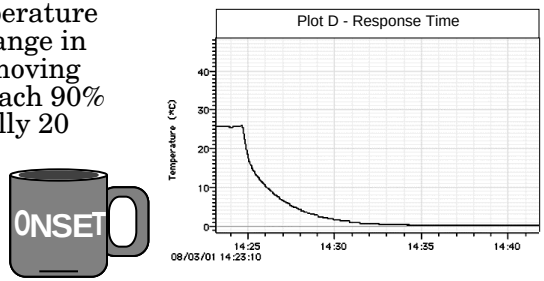
The coffee mug logger test

The freezing point of water is 0°C (+32°F) with only a tiny dependence on pressure and the salt levels found in normal tap water. You can use this information to test the accuracy of your StowAway TidbiT logger. Put crushed ice and water in an insulated container, and completely submerge the logger in the ice water. Place the container in a refrigerator to minimize temperature gradients. Leave it in for fifteen minutes while logging to be sure the TidbiT reaches equilibrium. Offload the data and blow up the end of your plot to check the logger's accuracy. The actual temperature will be above 0°C, though less than 0.1°C if you do everything right.

Five minute response time in water

Plot D shows that the temperature reached 90% of the step change in about five minutes. In air moving 1m/sec, response time to reach 90% of the step change is typically 20 minutes.



The logger is so small that you can fit a dozen of them in a coffee mug.

Note on CE Directives EN61326 for Radiated and Conducted Immunity and EN61326 for ESD Immunity

This product meets Criteria B or better of CE directive EN61326 for Radiated and Conducted Immunity. Strong RF fields (3V/m) may cause false measurements. Avoid placing the logger near signal/power wires or devices emitting strong RF signals. This product meets Criteria C or better of CE directive EN61326 for ESD Immunity. ESD events may cause the logger to stop collecting data and require operator to restart logger.

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D 3050-H MAN-TBI32

StowAway® TidbiT®

User's Manual

onset

Tel: 1-800-LOGGERS (1-800-564-4377), 508-759-9500 u Fax: 508-759-9100
sales@onsetcomp.com u www.onsetcomp.com

Thank you for purchasing a StowAway® TidbiT® temperature logger. The minimum optic logging system is comprised of these components: the StowAway TidbiT temperature logger, Optic Base Station™, TidbiT® Coupler, and logger software.

Launch and recovery

Launching your StowAway TidbiT

Connect the Optic Base Station™ to the host computer using the appropriate interface cable (CABLE-PC-3.5 for a PC and CABLE-MAC-HOBO for a Macintosh). Place the StowAway TidbiT onto the TidbiT® Coupler attached to the Optic Base Station™. Refer to the Optic Base Station™ User's Manual for proper alignment. Refer to the software user's manual for launching procedures. Recommended software: BoxCar® 3.6+ or any version of BoxCar® Pro.

Triggered launch and the StowAway TidbiT

The StowAway TidbiT has an optional triggered launch. Launch your logger choosing the triggered launch option. The magnetically operated reed switch is activated when the TidbiT® Coupler™ is reconnected to the logger and then removed. The Optic Base Station™ and TidbiT® Coupler™ are not necessary to trigger the launch. Any strong magnet placed near the face of the logger will trigger the launch. The StowAway TidbiT's green LED light will flash brightly four times to indicate successful triggered launch.

Seeing if the alarm has been tripped

The StowAway TidbiT has two LEDs. The green LED blinks during use if it has not seen out-of-range conditions (see the software user's manual for how to set the alarm). Note that the alarm can be set up to +70°C on the -20°C to +50°C TidbiT, but we recommend staying within the +50°C range of the logger. If it has recorded out-of-range conditions, the red LED will blink. When the StowAway TidbiT is full, neither LED will blink.

Data recovery

After the StowAway TidbiT has been launched, remove the logger from the TidbiT® Coupler™ and deploy the logger. At the end of the deployment, reconnect the logger to the TidbiT® Coupler™ attached to the Optic Base Station™ for readout. The StowAway TidbiT communicates at 1200 baud. The cleverly optimized software reads out 8K of data in 1.5 minutes, and 32K in 6 minutes.

