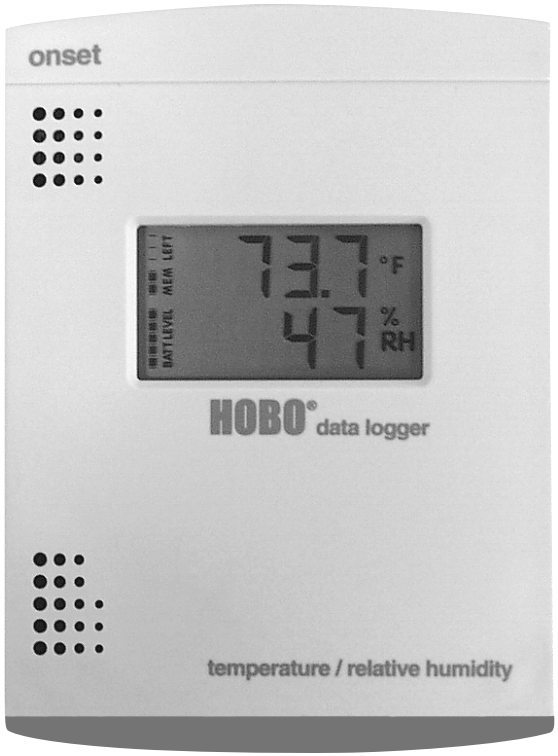
HOBO® LCD Data Logger
User's Manual



Document #: 7054-A MAN-H14-00X

Inside this package

The Onset HOBO LCD data logger is shipped with:

- HOBO LCD data logger CE, part number H14-001 (internal sensor) or H14-002 (external probe)
- 2 mounting screws
- 3 AAA batteries

Thank you and congratulations on your purchase of the HOBO® LCD data logger from Onset Computer Corporation. Please read this manual thoroughly before operating your HOBO LCD logger. Refer to the BoxCar® Pro User's Manual for details on using the host PC software. If you are also using a Palm™ handheld and HandCar® software, refer to the HandCar User's Manual.

⚠ WARNING: The HOBO LCD Logger, Remote Alarm, and/or Autodialer are not certified for and should not be deployed in any hazardous (classified) location where ignitable concentrations of gas and/or dust exist.

IMPORTANT: The HOBO LCD Logger, Remote Alarm, and/or Autodialer are not intended for and should not be used for medical or life support, aerospace, or nuclear installation applications.

Software/Cable Requirements

The HOBO LCD logger requires Onset Computer Corporation's BoxCar Pro software version 4.3 or later and a PC interface cable for operation. For optional operation with a Palm handheld, the HOBO LCD logger requires HandCar software version 1.1 or later, and a Palm handheld interface cable.

Functional Overview

The HOBO LCD logger records time-stamped relative humidity (RH) and temperature measurements in nonvolatile memory and also displays the current temperature and RH on the LCD. Logging parameters are set from a host computer running BoxCar Pro software. The logger is then started using the host computer or a Palm handheld running HandCar software. The logger updates displayed measurements every five seconds. The sample (logging) interval is software-selectable from one second to nine hours. Data in the LCD logger can be offloaded to a host computer or Palm handheld.

Additional Features

- ALERT indicator signals when temperature or relative humidity limits have been exceeded (software-selectable using BoxCar Pro).
- Contact closure connections for optional remote audio alarm and/or autodialer. Triggers on ALERT conditions.
- Memory Left (MEM LEFT) indicator on LCD shows how much data storage space remains.
- Battery Level (BATT LEVEL) indicator on LCD shows how much useful battery life remains.
- Software-selectable Fahrenheit or Celsius temperature units.
- Internal relative humidity measurement range of 15% to 95%.
- Internal temperature measurement range of -20°C to +50°C (-4°F to +122°F).
- External probe model with choice of temperature and temperature/RH probes (see specifications on page 13).
- Operates for one year on three alkaline AAA batteries in typical conditions.

product(s), properly packaged to protect against further damage, to Onset (at your expense) with the RMA number marked clearly on the outside of the package. Onset is not responsible for any package that is returned without a valid RMA number or for the loss of the package by any shipping company. Products must be clean and free of any toxins before they are sent back to Onset or they may be returned to you.

Repair Policy

Products that are returned after the warranty period or that are damaged by the customer as specified in the warranty provisions can be returned to Onset with a valid RMA number for evaluation.

Optional Services

Please contact Onset for more information and prices on:

- **ASAP Repair.** Onset will expedite the repair of a returned product.
- **Data-back™ Service.** HOBO data loggers store data in nonvolatile EEPROM memory. Onset will, if possible, recover your data to a disk.
- **Tune Up Service.** Onset will examine and retest any HOBO data logger.

