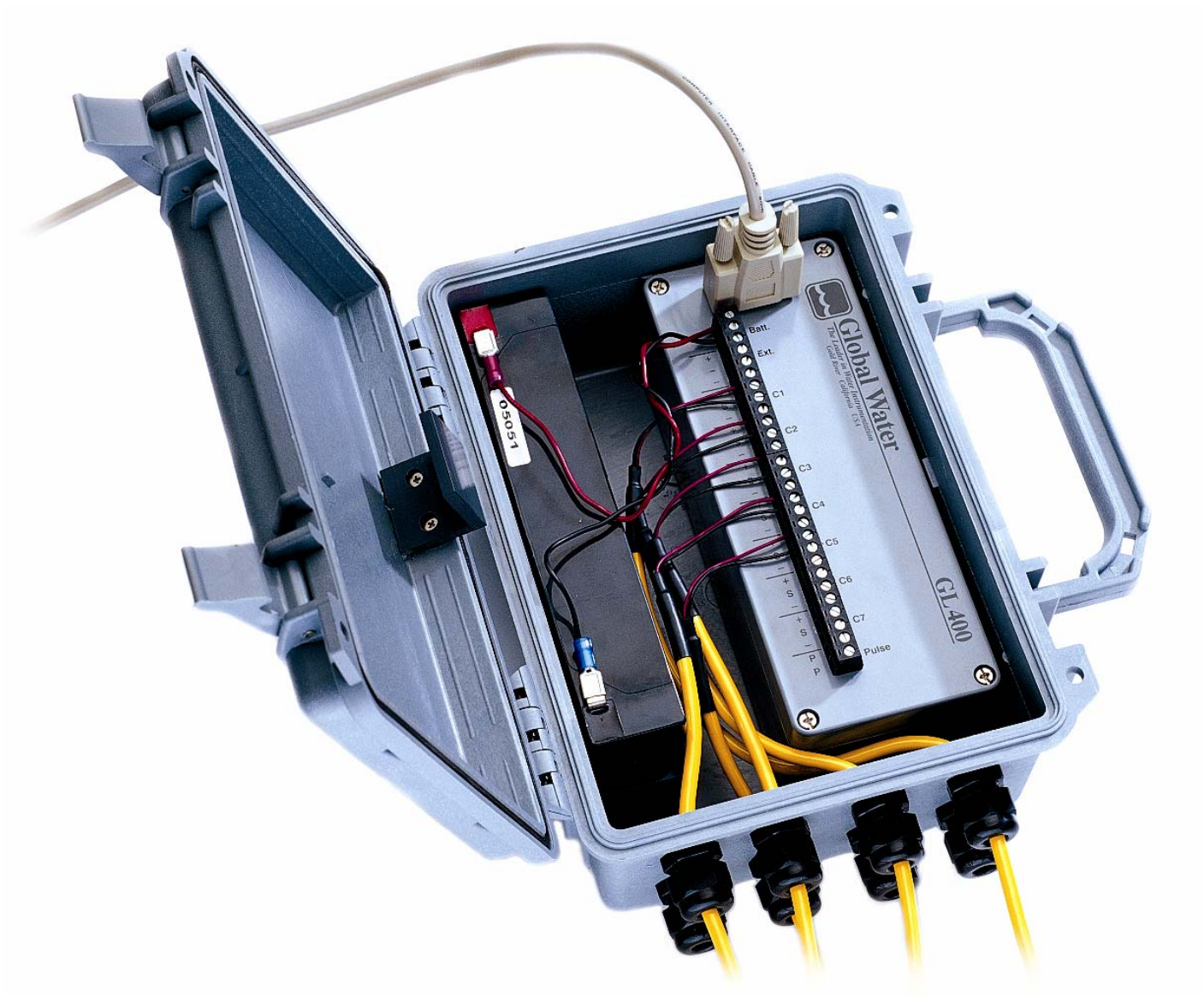
Global Water
Instrumentation, Inc.

GL400

Datalogger User's Guide



1/05/2005

Warranty

Global Water Instrumentation, Inc. warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from date of shipment from the factory. Global Water's obligations under this warranty are limited to, at Global Water's option: (I) replacing or (II) repairing; any products determined to be defective. In no case shall Global Water's liability exceed the products original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by Global Water Instrumentation, Inc., or which has been subject to misuse, negligence or accident. It is expressly agreed that this warranty will be in lieu of all warranties of fitness and in lieu of the warranty of merchantability.

The warranty begins on the date of your invoice.

Requirements

- Windows 95, 98, ME, NT, 2000 or XP*
- 486DX 66MHz, 16MB RAM (Windows 95 base machine; later operating systems may require higher specifications)
- Available COM port

Contact Information

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Terminology

In order to better understand this product manual, please be aware of the following terminology and formatting standards.

Bolded terms (i.e. **bold**) indicate either a keyboard key, a word or icon that appears on your computer monitor screen or a phrase to be emphasized. Context will dictate which is indicated.

Since it is assumed that users of this manual are familiar with mouse usage, many mouse operations are implied. The term "click" or "clicking" means to press and release the left mouse button. Similarly, "double-click" means to press and release the left mouse button twice in quick succession. For example, the phrase "Click the **start** button" should be interpreted as "Move the mouse pointer to the task bar and click the **start** button." If any other mouse button is used in an operation, it will be specified in the documentation.

The term "select" means to move the mouse pointer over the indicated target. For example the phrase "Select **Toolbars** from the **View** menu" means to move the mouse pointer over **View**, click **View** and then move the mouse pointer over **Toolbars**. This action provides access to the **Toolbars** menu. "Select" is normally used when the mouseover action will cause additional menus to display.

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*Windows® 95, 98, ME, NT, 2000 & XP are trademarks of the Microsoft Corporation

The → symbol is used with submenu operations where the user should click the first and last items in the string separated by →. For example, the phrase "Click on **File** → **New** → **Folder**" means click on **File**, select **New** and click on **Folder**.

When the documentation directs you to exit a program or window, you can generally do so by clicking the **x** graphic in the upper right-hand corner or by clicking **File** → **Exit**.

Table of Contents

Introduction 1

The GL400 Datalogger

Congratulations on your purchase of the Global Water GL400 Datalogger. This instrument has been quality tested and approved to provide accurate and reliable measurements for a variety of sensors. We are confident you will find the GL400 to be a valuable asset for your applications. Should you require assistance, our technical staff will be happy to help.

The GL400 is the latest addition to our line of rugged remote monitoring instrumentation and comes in two varieties: the 8-channel (GL400-7-1) and 2-channel (GL400-1-1) loggers. The 8-channel logger features 7-analog and 1-pulse channels for data recording, while the 2-channel features 1-analog and 1-pulse. The Global Logger* software package operates on the user-friendly operating systems Microsoft Windows® 95, 98, ME, NT, 2000 and XP**.

Remote monitoring sensors are connected to the GL400's internal terminal junctions. Types of sensors that are typically used include Dissolved Oxygen, pH, Conductivity, Turbidity, Temperature, ORP, Water Level, Wind Speed, Wind Direction, Humidity, Barometric Pressure, Solar Radiation and Rain Gauges. Contact us for unique, special and custom modifications to meet the requirements of your application.

The GL400 Datalogger is designed to accept any 4-20 mA sensors. Twisted pair 2-wire and 3-wire sensors can be quickly connected to the logger's terminal strip providing them with switched power and connecting them to the GL400's data processes.

The GL400's rugged, lockable and weather-resistant enclosure can easily be hidden, bolted to a post or secured inside an additional container for added protection from the elements, animals, or vandals.

Features

GL400-7-1

Data
- Windows based Global Logger* software
- Tabular display/printout
- Data in standard spreadsheet format
- Communication cable included (RS232C)

Logger
- 7-analog 1-pulse channels
- Low power internal battery with charger
- 8,000 data logs per channel
- 12-bit or 1/4,000 resolution
- UV protected PVC weather-resistant enclosure

GL400-1-1

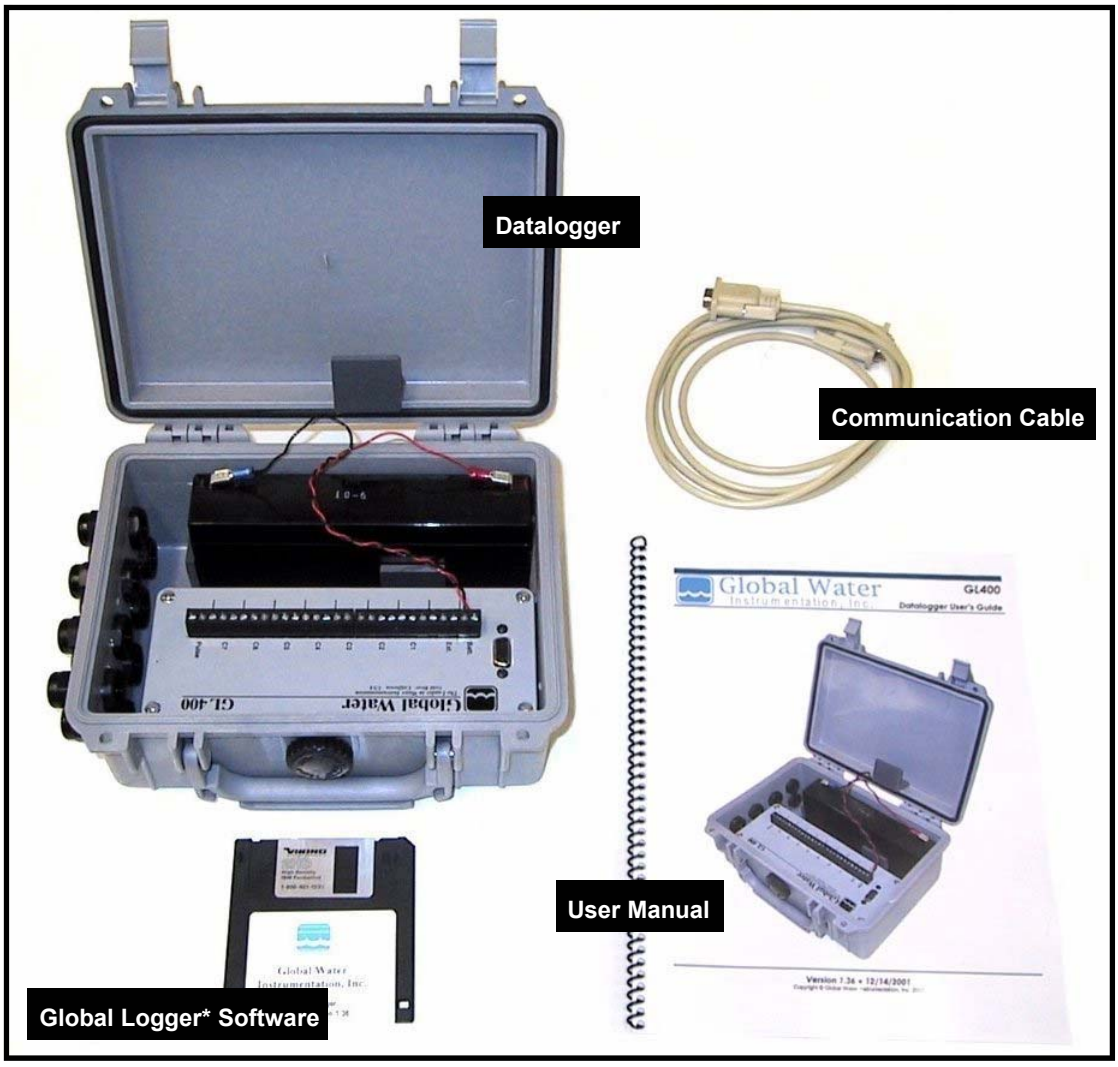
Data
- Windows based Global Logger* software
- Tabular display/printout
- Data in standard spreadsheet format
- Communication cable included (RS232C)

