a piling to prevent damage from floating material. Refer to [Figure 8](#). Carefully install straps such as web belts and large plastic Tie-wraps on both ends of the instrument housing. Attach the deployment cable in the same way (if used) to prevent cable damage from floating material, navigation and vandalism. To prevent vandalism, install the instrument and cable so they are not easily seen.

Figure 8 Attach the instrument to a structure



Maintenance

▲ CAUTION



Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

▲ CAUTION



Personal injury hazard. Because of pressure buildup inside of the instrument, removable parts can disengage with force when removed. Loosen and remove the parts slowly. Point the parts away from people and wear the appropriate protective equipment during maintenance or service activities.

NOTICE

Do not disassemble the instrument for maintenance without authorization from the manufacturer. If the internal components must be cleaned or repaired, contact the manufacturer.

NOTICE

Keep the instrument in a location where the sensors will not freeze or sensor damage will occur.

Clean the housing and the sensor guard**NOTICE**

To prevent damage to some sensors and the instrument, do not use solvents that dissolve plastic to clean the housing and sensor guard.

At regular intervals, examine the instrument housing and sensor guard. Clean the housing and sensor guard as necessary to remove unwanted material and deposits.

1. Remove the sensor guard from the instrument.
2. Pour a minimum of 2.5 cm (1 in.) of pH 4 buffer or clean tap water into the storage/calibration cup.
3. Install the storage/calibration cup on the instrument.
4. Clean the housing and sensor guard with:
 - Mild detergent
 - Non-toxic, degreasing solution, such as Simple Green® (A registered trademark of Sunshine Makers, Inc.)
 - Warm water
 - Clean, soft toothbrush
 - Soft cloth and/or cotton swabs

If necessary, soak the sensor guard and/or housing in water for at least 30 minutes to make the contaminates soft and easier to remove.
5. Rinse the housing and sensor guard with clean water.

Clean the sensors

At regular intervals, examine the sensors for unwanted material, deposits (inorganic and biological) and damage. Clean the sensors if unwanted material is found. In addition, clean the sensors if sensor performance has degraded. Refer to the sensor documentation for cleaning instructions.

Replace any damaged parts (e.g., sensor membranes). Replace any parts with fouling (sedimentary and/or biological) that affects performance and cannot be removed. Refer to the sensor documentation for maintenance instructions.

Replace the battery**▲ WARNING**

Explosion hazard. Incorrect battery installation can cause the release of explosive gases. Be sure that the battery is of the approved chemical type and is inserted in the correct orientation.

▲ WARNING

Explosion hazard. An expired battery can cause hydrogen gas buildup inside the instrument. Replace the battery before it expires. Do not store the instrument for long periods with a battery installed.

For instruments with an internal battery pack, replace the D-cell battery when the battery power level is low. Refer to [Figure 3](#) on page 7. The battery power level is shown at the top of the Hydrolab Operating Software window.

Replace the battery with the same type and rating. Refer to the internal battery pack requirements in [Specifications](#) on page 3.