Warranty

Onset Computer Corporation ("Onset") warrants to the original end-user purchaser for a period of one year from the date of original purchase that the HOBO® product(s) purchased will be free from defect in material and workmanship. During the warranty period Onset will, at its option, either repair or replace products that prove to be defective in material or workmanship. This warranty shall terminate and be of no further effect at the time the product is (1) damaged by extraneous cause such as fire, water, lightning, etc. or not maintained in accordance with the accompanying documentation; (2) modified; (3) improperly installed; (4) repaired by someone other than Onset; or (5) used in a manner or purpose for which the product was not intended.

Disclaimer and Limitation of Liability

ONSET'S OBLIGATION UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT. ONSET SHALL HAVE NO LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THE HOBO® PRODUCT(S) EVEN IF ONSET KNEW OR SHOULD HAVE KNOWN OF THE POSSIBILITY OF SUCH DAMAGES.

Onset shall not be liable for injury to persons or property resulting from the use of HOBO® product(s) or the failure of such product(s). Onset's liability, if any, shall be limited to the original purchase price paid for the product. Onset assumes no liability for installation of the product(s) and/or interruptions of service due to strikes, riots, floods, fire, and/or any cause beyond Onset's control.

Legal Remedies

This warranty gives you specific legal rights. You may also have other rights which vary by jurisdiction. The remedies provided herein are in lieu of all other remedies, express or implied.

- Temperature accuracy: ±0.7°C at +20°C (±1.3°F at +68°F), see plot B *
- Temperature resolution: 0.4°C at +20°C (0.7°F at +68°F)
- Temperature accuracy drift: <0.1°C (0.2°F) per year, typical
- Temperature response time to 90%: 8 minutes typical in airflow of 2 m/s (4.5 mph)

Environmental

- Operating RH range: 0% to 100% intermittent condensing environments up to +30°C (+86°F) and non-condensing above +30°C (+86°F)
- Operating temperature range: -40°C to +75°C (-40°F to +167°F)

** The H14-001 meets CE specification EN61326 criterion A for ESD and Immunity. The H14-002 meets CE specification EN61326 criterion C for ESD and criterion B for Immunity. To minimize measurement errors due to ambient RF, use the shortest possible probe cable length and keep the probe cable as far as possible from other cables.*

Service and Support

HOBO® products are easy to use and reliable. In the unlikely event that you have a problem with this instrument, please read the following:

Who do I contact?

Contact the company that you bought the loggers from: Onset or an Onset Authorized Dealer. Before calling, you can evaluate and often solve your problem if you try the following:

1. Write down the events that led to the problem. Are you doing anything differently?
2. Visit the Technical Support section of the Onset web site at www.onsetcomp.com/support.html.

When contacting Onset, please indicate that you need Technical Support for the HOBO LCD logger. Be prepared to:

- Provide the product number and serial number for the HOBO LCD logger and software version in question.
- Completely describe the problem or question. The more information you provide, the faster and more accurately we will be able to respond.

Onset Technical Support

Onset Computer Corporation
470 MacArthur Blvd., Bourne, MA 02532
Mailing: PO Box 3450, Pocasset, MA 02559-3450
Phone: 1-800-LOGGERS (1-800-564-4377) or 508-759-9500
Fax: 508-759-9100
E-mail: loggerhelp@onsetcomp.com
Internet: www.onsetcomp.com

Returning Products to Onset

Direct all warranty claims and repair requests to place of purchase. Before returning a failed unit, you must obtain a Return Merchandise Authorization (RMA) number from Onset. You must provide proof that you purchased the Onset product(s) directly from Onset (purchase order number or Onset invoice number). Onset will issue an RMA number that is valid for 30 days. You must ship the

Installing Batteries

To begin operation of the HOBO LCD logger, remove the battery door (back of unit) and insert the three AAA batteries. Ensure the batteries are installed in the proper direction, then replace the battery cover. After installing the batteries, the LCD will display all characters for five seconds. Thereafter, the LCD will display temperature and % RH information for 30 seconds (external probe model needs probe installed). After this, the logger will go into battery conservation mode and display only the battery level. The logger will awake from battery conservation mode and display data when launched with the host software.

The HOBO LCD logger has nonvolatile EEPROM memory that retains data even if the batteries fail. As an extra precaution, do not remove batteries while logger is recording data.