Logger
- 1-analog 1-pulse channels
- Low power internal battery with charger
- 19,500 data logs per channel
- 12-bit or 1/4,000 resolution
- UV protected PVC weather-resistant enclosure

Checklist

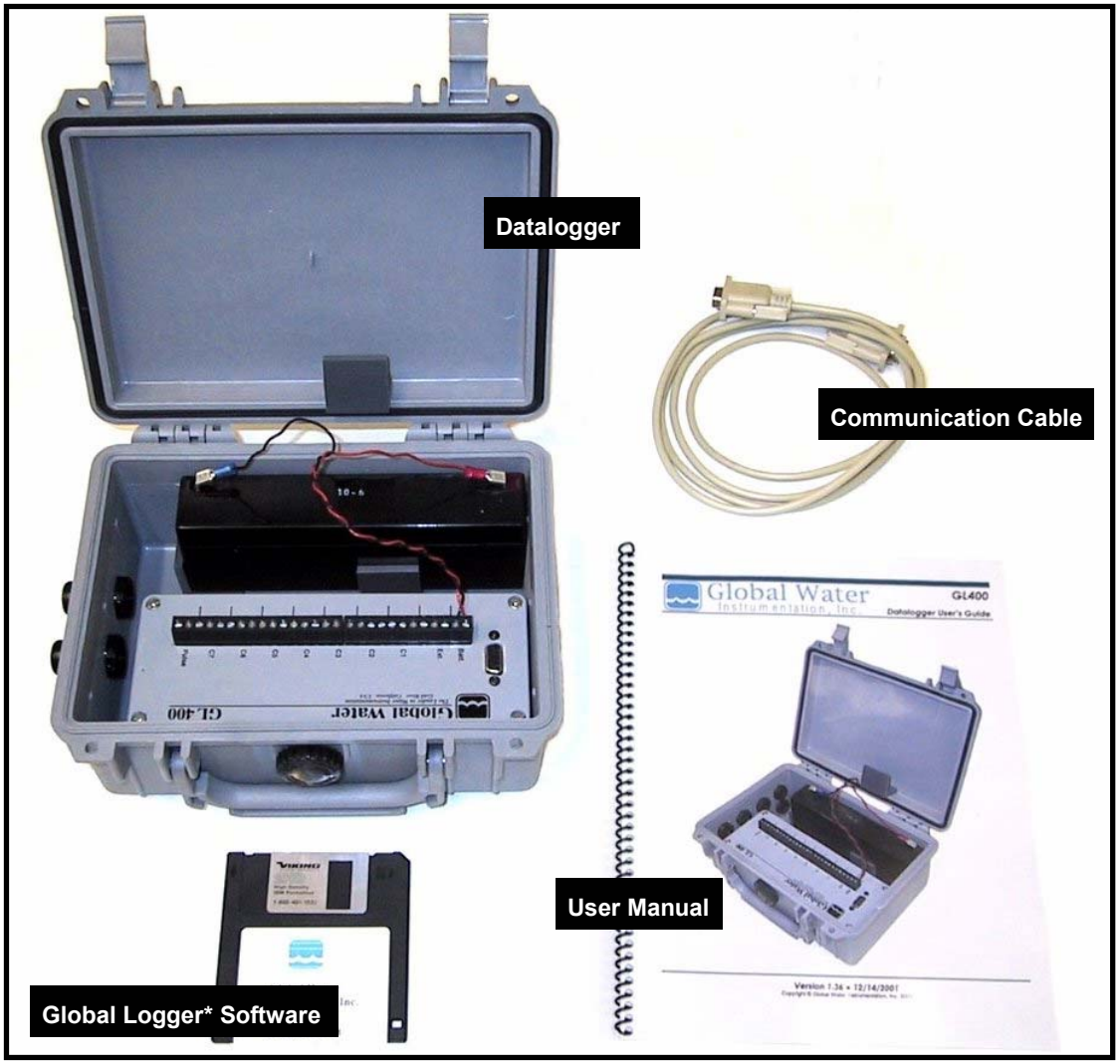
Your GL400 was carefully inspected and certified by our Quality Assurance Team before shipping. If any damage has occurred during shipping, please notify Global Water Instrumentation, Inc. and file a claim with the carrier involved. Use the checklist to ensure that you have received everything needed to operate the GL400. Note, there are two different varieties of dataloggers, the GL400-7-1 and GL400-1-1. Use the checklist appropriate to your model number.

Package Contents for GL400-7-1



- GL400-7-1 (8-Channel Datalogger)
- User Manual
- Communication Cable (RS232C COM Cable)
- Global Logger Software (3 1/2" Floppy Diskette)

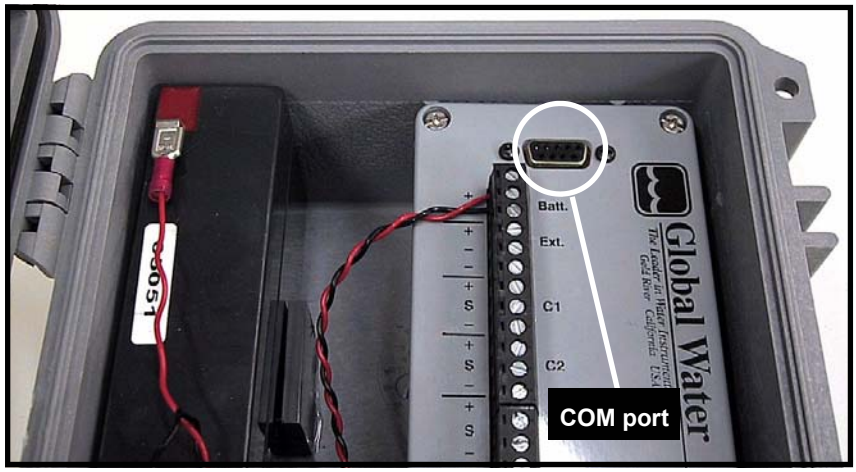
Package Contents for GL400-1-1



- GL400-1-1 (2-Channel Datalogger)
- User Manual
- Communication Cable (RS232C COM Cable)
- Global Logger Software (3 1/2” Floppy Diskette)

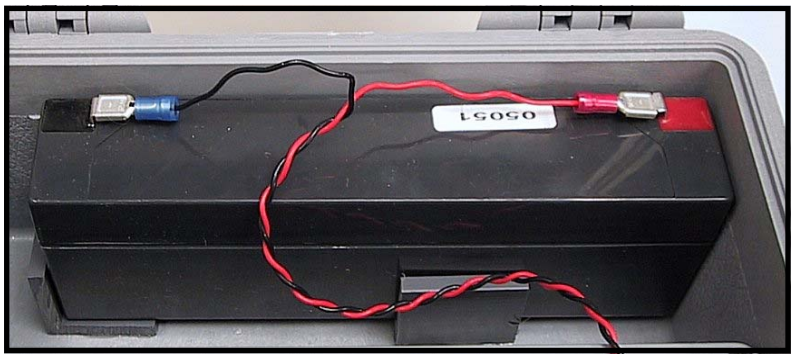
Getting to Know the GL400

The GL400 is enclosed in a UV protected PVC weather-resistant enclosure.

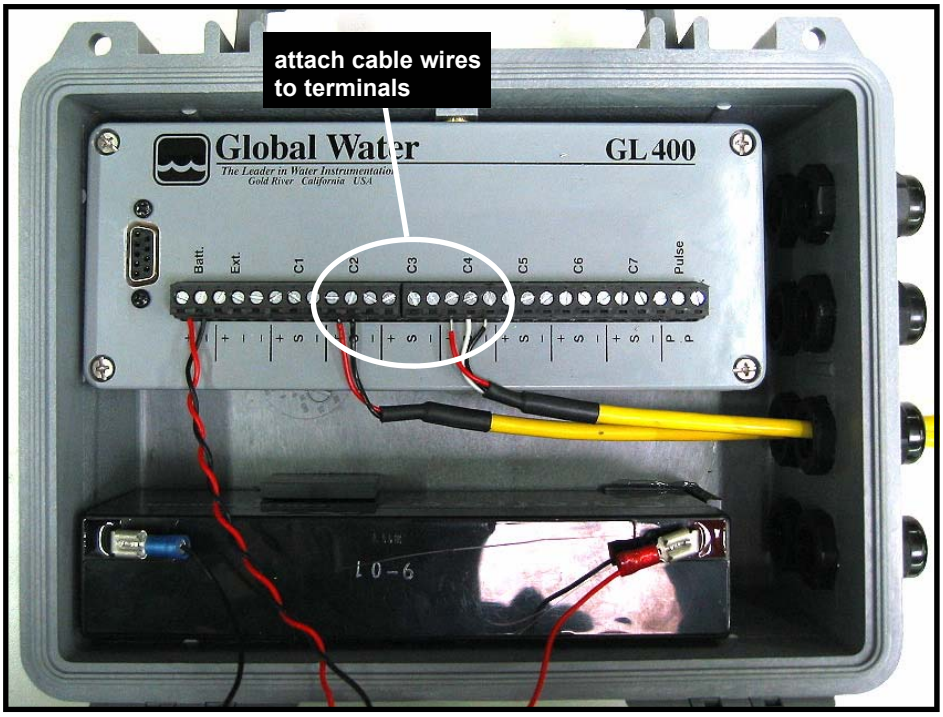


The COM port can connect to a PC serial port using the included Communication Cable.

Access the included 12V, 2 AH lead acid gell cell directly from inside enclosure.



Connect sensors to the GL400 by threading sensor cables through the enclosure's strain reliefs (8 on the GL400-7-1 and 2 on the GL400-1-1) and attaching cable wires to the channel terminals.



Each end of the Communication Cable is identical. Connect one DB-9 female connector to your PC and the other to your Datalogger.