Sealed logger designed for field operation

The StowAway TidbiT uses optical communication because it is completely sealed. This means that the logger can be used in wet or dirty locations or even completely submerged. The logger can be launched and readout directly to a host computer using the TidbiT® Coupler™, the Optic Base Station™, and the appropriate interface cable. Data can also be readout in the field with the Optic Shuttle™, Onset's unique field data transporter. For data retrieval be sure to

Indemnification. Products supplied by Onset are not designed, intended, or authorized for use as components intended for surgical implant or ingestion into the body or other applications involving life-support, or for any application in which the failure of the Onset-supplied product could create or contribute to a situation where personal injury or death may occur. Products supplied by Onset are not designed, intended, or authorized for use in or with any nuclear installation or activity. Products supplied by Onset are not designed, intended, or authorized for use in any aeronautical or related application. Should any Onset-supplied product or equipment be used in any application involving surgical implant or ingestion, life-support, or where failure of the product could lead to personal injury or death, or should any Onset-supplied product or equipment be used in or with any nuclear installation or activity, or in or with any aeronautical or related application or activity, Purchaser will indemnify Onset and hold Onset harmless from any liability or damage whatsoever arising out of the use of the product and/or equipment in such manner.

Returns

Please direct all warranty claims and repair requests to place of purchase.

Before returning a failed unit directly to Onset, 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 product(s), properly packaged 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. Loggers must be clean 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 are damaged by the customer as specified in the warranty provisions can be returned to Onset with a valid RMA number for evaluation.

ASAP Repair Policy. For an additional charge, 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.

Service and Support

HOBO products are easy to use and reliable. In the unlikely event that you have a problem with this instrument, contact the company where you bought the logger: Onset or an Onset Authorized Dealer. Before calling, you can evaluate and often solve the problem if you write down the events that led to the problem (are you doing anything differently?) and if you visit the Technical Support section of the Onset web site at www.onsetcomp.com/support.html. When contacting Onset, ask for technical support and be prepared to provide the product number and serial number for the logger and software version in question. Also completely describe the problem or question. The more information you provide, the faster and more accurately we will be able to respond.

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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. **THERE ARE NO WARRANTIES BEYOND THE EXPRESSED WARRANTY ABOVE. IN NO EVENT SHALL ONSET BE LIABLE FOR LOSS OF PROFITS OR INDIRECT, CONSEQUENTIAL, INCIDENTAL, SPECIAL OR OTHER SIMILAR DAMAGES ARISING OUT OF ANY BREACH OF THIS CONTRACT OR OBLIGATIONS UNDER THIS CONTRACT, INCLUDING BREACH OF WARRANTY, NEGLIGENCE, STRICT LIABILITY, OR ANY OTHER LEGAL THEORY.**

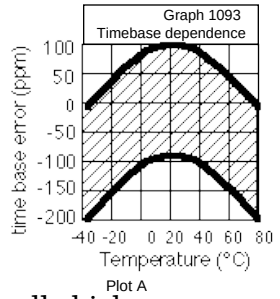
Limitation of Liability. The Purchaser's sole remedy and the limit of Onset's liability for any loss whatsoever shall not exceed the Purchaser's price of the product(s). The determination of suitability of products to the specific needs of the Purchaser is solely the Purchaser's responsibility. **THERE ARE NO WARRANTIES BEYOND THE EXPRESSED WARRANTY OFFERED WITH THIS PRODUCT. EXCEPT AS SPECIFICALLY PROVIDED IN THIS DOCUMENT, THERE ARE NO OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTIBILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO INFORMATION OR ADVICE GIVEN BY ONSET, ITS AGENTS OR EMPLOYEES SHALL CREATE A WARRANTY OR IN ANY WAY INCREASE THE SCOPE OF THE EXPRESSED WARRANTY OFFERED WITH THIS PRODUCT.**

clean your logger of dirt and dust. To clean your TidbiT use only a non-abrasive mild soap and warm water with a non-scratching sponge or cloth. Any scratches or abrasions on the TidbiT's surface may impair communication. (For tougher cleaning jobs use a plastic polish such as Novus® plastic polish.)

Hardware details

Time accuracy

At room temperature, the logger's idea of time can vary from the actual time by as much as one hour per year (100 ppm). There is an additional temperature effect shown in Plot A.



Plot A

Depth: rated to 1000 feet

Just for fun, we tested the StowAway TidbiT at really high pressures. Although they worked at 5000 psi (10,000 ft water depth equivalent) we are not prepared to test all of them to this depth. We allowed a conservative factor of 10, rating them to 1000 ft.

Operating temperature range -20°C to +50°C

The StowAway TidbiT will operate properly in the temperature range -20°C to +50°C. It will record temperatures up to +70°C but exposure to temperatures above +50°C or below -20°C will reduce the battery life. For temperatures above the highest value in its range, it will read its highest value, and for temperatures below the lowest value in its range, it will read its lowest value.

Notice: To guarantee specified accuracy, the TidbiT and Optic StowAway units should not be used in condensing environments and water temperatures higher than +30°C (+86°F) for more than eight weeks cumulatively. Prolonged exposure will lead to measurement drift and eventual failure. If your application temperatures and environment are questionable based on the above statement, please contact Onset or your authorized Onset dealer for more information.