Install External Probe *(external probe model H14-002 only)*

The H14-002 external data logger requires a compatible external temperature/relative humidity probe or temperature probe (see *External Probe Specifications* on page 13). Plug the external probe into the RJ-12 jack on the side of the HOBO LCD logger. If an H14-002 logger is launched and no external probe has been connected, the display will show dashes "---" (Figure 1) and will log false values (-69°C/-92°F for temperature and 0% for RH). **Make sure the probe is installed before logging begins, and do not remove the probe once logging starts.** If a temperature-only probe is connected, no RH value should be displayed (Figure 2). A display of --% RH (Figure 3) indicates that the humidity channel is active in the software and should be turned off to maximize memory space. Otherwise, the unit will record a 0% RH value at every logging interval. 100% RH is displayed if a temperature/RH sensor is connected and is covered with condensation. The sensor will not provide accurate readings until it has dried out. In some applications, it may be more convenient to permanently mount a remote probe at the site (e.g., refrigerator, freezer, clean room). Be sure to place the remote probe's sensor in a location that is representative of the target measurement location and allows free flow of air (beware of any drafts caused by vents, doors, etc). See *External Probe Mounting Details* on page 11 for additional mounting information.

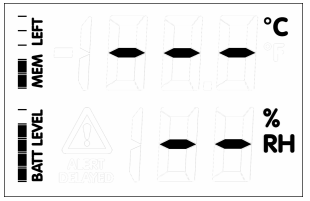


Figure 1

H14-002 display when no external sensor is connected. False values, -69°C (-92°F)/0%RH will be logged until a sensor is connected.

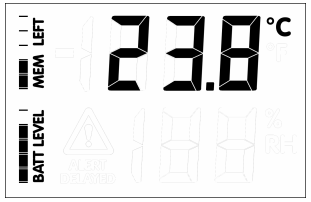


Figure 2

Display when external temperature sensor is installed, with no RH sensor.

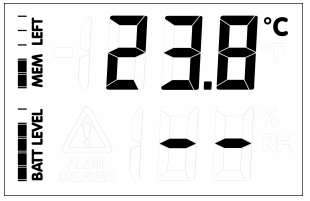


Figure 3

Display when no RH sensor is installed, but RH is still active in software. Turning RH off in software will maximize logger space.

It is possible to disconnect the remote probe and transport the HOBO LCD logger back to the host PC for data off-loading and relaunching. See details in *Launching the Logger* on page 4 and *Reading out the Logger* on page 5.

Launching the Logger

To launch the HOBO LCD logger:

1. Install BoxCar Pro software on the computer (see BoxCar Pro User's Manual for details).
2. Plug one end of the PC interface cable into an available serial port on the host PC and the other end into the 3.5 mm jack on the logger.
3. Start BoxCar Pro software. From the **Logger** menu, select **HOBO LCD Temp/RH** and select **Launch**.
4. Specify temperature and/or relative humidity measurements based on available sensors. If you are using an external temperature-only sensor (no RH capability), make sure the humidity is disabled in the software to maximize memory space. Otherwise, the unit will record a zero RH value at every logging interval. Choose any ALERT limits and select other advanced options. Set the logger to begin logging immediately or at a future date/time. By default, the logger clock will be set to the computer host time unless you disable the option "Set Logger Clock with Host Time on Launch."
5. Click **Start Logging Immediately** or **Delayed Start** or, optionally, use **Hold for Launch Later** to start later with HandCar on a Palm handheld.

The temperature, RH (if activated), and memory bars will become visible on the LCD (see Figure 4) when logging. For full details on software operation, refer to the BoxCar Pro User's Manual. When using a Palm handheld, refer to the HandCar User's Manual.

Note: If the deployment requires a remote probe to be permanently installed at the site and the logger is being launched without a connected probe, use the **Delayed Start** feature, allowing enough time to transport the logger to the site and attach the remote probe.

Do not remove and re-insert probes once logging has begun.

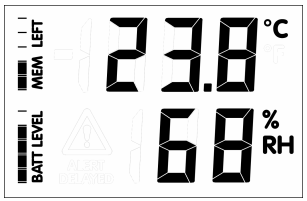


Figure 4

Remaining memory is indicated by a five-segment bar. When "wrap around when full" is not selected in the software, the segments decrease as memory fills; when it is selected, the segments continually cycle. Remaining battery level is indicated by a five-segment bar; segments decrease as battery level decreases.

If the temperature or RH measured by the logger falls outside the selected high or low limit, the word 'Alert,' an alert symbol, and the temperature or RH measurement that went out of limits will flash. If an Alert Delay time has been set, the words 'Alert Delayed' will flash until the measurement value returns to within the acceptable range, or until the programmed delay time has passed and the alert condition is activated. See "Delaying the Alert Conditions" and "Alert Behavior" for more information.