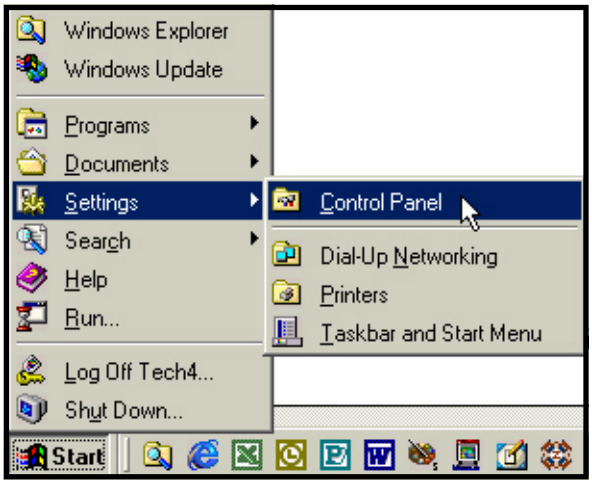
Setup 2

Installing the GL400

System Time Check

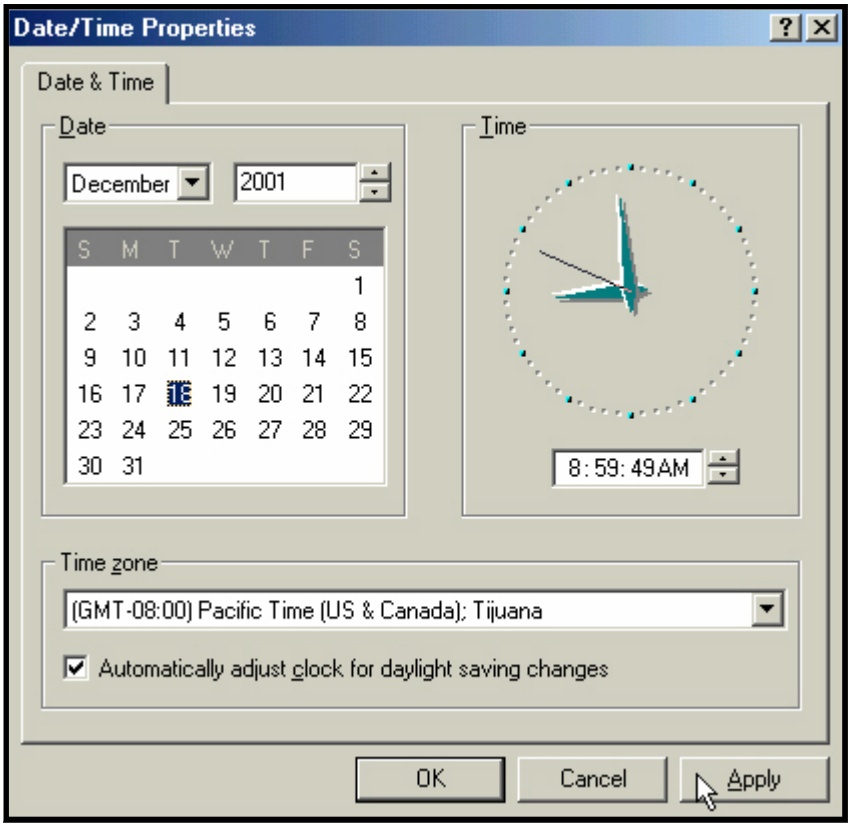
Before you install the software, check the accuracy of the time and date on your computer. The GL400 will be programmed with this information.

To verify your system time in Windows, click **Start → Settings → Control Panel** from the task bar.



Double-click the **Date/Time** icon.

Verify that your system is set to the correct time. If not, make the necessary changes, click the **Apply** button and then the **OK** button. Exit the control panel.



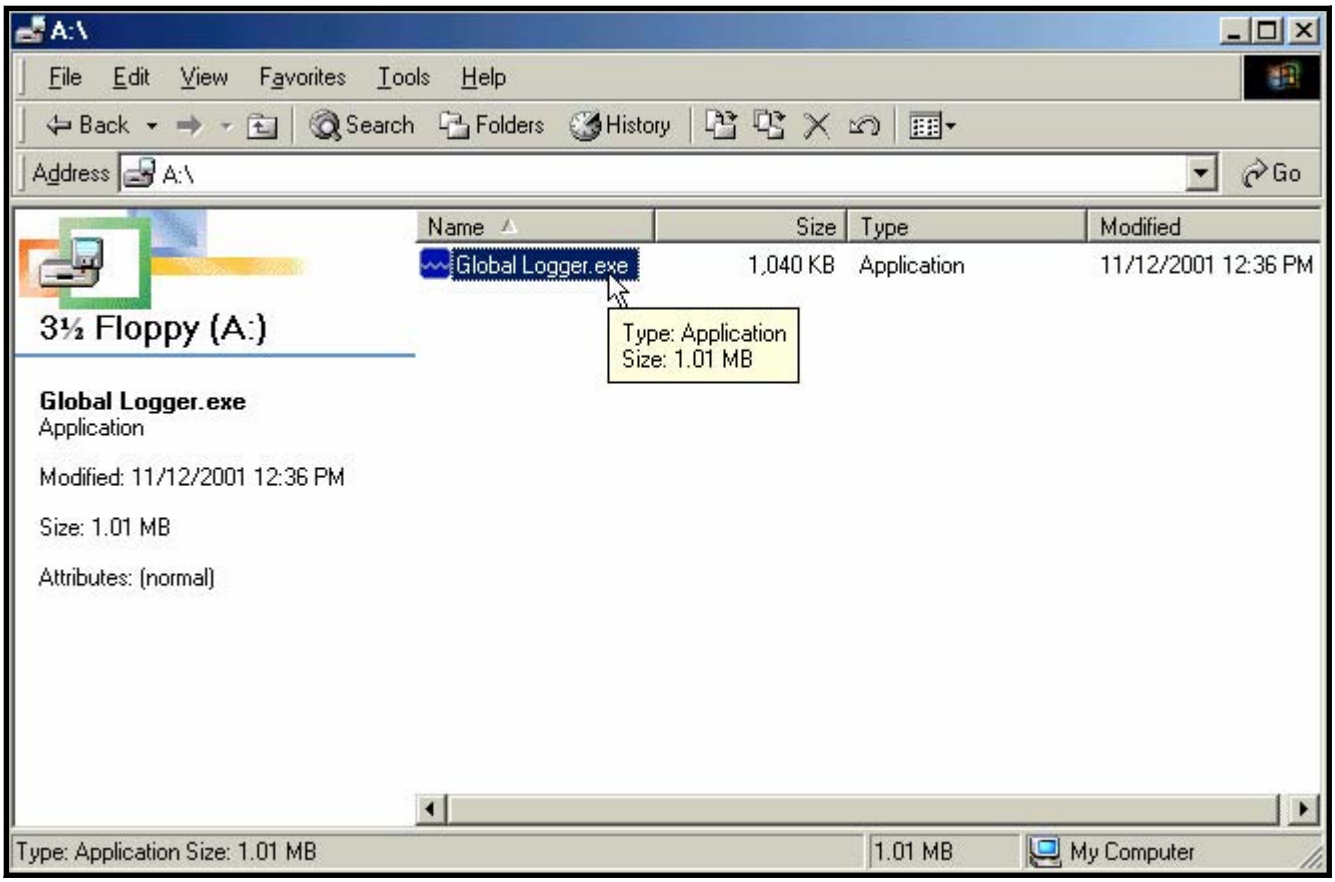
Global Logger Software Installation

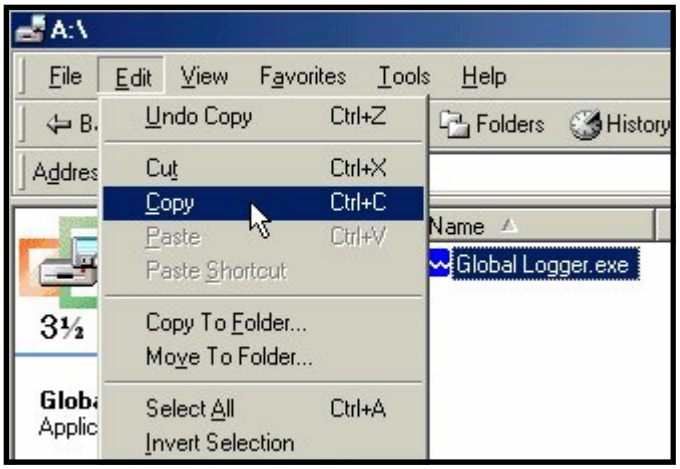
Insert the 3 1/2" floppy diskette labeled "Global Logger Software Version x.xx" (where x.xx is a version number such as 1.38) into your computer's floppy disk drive. Normally, the floppy is configured as a system's "A" drive.

Double-click the **My Computer** icon on your desktop.

Double-click the floppy icon (normally listed as **3 ½ floppy (A:)**).

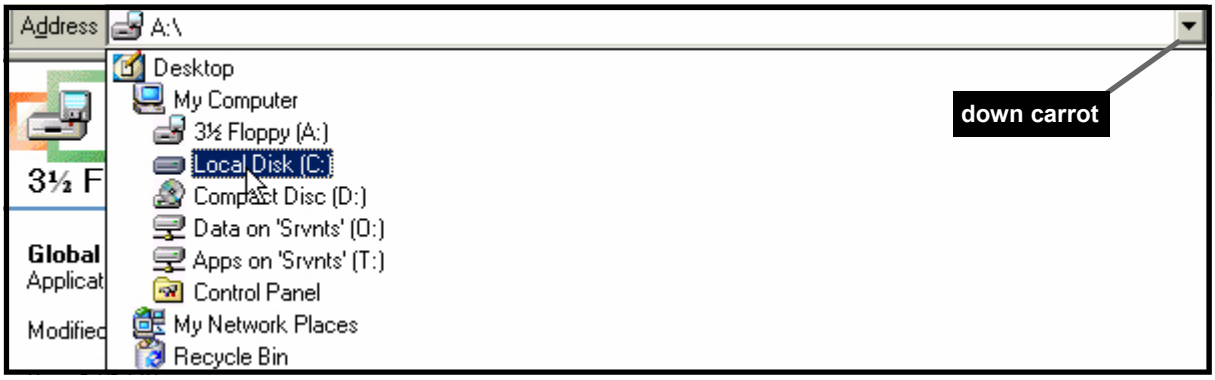
Click on the file **Global Logger.exe**.

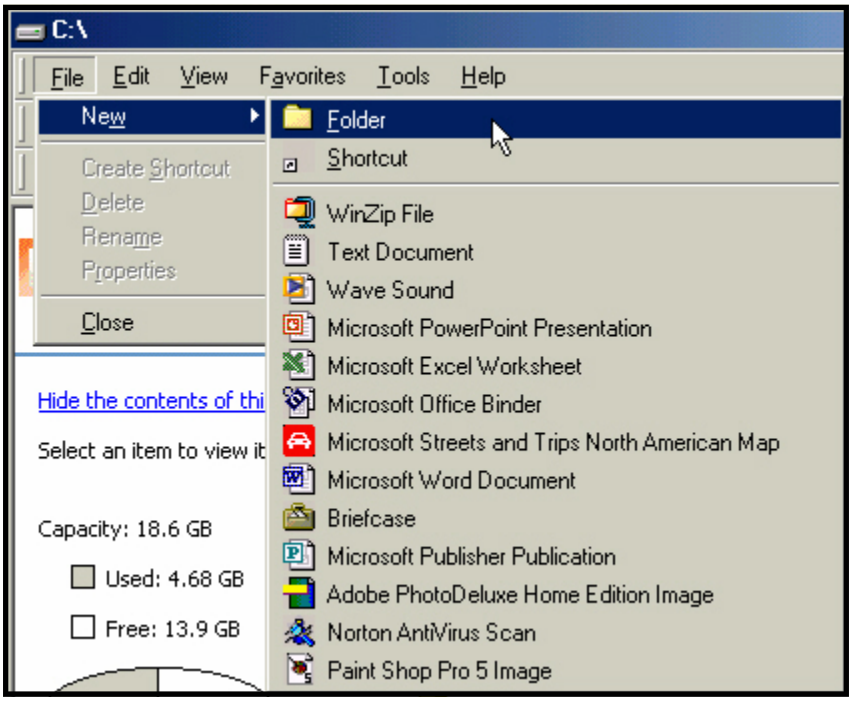




Click **Edit → Copy** from the menu bar.

Save the file to a directory of your choosing. Note, it should be a location you will easily remember. To save to the directory **Global Logger** located on your main "C" hard drive (although "C" is normally the main system drive, the designation can vary from system to system), start by clicking the down carrot of the address field. Click on the **Local Disk (C:)** icon or appropriate main system drive designation.