Five year battery life

The StowAway Tidbit has a five-year battery life in typical use. This corresponds to 16 three-month deployments in water (+35°F to +80°F) with 4 minute or longer intervals, no multiple sampling and one offload per deployment. Alternatively, if the logger is used constantly in short duration applications, the battery life can be substantially reduced. Examples of the battery life in short deployments are: 6,000 one-hour deployments with no multiple sampling, 5,000 two-hour deployments with no multiple sampling, and 70 four-day deployments with multiple sampling. Sampling intervals shorter than 1 minute and/or extended storage or deployment above +80°F will significantly reduce battery life. The battery is not replaceable.

1.2” x 1.6” x 0.45” and 0.5 oz.

The shape of the StowAway TidbiT was chosen to minimize the logger’s volume. The thermistor has been placed on the PC board in the logger to provide enhanced protection for the sensor and further improve the already high reliability of these loggers. The logger weighs 0.5 oz. (14 g) and is negatively buoyant.

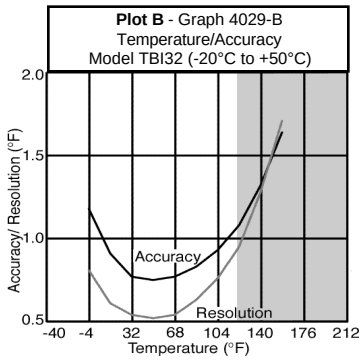
Accuracy of two different temperature ranges

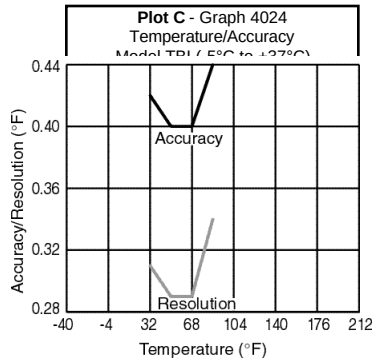
Temperature accuracy and resolution

The StowAway TidbiT logger's accuracy and resolution specifications are given in plot B and plot C. The logger's accuracy specification is it's maximum measurement error, including the effects of thermistor error and quantization error. In most cases the logger's actual accuracy is better than the specified value. The logger's resolution is the difference between temperature steps.
Model TBI32-05+37: Range -4°C to 37°C (24°F to 99°F)*
Model TBI32-20+50: Range -20°C to 50°C (-40°F to 122°F)*

*Specified range is narrower than nominal range due to precision calibration process.

The TidbiT will measure temperature in the grey area, but exposure to temperatures in this range will reduce the TidbiT's battery life.





Individual calibration

Factors that affect the StowAway TidbiT’s accuracy are the thermistor error, component imperfections (resistor variations and A-D nonlinearities), and quantization error (difference between temperature steps). Most StowAways use thermistors with a 0.2°C interchangeability in the range 0°C to +75°C. The StowAway TidbiT model TBI32-05+37, uses a thermistor that has 0.1°C interchangeability. Onset Computer Corporation’s proprietary test procedures effectively eliminate the resistor and A-D errors, leaving only the thermistor error, quantization error, and a small residual calibration error.

The blinking LEDs

Waiting for trigger: Weak green blink every six seconds.

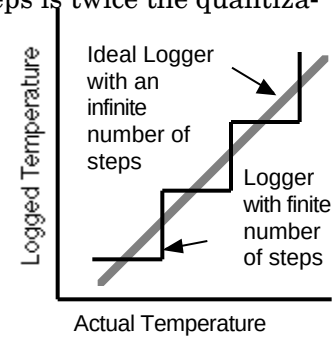
Waiting out delay: Weak green blink every four seconds.

Logging: Bright green blink every measurement, and weak every two seconds between measurements. If the StowAway TidbiT is in multiple sampling mode, it will blink at each measurement, not each time data is recorded.

Alarm: A logger is out-of-range if it has recorded a value that is above the high alarm limit or below the low alarm limit. The red LED will blink during the duration of the deployment instead of the green LED.

What is quantization error?

Ideally a logger would record a different temperature for each temperature applied to it. The StowAway TidbiT can store only 255 different temperature values in its temperature range. If you exposed the logger to a slowly rising temperature, the logger would record a constant value and then jump to a higher value, recording that value for a while. The difference between the steps is twice the quantization error since a perfectly calibrated logger will never be more than half a step away from the actual value.



Differences between loggers

The calibration process adjusts the measured values of individual loggers with the same temperature range. This means that two loggers will not necessarily have the same step values, so that two loggers exposed to the same temperatures may report different values. Each one will be correct within its accuracy.