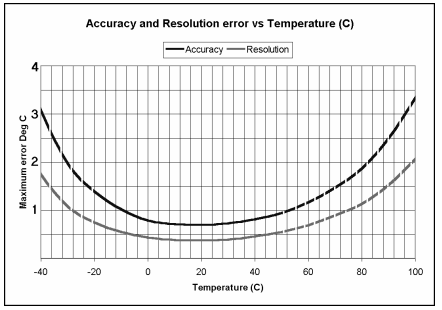
Power

- 3 AAA Alkaline batteries, user-replaceable

Internal Temperature Sensor

- Measurement range: -20°C to +50°C (-4°F to +122°F)
- Accuracy: ±0.7°C at +20°C (±1.3°F at +68°F), see plot B
- Resolution: 0.4°C at +20°C (0.7°F at +68°F)
- Response time (to 90%): Less than 15 minutes in airflow of 1 m/s (2.2 mph)
- Temperature Accuracy Drift: Negligible

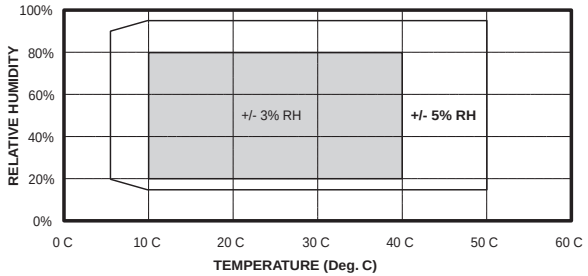
Plot B
Internal Temperature Sensor Accuracy/Resolution



Internal Relative Humidity Sensor

- User replaceable
- Measurement range: 15% to 95% at +25°C (+77°F)
- Accuracy: ±3% over range of 20% to 80% see plot C
- Response time to 90%: <2 minutes in airflow of 1 m/s (2.2 mph)
- Accuracy Drift: <2% over 5 years typical

Plot C Internal Model RH Range



External Probe Specifications

External Analog

Temperature Sensors (Onset part numbers L-TMA-M002, L-TMA-M006, L-TMB-M002)

- Measurement range: -40°C to +100°C (-40°F to +212°F)
- Accuracy: ±0.7°C at +20°C (±1.3°F at +68°F), see plot B *
- Temperature resolution: 0.4°C at +20°C (0.7°F at +68°F)
- Response time (to 90%): <3 minutes typical in airflow of 1 m/s (2.2 mph), 1 minute typical in stirred water (L-TMA-M002, L-TMA-M006, sensor tip and cable can be immersed in fresh water up to +50°C (+122°F) for 1 year); <3 minutes in still air, 15 seconds in stirred water (L-TMB-M002, sensor tip only is suitable for immersion)
- Accuracy drift: < 0.1°C per year

Environmental

- Operating RH range: 0% to 100%
- Operating temperature range: -40°C to +100°C (-40°F to +212°F)

External Digital Temperature/Relative Humidity Sensor (Onset part numbers S-THA-M002, S-THA-M006, S-THA-M017)

Note: Use only digital probes with serial numbers greater than 580314 with this logger.

- RH measurement range: 0% to 100% between 0°C and +50°C (+32°F to +122°F)
- RH accuracy: ±3% from 0°C to +50°C (+32°F to +122° F) (±4% in condensing environments)
- RH accuracy drift: Less than 1% per year (an additional reversible drift up to +3% can occur when the average relative humidity is above 70%)
- RH response time to 90%: 5 minutes typical in airflow of 2 m/s (4.5 mph)
- Temperature measurement range: -40°C to +75°C (-40°F to +167°F)

Mount the probe to ensure the RH sensor is protected from direct splashing, rain, or other sources of water saturation. The RH sensor can recover from condensation, but it will read approximately 100% RH while saturated until it dries out. For accurate temperature measurements, the probe should not be placed in direct sun. In outdoor locations that are exposed to direct sun, use a solar radiation shield. Consult the external probe User's Manual for additional information.