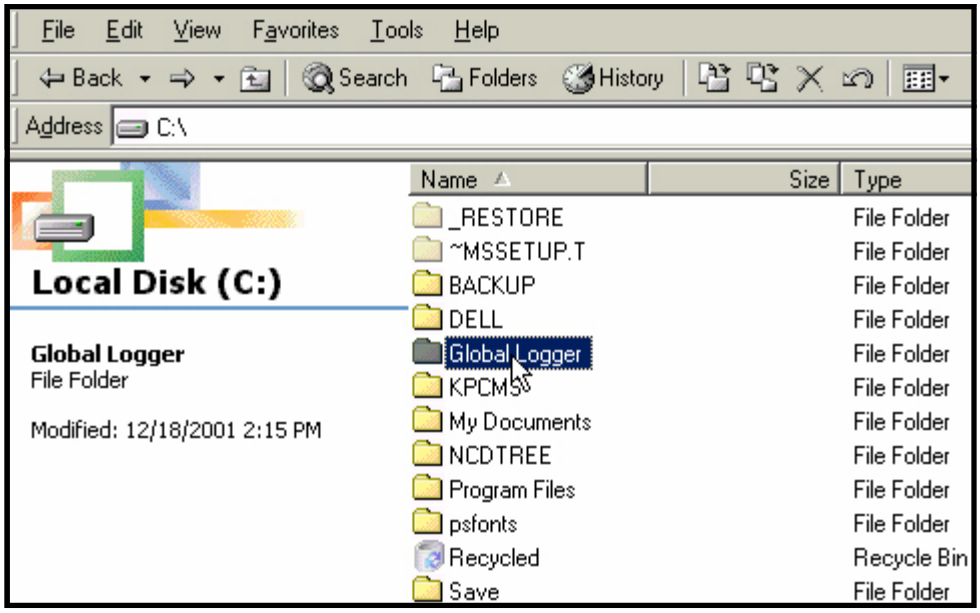


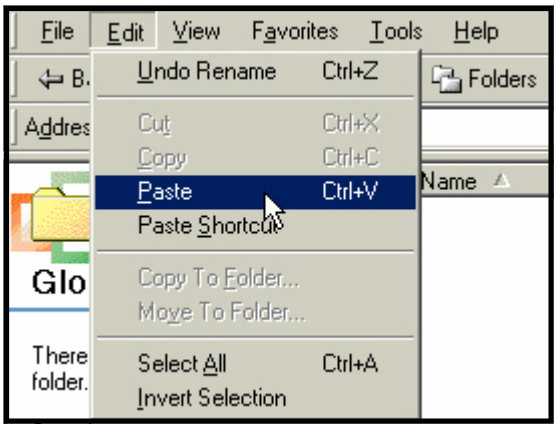


If the directory **Global Logger** is not listed, click **File** → **New** → **Folder** from the menu bar.

The directory **New Folder** should now be created and automatically selected for typeover. Type **Global Logger** and press the **enter** key.

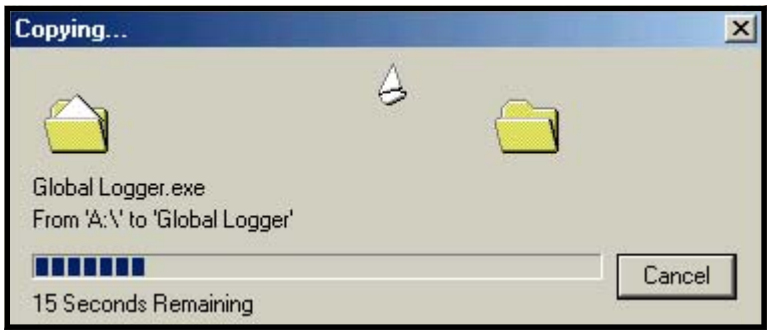
Double-click on the new **Global Logger** directory.



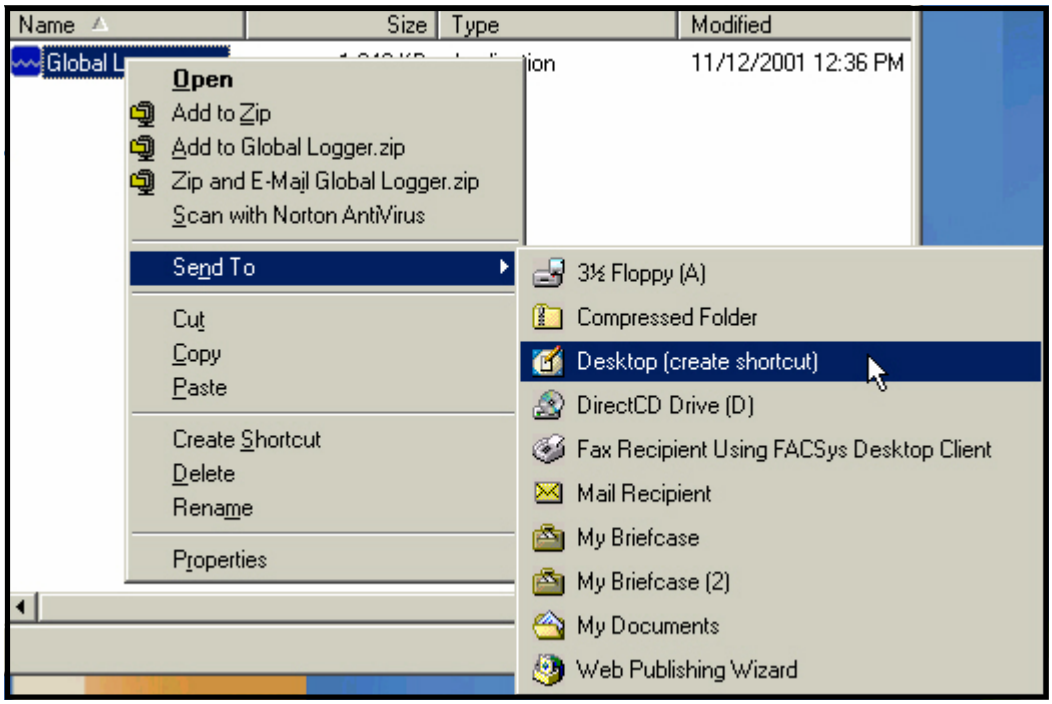


Click **Edit → Paste** from the menu bar.

A **Copying…** dialog box should now display. Wait for the copy process to complete.



To create a desktop shortcut, right-click the **Global Logger.exe** file you previously saved, select **Send To** and click on **Desktop (create shortcut)**.



You can now access your Global Logger* software directly from the desktop.

Hardware Installation

General Installation Tips

- **The datalogger is not waterproof**. It is water-resistant. This means that condensation, which can build up inside the enclosure during humid conditions, should not affect the performance of the GL400. However, if the datalogger is submerged in water, it will corrode the electronics and cause it to stop working properly. Please ensure that the datalogger will be clear from flooding and out of direct rainfall.
- The accuracy of the sensor readings can be affected by such adverse conditions as overpressure, lightening strikes, improper care/handling, and physical damage or abuse.
- **Do not install GL400 sensors in applications that contain solvents**. Over time, many solvents can deteriorate the cable and the sensing elements.
- Install your GL400 so that it is easily accessible for calibration purposes. You may need to remove and reinstall it in the future, so plan ahead!

Sensor Installation

Note, the following instructions and screenshots specifically refer to the GL400-7-1. If you have purchased the GL400-1-1, you will only be able to utilize analog channel 1 (**C1**) and the pulse channel (**Pulse**).

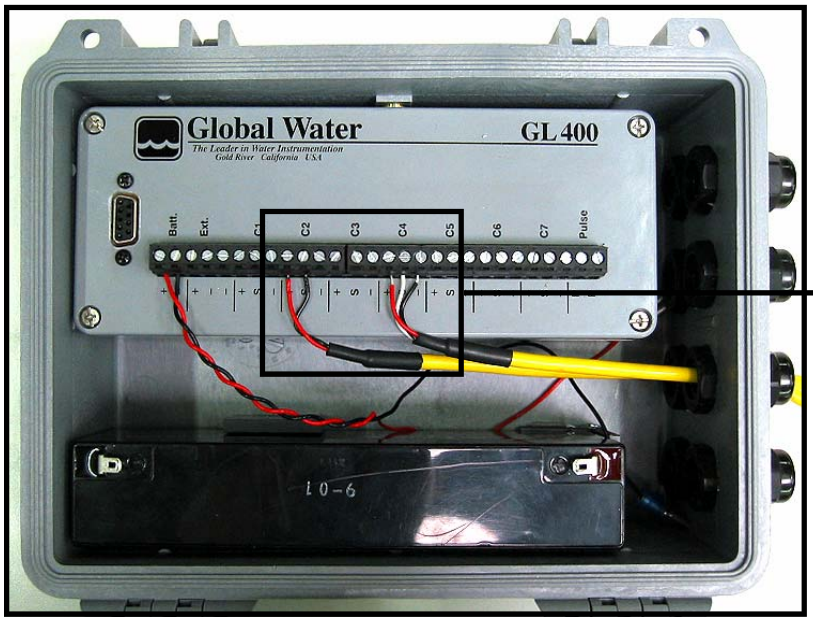
You can connect 2-wire or 3-wire sensors to the GL400. Before connecting a sensor, first disconnect the battery spade lugs from terminals.

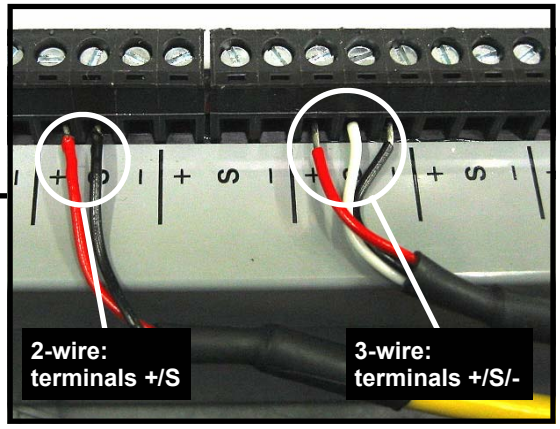
You can connect analog sensors to channels 1 – 7 (**C1 – C7**) on the terminal strip and a pulse sensor to the **Pulse** channel. Note, you can connect an external power source to the **Ext.** terminals, located below the internal battery (**Batt.**) terminals.

To connect a sensor thread sensor cable through an enclosure strain relief, and attach cable wires to the channel terminals. Before inserting wires into terminals you may need to loosen terminal screws.

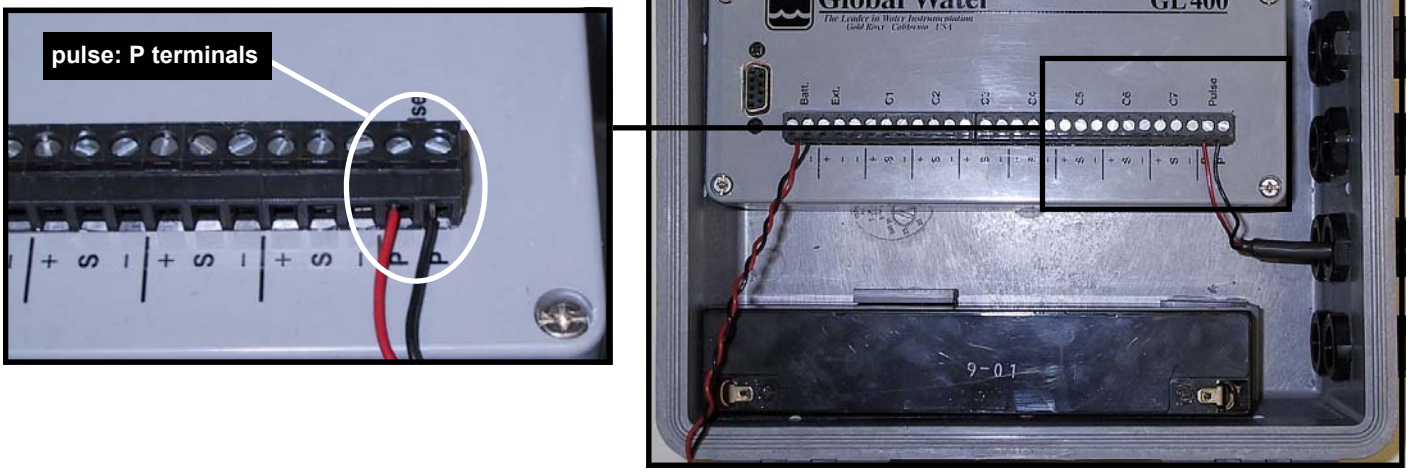
For 2-wire analog sensors, insert black wire into the **S** (signal) terminal and tighten until secure. Next, insert red wire into the + (power) terminal and tighten until secure.