HOBO LCD Logger Specifications

Environmental

- Operating temperature range -20°C to +50°C, (-4°F to +122°F)
- Operating relative humidity range 0 to 95%, non-condensing
- Non-corrosive environment

Logger Capabilities

- Capacity: 65,136 measurements
- Software-selectable sampling intervals: 1 second up to 9 hours, recording times up to 1 year
- Programmable start time/date
- Recording modes: Stop when full, Wrap-around when full
- Nonvolatile EEPROM memory retains data even if batteries fail

LCD

- Size: 33 x 50.8 mm (1.3 x 2 inches)
- Displays temperature and relative humidity simultaneously
- Displays °C or °F (selectable within host software)
- Displays memory remaining
- Displays battery level
- Displays flashing ALERT for out-of-limits conditions (selectable within host software)

ALERT

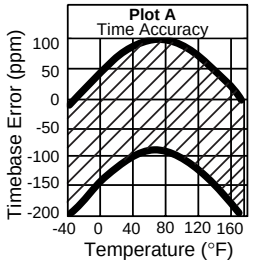
- High and low set points for both temperature and relative humidity
- ALERT conditions reset on offload
- ALERT relay output selectable: Normally Closed or Normally Open
- Contact rating: 48VDC, 1A max
- Contact resistance: less than 1 Ohm
- Wire size range is 22AWG to 14AWG

Communications

- High Speed RS-232 serial offload
- Offloads to PC or Palm handheld with serial cable
- Offload speed 38.4Kbps. Readout full logger (64K) in less than 1 minute

Timekeeping

- Time accuracy: ±1 minute per week at +20°C (+68°F), see plot A



Size/Weight:

- 125 x 92 x 31 mm (4.9 x 3.6 x 1.2 inches)
- 170 g (6.0 oz) with batteries

Memory Indication/Logging Operation

The HOBO LCD logger updates the LCD every five seconds. When the Wrap Around When Full feature is enabled, the MEM LEFT bar graph continually cycles through the segments because the memory can never be empty in this mode. Selecting Wrap mode allows the logger to measure and record continuously, overwriting the oldest points after memory becomes full. If the Wrap Around When Full feature is not selected, the MEM LEFT bar graph will decrease as the memory is filled. When the memory has been completely filled, the LCD will show 'FLL' (Full), which means the logger has stopped and is no longer making measurements, logging data, or providing alert/alarm functions. Data must be offloaded to a PC or Palm handheld before the logger can begin logging again. **If continuous logger operation is critical for alarm purposes, the logger should be launched in Wrap mode.**

If you select Delayed Start in BoxCar Pro software, the LCD will display 'dLy,' indicating that the logger is delaying logging until the specified date/time. If you select Hold for Later Launch, the LCD will display 'hLd' and will hold these settings until it is triggered to start with HandCar software on a Palm handheld or BoxCar Pro software on a laptop.

Note: There may be slight variations between the displayed temperature value and the logged value due to limits in display conversions. The values seen on the host PC and Palm handheld are the actual recorded values and the most accurate. The displayed temperature values may be up to 0.6°C or 0.6°F higher, or 0.1°C or 0.3°F lower than the logged value. Fahrenheit values of 200° and higher are displayed as three digits without a decimal (e.g., 205°F); however, the full resolution value will be recorded in the logger memory (e.g., 205.4).

Reading Out the Logger

To read out (off-load) the HOBO LCD logger:

1. Plug the PC interface cable into the logger.
2. Run BoxCar Pro software on a host PC to offload data from the HOBO LCD logger. Alternatively, use the Palm handheld and HandCar software to offload data and transport it back to the host PC.
3. From the **Logger** menu, select **HOBO LCD Temp/RH** and select **Readout**.
4. If the logger is currently logging, you can choose to continue logging while offloading or stop logging.
5. Type a name for the file and click **Save**. The software will offload the logger, and indicate when offload is complete.

After offload, the logger can be stopped, allowed to continue with its current deployment, or relaunched to initiate a new deployment. You also have the option of adjusting the time zone used for display on the graph. See the BoxCar Pro and/or HandCar manuals for more details on graphing, time selection in plots, exporting data files, and more.

If an application requires a remote probe to be permanently installed at the site, first disconnect the logger from any alarm and then disconnect it from the remote probe. Then, transport the logger back to the host PC for Readout. The logger will record values of -69°C/-92°F for temperature and 0% RH after the logger has been disconnected from a remote probe. After offloading the logger, re-launch it with a delayed start allowing enough time to return the logger back to the site, connect it to the alarm, and re-insert the external probe.

If the alert output is connected to a remote alarm configured for Normally Closed inputs (see page 7), you can avoid false alarms when the logger is disconnected by making a temporary connection between the wires going to the remote alarm. *Be sure to disconnect this temporary connection when the logger is reconnected to the remote alarm wires.* **Note:** HandCar software for Palm handhelds allows you to start a logger, check current measurements, offload logger data for transport back to a PC, and restart a logger. HandCar does not allow you to view stored data or set launch parameters.

ALERT Operation Overview

Use the ALERT feature to flash a warning on the LCD if monitored temperature or relative humidity falls outside user-selectable limits. If you require remote or secondary notification of an ALERT condition, you can connect a remote audio alarm and/or an autodialer to the contact closure. The limits are set in the host software and are active only when the logger is logging. When the logger is not logging (i.e., when in delayed launch mode or if the memory is full and the Wrap Around When Full feature was disabled), the limits are not checked. When the ALERT flashes, the measurement that went out of limits (temperature or RH) also flashes. See page 8 for how to delay the triggering of the ALERT condition after the logger senses an out-of-limit condition.

Avoiding False ALERTs when Deploying a Logger

In some applications, the environment in which the logger is launched is in immediate violation of the desired ALERT limit. For example, launching the HOBO LCD logger at the host PC in room temperature and setting an upper alarm limit of +32°F for a freezer application will cause an immediate ALERT. In this situation, choose **Delayed Start** to allow enough time to transport, mount, and stabilize the logger in the desired location (see individual sensor response times beginning on page 13). Alternatively, choose **Hold for Later Launch** to save logging parameters for a subsequent start with a Palm handheld or laptop.

Connecting a Remote Alarm or Autodialer (optional)

The HOBO LCD logger is compatible with Onset's Remote Alarm (part number ARA) and Autodialer (part number AVD-45) available from Onset Computer or an Onset Authorized Dealer.

To access the ALERT contact closure connection, remove the battery door. Inside the logger, there are two screw terminals that connect to an internal relay. There is a feed-through on the bottom of the case to run wires from the screw terminals to

alarm at the time logging stops due to low battery level. Use the Advanced options screen in BoxCar Pro to set the alert on low battery.

External Probe Mounting Details

Temperature Probe

When mounting the temperature probe, be sure to thermally insulate the sensor from the mounting surface. The probe should not be attached directly to a mounting surface unless that surface is at the same temperature as the environment being monitored. Note that the mass of the mounting surface can also affect the probe's response time, so for best accuracy and response, it is best to mount the sensor away from the surface.

The sensor tip and cable on the L-TMA-M002 and L-TMA-M006 external temperature probe is designed to last at least one year in water as warm as 50°C (122°F). The sensor tip on the L-TMB-M002 stainless steel probe is waterproof, but the connector and handle is not intended for prolonged use in water or moist environments, especially those with temperatures greater than 50°C (122°F). For accurate measurement, the probe should not be placed in direct sunlight. In outdoor locations that are exposed to direct sun, use a solar radiation shield. Consult the external probe User's Manual for additional information.

Temperature/RH Probe

Temperature/RH probes should be mounted in one of the following ways:

- Hanging via the cable in the vertical position as shown in Figure 10.
- Hanging via the mounting hole as shown in Figure 11 (in non-condensing environments only).

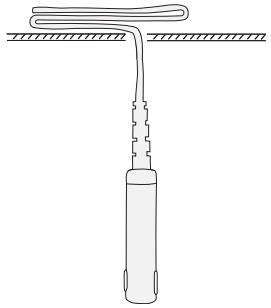


Figure 10

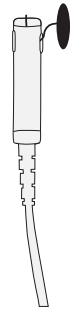


Figure 11

For accurate readings, the probe should not be attached directly to a mounting surface unless that surface is at the same temperature as the environment being monitored. Note that the mass of the mounting surface can affect the probe's response time, so if this is a concern, it is best to use one of the three mounting methods listed above.

Replacing the Internal RH Sensor

The relative humidity sensor in the H14-001 (internal version) may require replacement if it is damaged mechanically or by exposure to condensation or chemicals. The replacement sensor (Onset part number HUM-UPS-600) is available from Onset or an Onset Authorized Dealer. To replace the sensor:

1. Remove the four screws on the back of the unit and open the case.
2. Carefully remove the board and turn it over so the LCD is facing up.
3. The RH sensor is located on the upper left side of the board, adjacent to the LCD. Use a sharp knife or razor to carefully cut the RTV rubber adhesive on both sides of the humidity sensor.
4. Gently grasp the installed sensor and lift, removing the sensor's prongs from the sockets.
5. Pick up the replacement sensor with your thumb and forefinger on the top and bottom opposite the prongs.
6. Align the prongs of the sensor with the sockets on the circuit board and gently press the prongs into place using your other thumb to ensure the prongs are firmly seated in the sockets.
7. Use a small dab of noncorrosive RTV adhesive (e.g., General Electric RTV 162) on both sides of the replacement sensor to hold it in place. Be certain that no RTV covers the upper screen on the sensor.
8. Place the board back into the case (be careful not to dislodge the sensor) and tighten the case with the screws.
9. Start the logger and check the accuracy of the % RH readings.