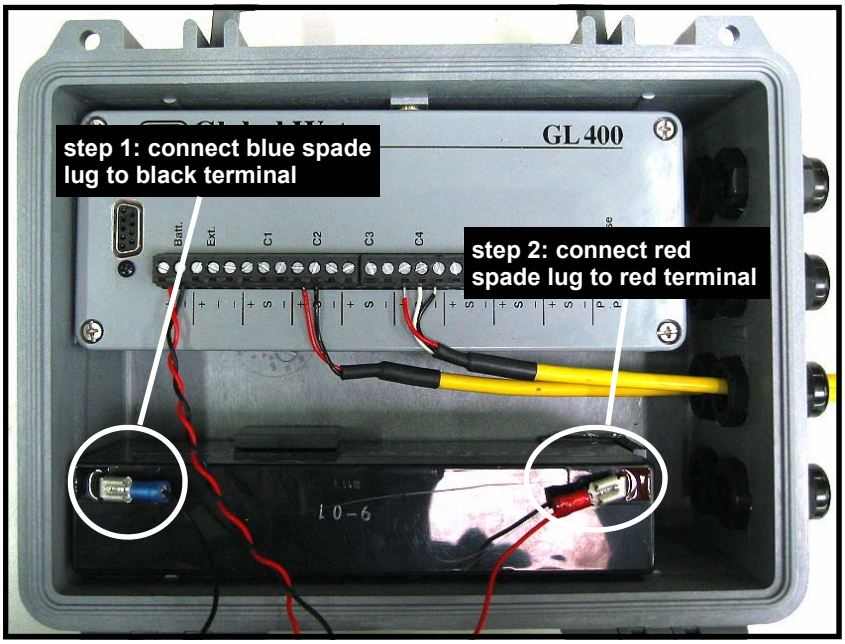
For 3-wire analog sensors, insert black wire into the – (ground) terminal and tighten until secure. Next, insert white wire into the **S** (signal) terminal and tighten until secure. Finally, insert red wire into the + (power) terminal and tighten until secure.





For pulse sensors polarity is not an issue, so red and black wires may be inserted in either **P** terminals. Insert black/red wire into one **P** terminal and tighten until secure. Insert the black/red wire into the other **P** terminal and tighten until secure. There is no pulse signal terminal.





Connect the battery's blue spade lug to the black terminal followed by the red spade lug to the red terminal.

Your sensor is now connected to the logger and is accessible* through the Global Logger** software package.

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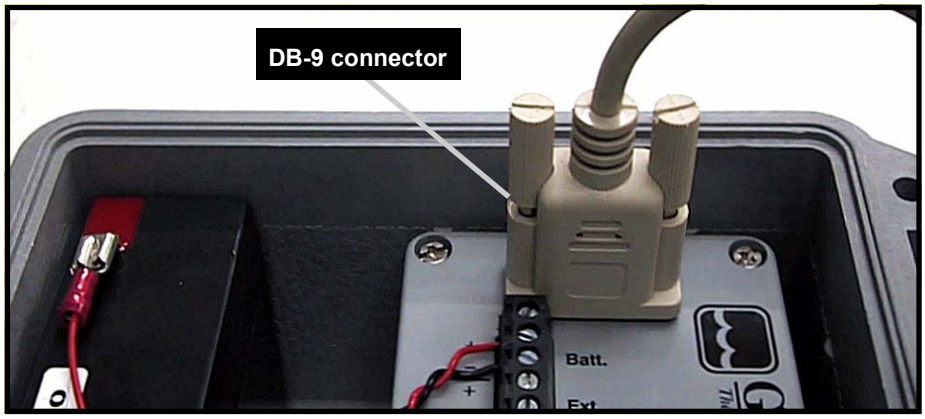
* See **Global Logger Startup**, page 18.

Using Global Logger Software 3

Hardware Connection

Connect the DB-9 female connector of the included communication cable (RS232C) to the COM 1 serial port on your computer. If COM 1 is being used, either disconnect and/or disable the device on COM 1 or connect to COM 2*.

Connect the DB-9 male connector of the communication cable (RS232C) to your GL400 COM port.



Global Logger Startup

Double-click the Global Logger** icon on your desktop if you created a desktop shortcut during software setup. Otherwise, access the directory in which your **Global Logger.exe** file is located and double-click on the file. If you have not installed the Global Logger software or if you want to create a desktop icon, see **Global Logger Software Installation***. Note that the screen-shots in **Chapter 3: Using Global Logger Software** represent those of an eight channel logger (GL400-7-1). If you own a different model such as the GL400-1-1, Global Logger will display differently.

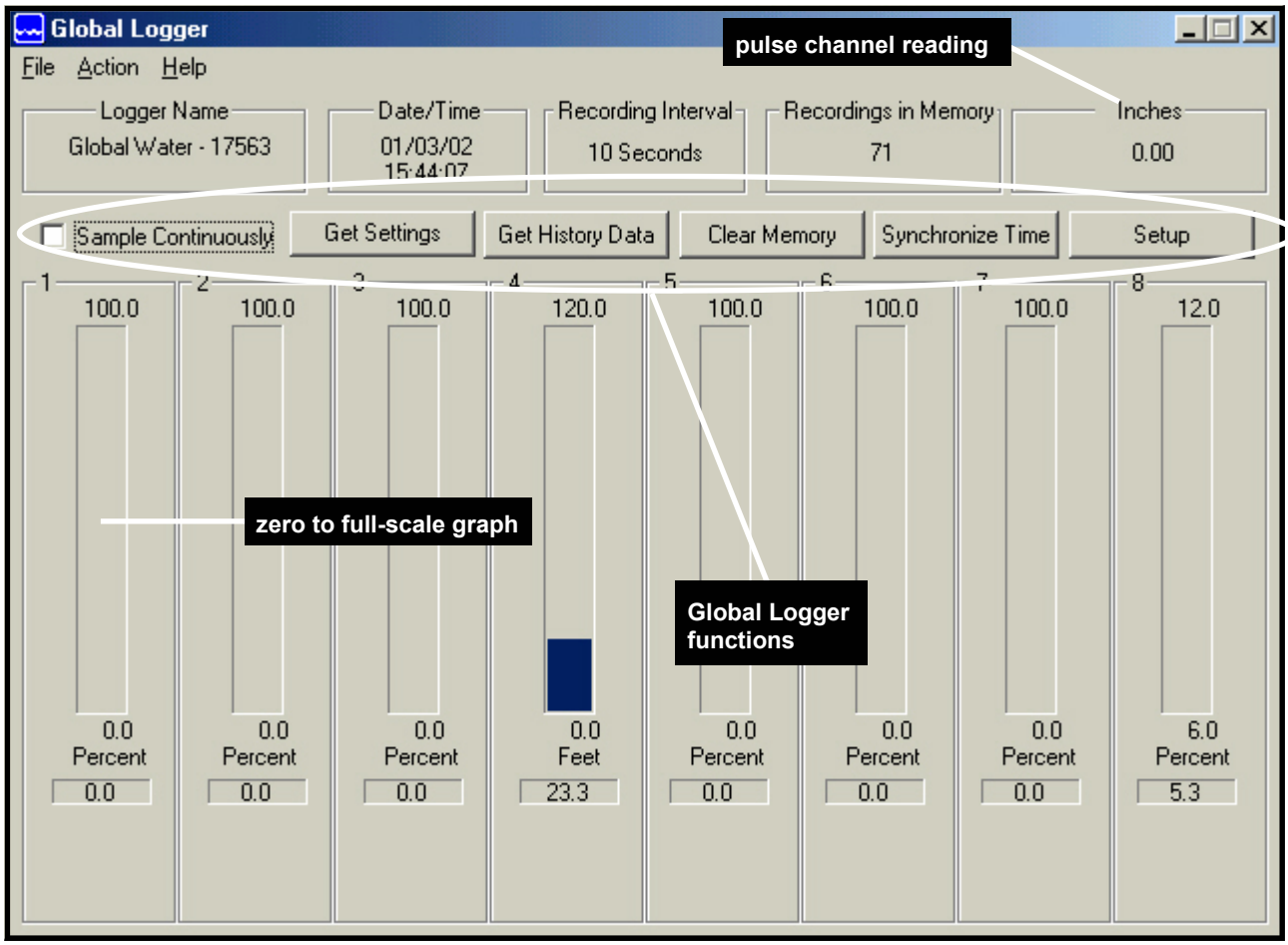
* See **Comm Failure**, page 32.
** Copyright © Global Water Instrumentation, Inc. 2001
***See **Global Logger Software Installation**, pages 11 – 15

The Global Logger* main window will display data in the following fields: **Logger Name**, **Date/Time**, **Recording Interval** and **Recordings in Memory**.

Access the Global Logger functions **Sample Continuously**, **Get Settings**, **Get History Data**, **Clear Memory**, **Synchronize Time** and **Setup** through the main menu check box and buttons. All Global Logger functions can also be accessed through **Action** on the menu bar.

The bar graphs indicate zero to full-scale range of sensor for the eight analog channels of the datalogger. For example, the channel 4 graph in the following screen shot displays a 120 foot sensor with a reading of 23.3 feet. This data indicates that the sensor is currently at a depth of 23.3 feet. Sensors are calibrated to a variety of unit specifications (i.e. meters, percent, etc.), so your bar graph readings may differ slightly. Note that the GL400 terminal strip can only accommodate seven analog sensors, so one channel will not be used.