Battery Maintenance

The HOBO LCD logger's batteries will last one year in typical conditions (logging intervals of ≥ 1 minute with weekly offloads and average temperatures greater than 10°C or +50°F). Frequent offloads and/or extreme temperatures will reduce battery life. At temperatures below freezing (0°C or +32°F), the battery level bar graph should be checked regularly; under these conditions batteries will typically require replacement every six months.

Batteries should be replaced when the BATT LEVEL bar graph is down to one segment, which indicates 20% battery life or less. To ensure data integrity, use BoxCar Pro or HandCar software to off-load the logger and turn it off before changing batteries. The HOBO LCD logger requires three AAA batteries. Onset Computer Corporation strongly recommends the use of fresh alkaline batteries. When battery level is very low, BATT LEVEL and the bar graph begin to flash, indicating that the batteries should be replaced immediately to continue system operation. If BATT LEVEL and the bar graph are flashing but no temperature or RH values are displayed, the system has stopped logging data or performing alarm functions because of insufficient power. If the HOBO LCD is connected to a Remote Alarm and/or Autodialer, you can choose to have the unit activate an

the outside. The interconnect wire range is 22AWG to 14AWG. Refer to Figures 5, 6, and 7 for wiring connection details. **Note:** All drawings show the logger in the Normally Closed state with the ALERT inactive.

In Figures 5 and 6, the polarity of the connections to the logger does not matter, but the connections to the ARA Remote Alarm and AVD-45 Autodialer should be connected as shown in Figure 7. The HOBO LCD logger's contact closure is initially set at the factory to be Normally Closed, but you can change this within BoxCar Pro to accommodate Normally Open devices (see ARA User's Manual).

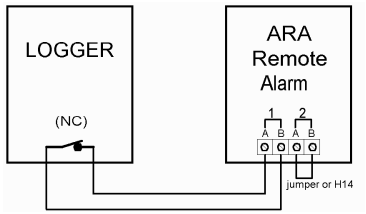


Figure 5 – LCD logger with Onset's ARA Remote Alarm

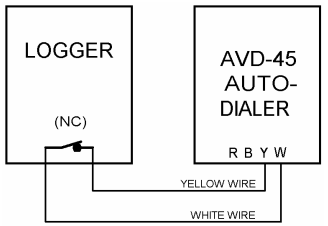


Figure 6 – LCD logger with Onset's AVD-45 Autodialer

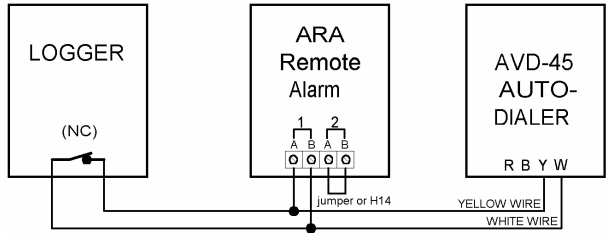


Figure 7 – LCD Logger with Onset's ARA Remote Alarm and AVD-45 Autodialer

Setting up the Remote Alarm and Autodialer in Host Software

To configure the ARA Remote Alarm, AVD-45 Autodialer, or other connected device, open BoxCar Pro. From the **Logger** menu, select **HOBO LCD Temp/RH**, select **Launch**, and click **Advanced Options** (Figure 8).

The ALERT contact closure can be set to operate as Normally Closed (which opens during an ALERT condition) or Normally Open (which closes during an ALERT condition). The HOBO LCD logger, AVD-45 Autodialer, and ARA Remote Alarm are pre-set in the factory for Normally Closed.

The AVD-45 Autodialer requires the logger's contacts to be set to Normally Closed. The ARA Remote Alarm can be set to Normally Closed or Normally Open (see

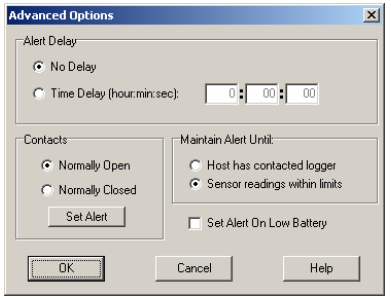


Figure 8 – Advance Option selection box for ALERT

remote device User's Manuals for more details). When you change the contact settings for the HOBO LCD logger between Normally Closed and Normally Open operation, the new configuration is retained when the batteries are changed.

Delaying the ALERT Condition

Select **No Delay** to immediately activate the ALERT when conditions go outside the defined limits, or select **Time Delay** to avoid unwanted ALERTs due to doors opening, defrost cycles, or similar events. Specify the delay time (up to 2 hours) and the ALERT will wait to activate after sensing an out-of-limit condition. If the out-of-limit measurement value comes back into the limit range before the delay time ends, the ALERT will not be activated. If the measured value is outside the limits before the delay time ends, that value and ALERT DELAYED will flash.