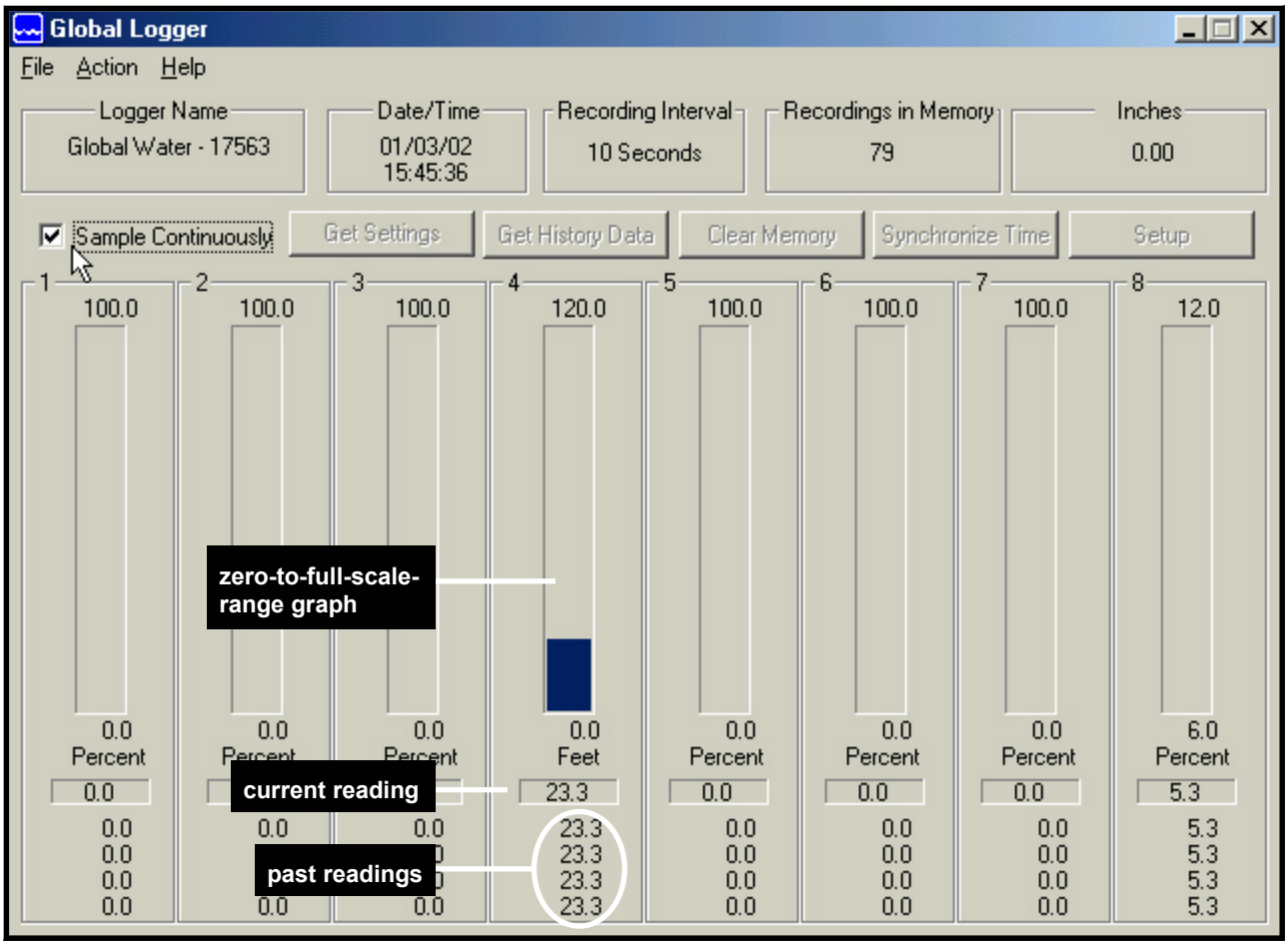
The pulse unit field (currently displaying **Inches**) at the top right of the window indicates the current single pulse channel reading.



Global Logger Functions

Sample Continuously/Real-Time Values

To display real-time values each second, select the **Sample Continuously** checkbox. Readings will display below each zero-to-full-scale-range graph. To stop readings, unselect checkbox. Note, that real-time data is not recorded; therefore, you cannot retrieve it from GL400 memory.

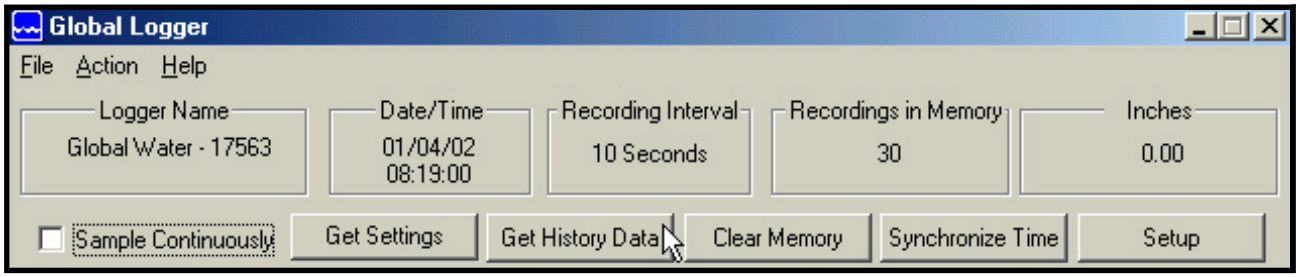


Get Settings

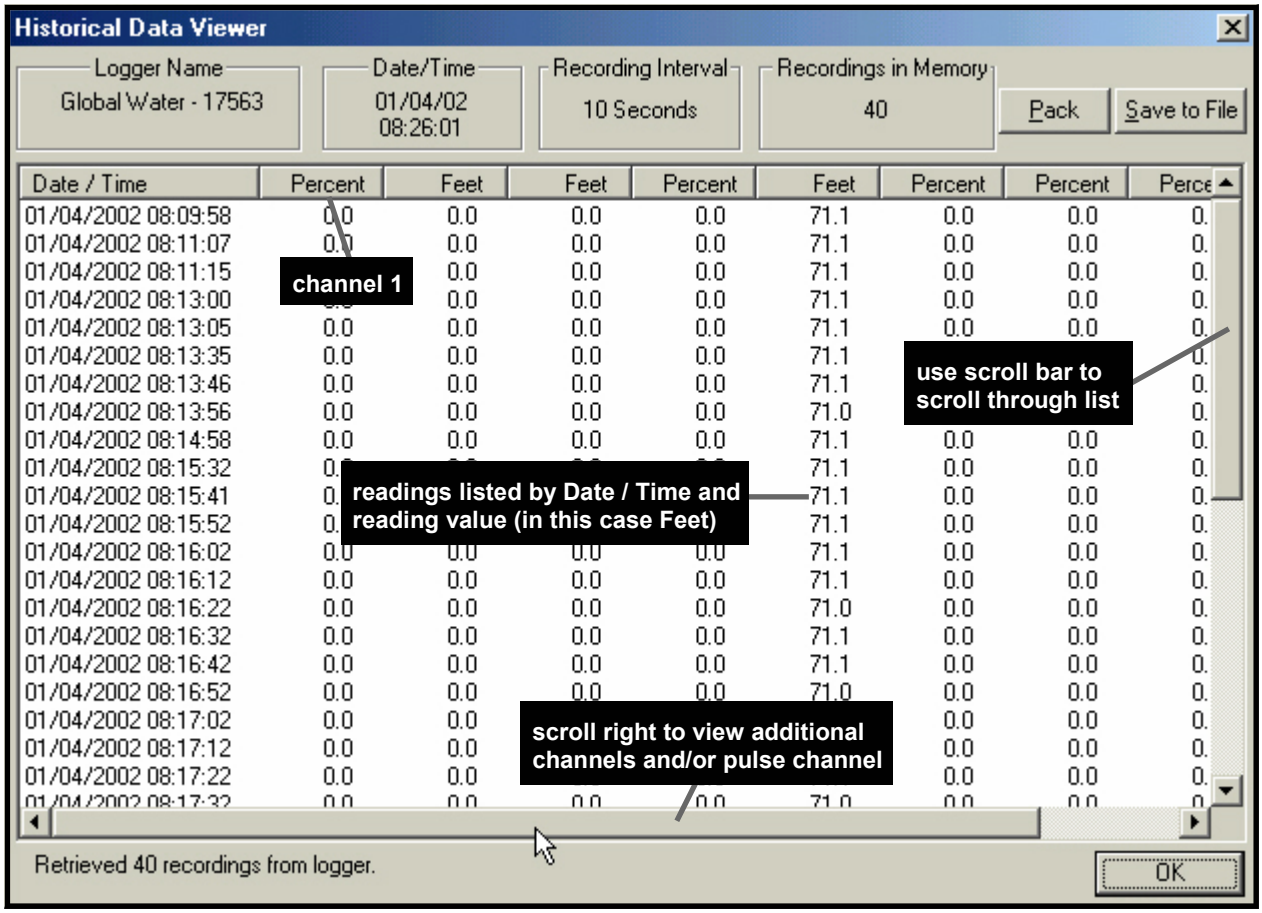
To refresh information in the Global Logger* main window, click the **Get Settings** button. This action will update the **Logger Name**, **Date/Time**, **Recording Interval** and **Recordings in Memory** fields.

Get History Data

To retrieve logged data from memory, click the **Get History Data** button. The speed of your upload will depend on the number of data points recorded (more recordings equals longer upload time). To minimize long upload times, clear memory* after backing it up to disk**.

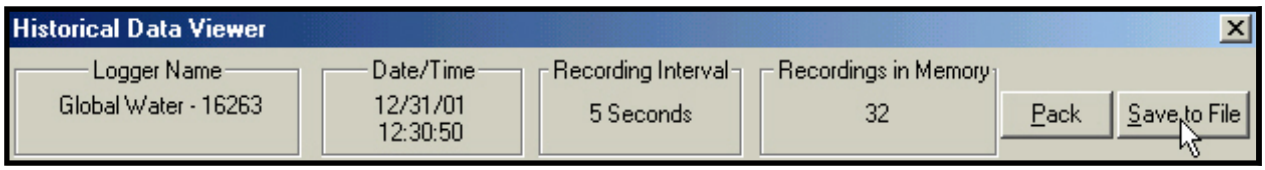


A **Historical Data Viewer** window will display. This window lists each data point for every channel by Date / Time and reading value. Channel 1 readings are displayed in the column immediately to the right of the **Date / Time** column and additional channels consecutively to the right of channel 1. If there are more data points in memory than will fit in the data view window, use the vertical scroll bar to scroll through the list of readings. To view the pulse channel column, scroll to the right using the horizontal scroll bar.

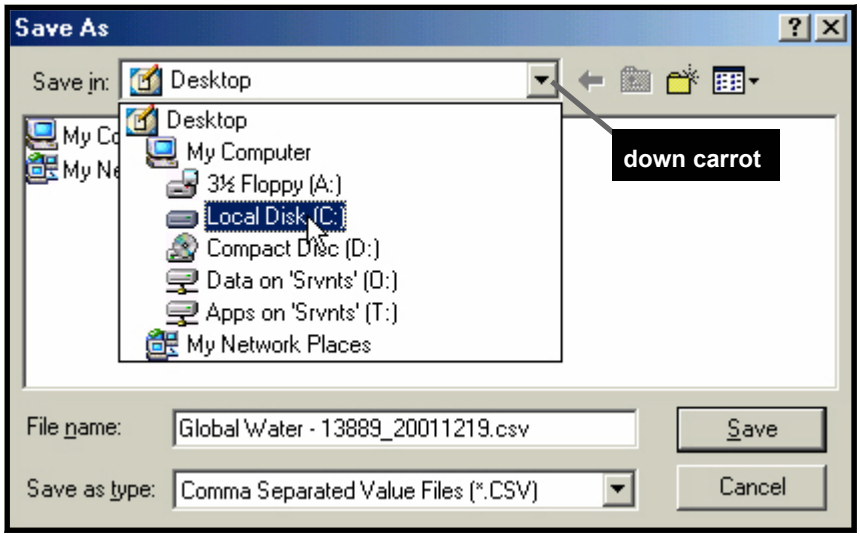


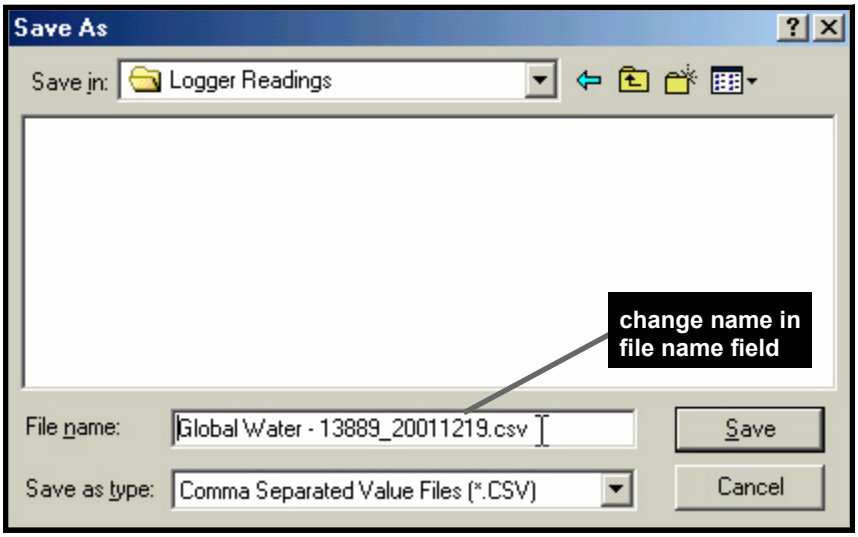
* See **Clear Memory**, pages 23
See **Get History Data, pages 22

If you want to save current readings, click the **Save to File** button.



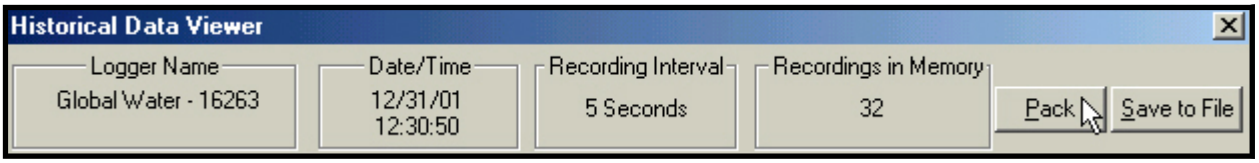
A **Save As** window will display. If you want to save your file to a directory other than the one displayed, click the down carrot of the **Save in:** field and click on the device (i.e. hard disk drive, floppy disk drive, etc.) you want to save the file to.





Double-click the directory or subdirectory you want to save to. If you want to change the file name click anywhere in the **File name:** field and type the desired name. However, do not change the .csv extension. This extension ensures the file will be recognized as a comma separated value (*.CSV) file. You can open CSV files in spreadsheet programs such as Microsoft Excel*. Click **Save** to save the file.

To remove duplicate readings, click the **Pack** button. Note, this operation will not remove the initial duplicate reading on each channel. For this feature to work, all channels must have consecutive duplicate readings. Since the pack function does not change the readings stored in memory, you will need to **Save to File** to preserve the pack operation. If you exit and then reenter the **Historical Data Viewer** window, all readings (including zero readings) stored in memory will display regardless of any prior pack operation.

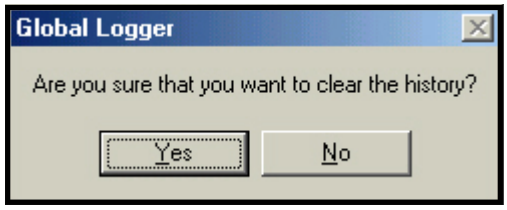


Click **OK** to exit the **Historical Data View** window.

*Windows® Excel is a trademark of the Microsoft Corporation

Clear Memory

To clear your GL400's memory of readings click the **Clear Memory** button.

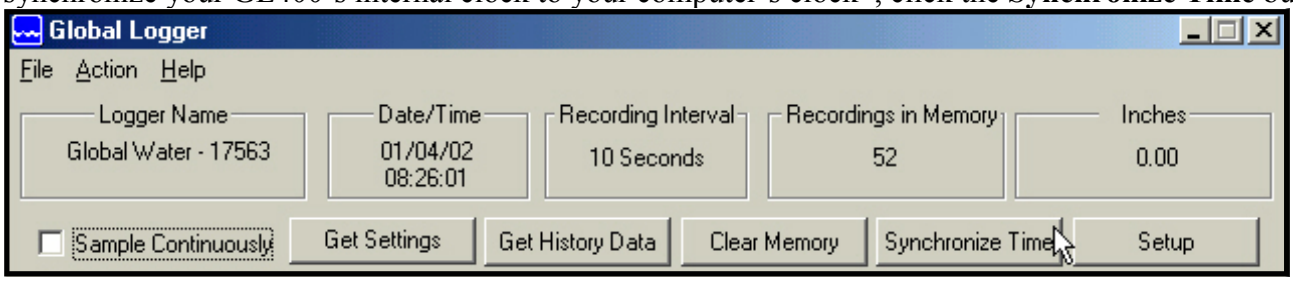


A confirmation dialog box will display. Click **Yes** to clear history or **No** to keep readings.

If you click **Yes**, a **Standby** graphic will display in the middle of your monitor screen while the memory is purged.

Synchronize Time

To synchronize your GL400's internal clock to your computer's clock*, click the **Synchronize Time** but-



A **Standby** graphic will display in the middle of your monitor screen while synchronizing.

Setup

Note that your datalogger has come completely setup from our factory. It has been calibrated and tested for optimal accuracy and performance with any sensors you have ordered along with your datalogger. If you choose to recalibrate your sensors or calibrate additional sensors, use the following procedures.

*See **System Time Check**, pages 10 – 11

To begin calibration and/or to change time interval settings, click the **Setup** button. A **Global Water Setup** window will display.

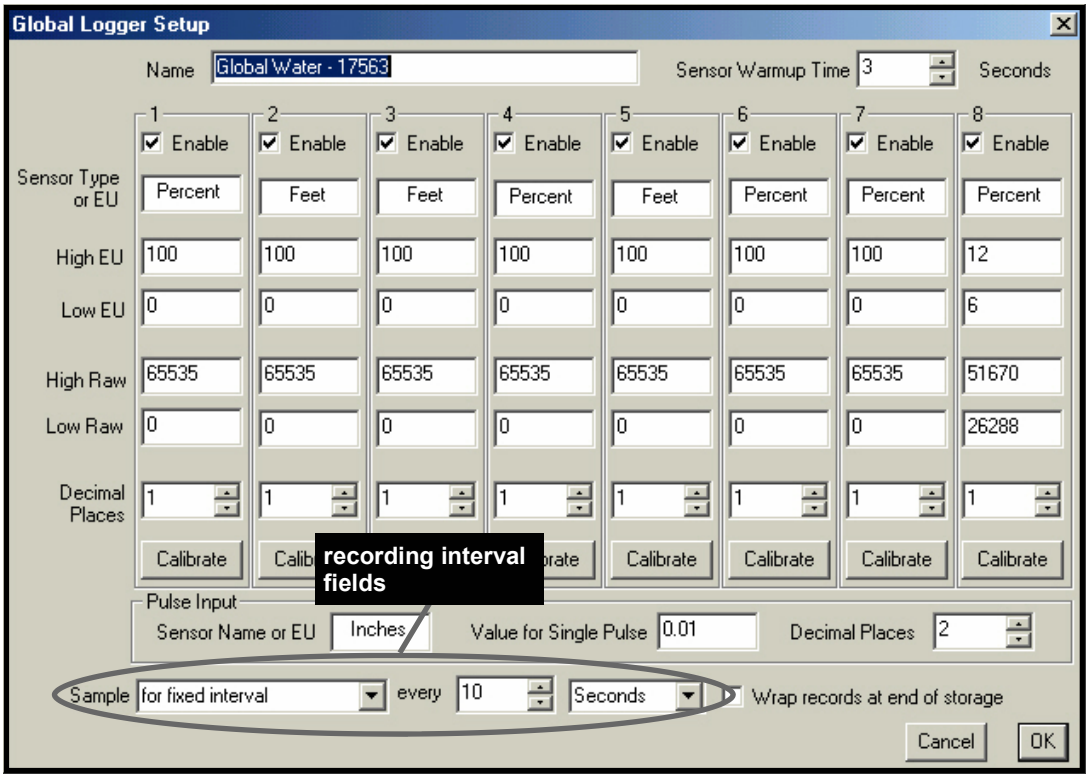
Datalogger Name and Sensor Warmup Time

If you want to change the datalogger name, click in the **Name** field and type in a new name.

In order to supply connected sensors with adequate power for accurate data measurments, set the **Sensor Warmup Time** field to the specification indicated in your sensor manual. Note that this field should reflect the sensor specification with the longest warm-up time. This setting dictates the length of time power is applied to the attached sensors before the datalogger takes a reading.

For example, you set Global Logger* to a sensor warm-up time of 3 seconds, and to record readings every 20 minutes at fixed intervals. If the process begins at 12:02:00, power will be applied to attached sensors immediately and readings taken at 12:02:03. At 12:22:00, power will again be applied to the attached sensors, and the datalogger will take readings at 12:22:03. Note that if the recording interval fields are less than or equal to the **Sensor Warmup Time** field, any attached sensors are powered continuously.

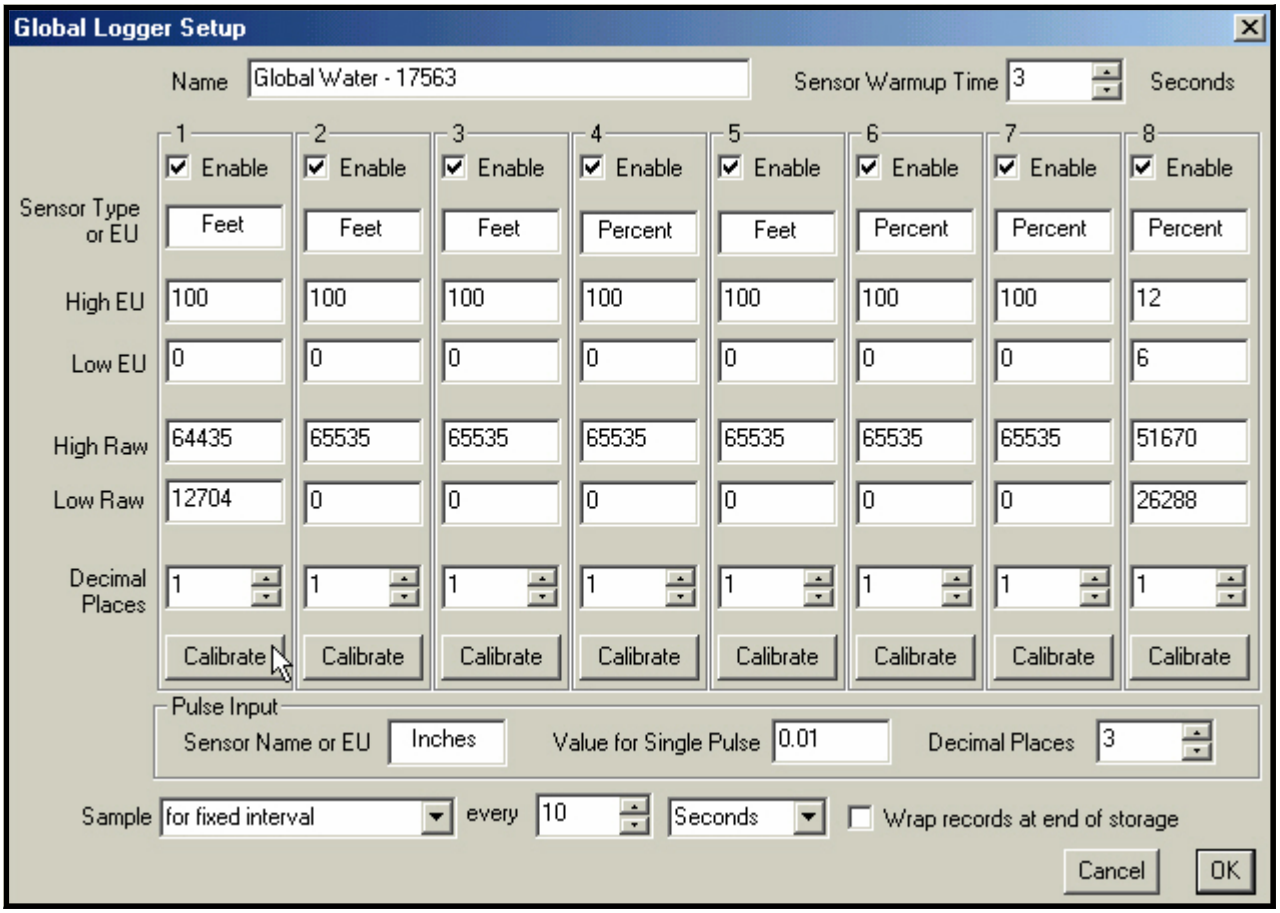
To change warm-up time, click in the **Sensor Warmup Time** field and enter the desired time (0 –15 seconds). You may also click the up/down arrows to the right of the text field to increase or decrease the value by 1.