ALERT Behavior

You can select how the ALERT function behaves once a limit has been exceeded. Choose to maintain the ALERT condition until the host has contacted the logger (i.e, for a status, off-load, or relaunch), or until the measurements return within limits (i.e., ALERT is activated only while the limits are exceeded).

Testing a Remote Alarm or Autodialer

The BoxCar Pro Advanced Options screen allows you to test the contact closure and any connected remote alarm or autodialer. After connecting your remote device and setting the preferred closure options (Normally Closed or Normally Open), click the **Set Alert** button. BoxCar Pro commands the logger to activate the ALERT and change the condition of the contact closure. Click the **Reset Alert** button to deactivate the ALERT. When testing the ALERT with the AVD-45 Autodialer, it is recommended that you activate the ALERT for up to 7 minutes to ensure that the AVD-45 Autodialer completes its dial-out sequence (see AVD-45 Autodialer User's Manual for details).

Temperature Accuracy and Resolution

The maximum reading error for the internal and external temperature sensors is shown in Plot B (page 13). This is a worst case error. In a typical logger, temperature errors will be substantially lower. NIST certification of temperature accuracy for some sensors is available from Onset.

The temperature resolution for internal and external sensors is also shown in Plot B (page 13). Resolution is the smallest difference between adjacent temperature steps that the logger can report.

The logger will typically experience little or no accuracy drift unless the electronic components or temperature sensor are damaged mechanically or by exposure to environmental factors beyond the specifications, such as high heat and humidity.

Relative Humidity Accuracy

The relative humidity sensors used in the internal sensor model and the Temp/RH external probe are temperature compensated. The logger's relative humidity accuracy for the internal model is ±3% over the corresponding temperature/humidity ranges (see specifications and Plot C, page 13). The external probe relative humidity is ±3% over the corresponding range and ±4% in condensing environments. The internal RH sensor has an operating RH range of 0 to 95%, and a measurement range of 15% to 95% at +25°C, and will be damaged by condensation. Do not expose the internal RH sensor to fog, mist, or other condensing conditions. The RH sensor used in the external probe has an operating range of 0 to 100% in intermittent condensing environments to +30°C (+86°F); it is recommended for only non-condensing environments above +30°C (+86°F). Sensor measurement range is 0% to 100% between 0°C and 50°C. The external RH sensor will not be damaged by intermittent condensation at temperatures to +30°C (+86°F), but, if saturated, it will read approximately 100% until it dries out. See page 11 for mounting instructions.

The internal RH sensor has an accuracy drift of less than 2% over five years in normal operating conditions (+25°C, 50% RH, non-corrosive). The external RH sensor may drift up to 1% per year. Accuracy is specified for the range 20% to 80%. Extended exposure to higher temperatures and/or higher relative humidity may increase the sensor's drift rate. You can replace the internal RH sensor yourself or have it replaced as part of an H14-001 tune-up/calibration service (available from Onset). The RH sensor on the external probe, however, is not replaceable. If damaged, the whole probe must be replaced.

Wall Mounting Instructions for Logger

1. Copy the template (Figure 9) and tape template onto the wall in the desired location.
2. Mark the center of holes with a punch.
3. Screw in mounting screws, leaving a gap between the wall and the head of the screw of about 0.5 cm (3/16 in.).
4. Attach logger by aligning it with the screws, and then push in and down to lock in place.

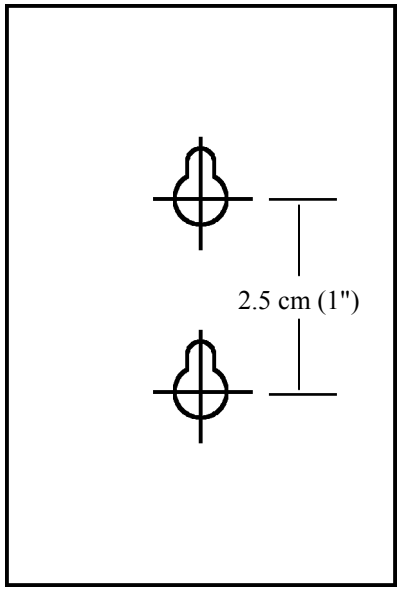


Figure 9 – Wall Mounting Template

Keep the HOBO LCD Logger Dry

The HOBO LCD logger is designed for a non-condensing, non-corrosive environment. Keep the logger dry. Some of the external probes can be placed in harsher environments; see *External Probe Specifications* on page 13.