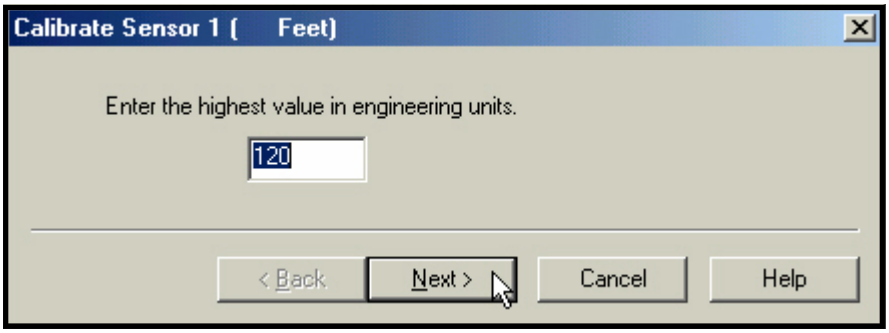


Analog Channel Calibration

Change the **Sensor Type or EU** (engineering units) field to the unit type you are calibrating to (i.e. meters, feet, etc.) by clicking in the field and typing the unit name. Note that the **Sensor Type or EU** field is only a text label. Actual readings are determined by the following calibration steps.

In case you make a mistake during the calibration process, write down the existing values in the **High Raw** and **Low Raw** fields before continuing (in this case **64435** and **12704**). Click the **Calibrate** button.

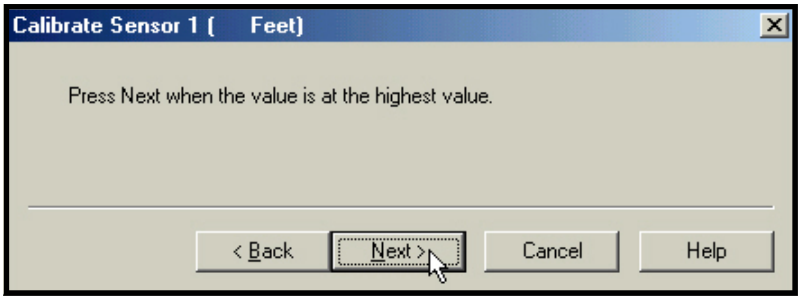


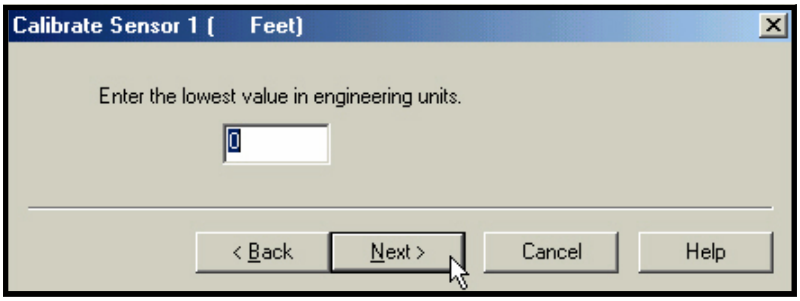


Enter the maximum unit range of the sensor (**120** for a 120' level sensor in this example) in the **highest value** text field and click the **Next** button.

If performing a lab calibration, insert the sensor into the appropriate calibration meter and set to full scale range of the sensor. If performing an environmental calibration, insert sensor into its targeted environment at conditions of at least 10% of full scale range. For example a 120' water level sensor should be calibrated at a water depth of at least 12'. Calibrating at greater percentages (up to 100%) provides greater accuracy.

For both environmental and lab calibrations, wait at least five seconds for the sensor to adjust to current sensing levels. Click the **Next** button.

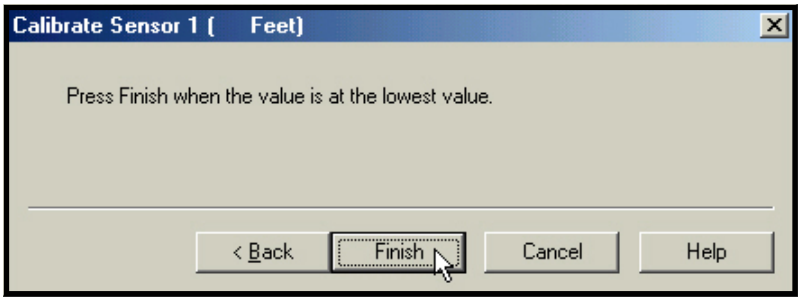


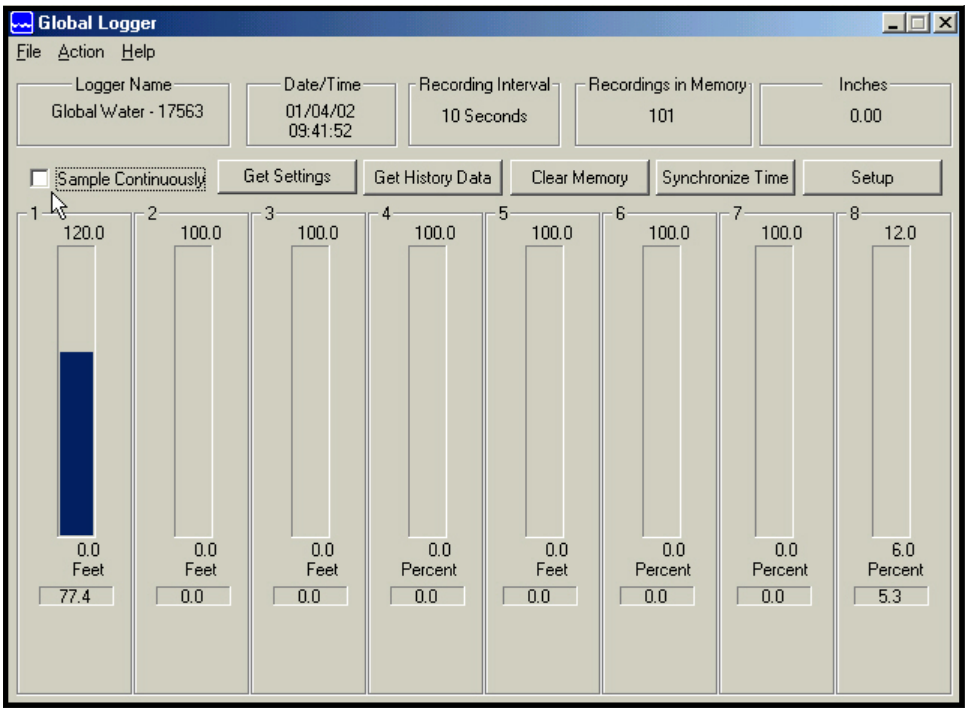


Enter **0** in the **lowest value** text field and click the **Next** button.

For lab calibrations, release the sensor from calibration meter. For environmental calibrations, take sensor out of targeted environment.

For both environmental and lab calibrations, wait at least five seconds for the sensor to adjust to 0 sensing levels. Click the **Finish** button.



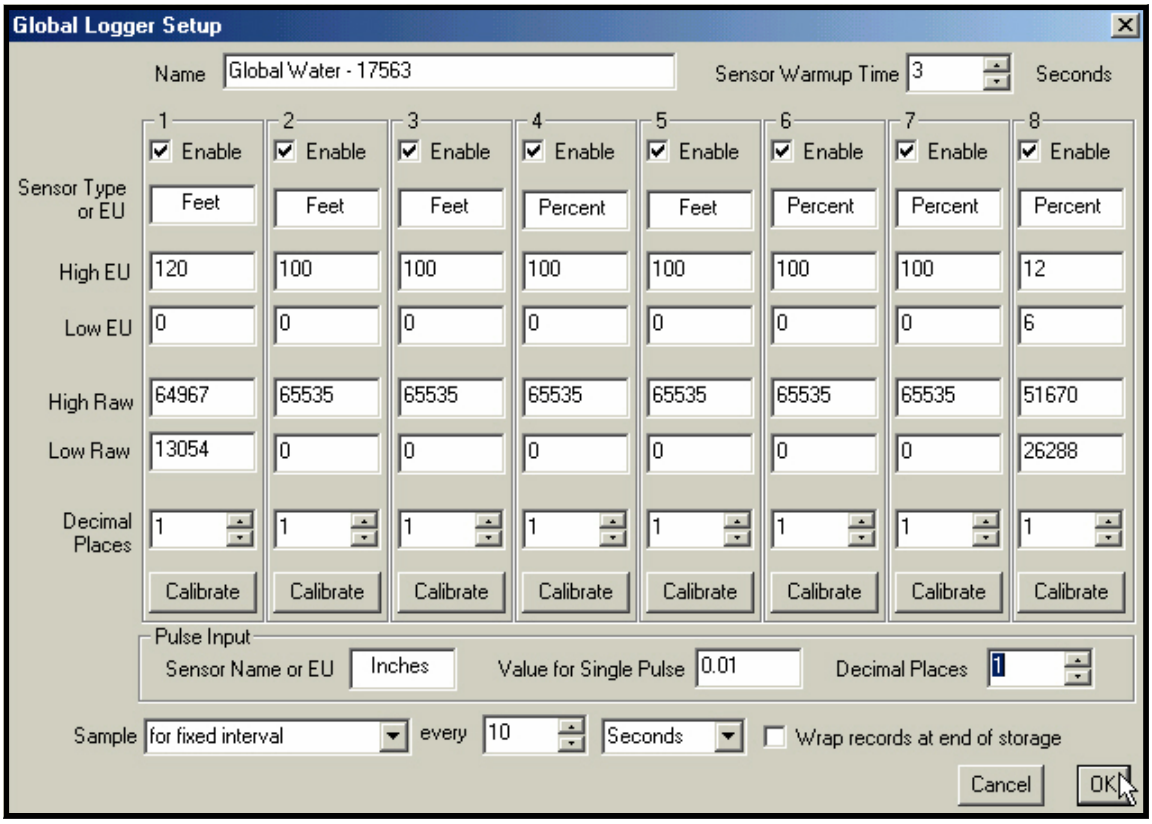


Note, that if performing an environmental calibration at a fraction of total sensor range, the bar graphs in the main **Global Logger** window will interpret full scale range at maximum calibration readings instead of actual total sensor range. All other logger operations will perform correctly. To revise calibration settings so that the graphs will function correctly, follow the worksheet **Calibrating the Bar Graph to Higher or Lower Range** in **Appendix B***.

*See **Appendix B: Worksheets**, pages 36

Verify that **High EU** and **Low EU** fields reflect desired unit readings. Also, verify that the **High Raw** field reflects a range of 60,000 – 65,000 and that the **Low Raw** field reflects a range of 10,000 – 15,000.

Adjust the **Decimal Places** field according to the accuracy percentage rating. The number of decimal places should not exceed the accuracy of the sensor. After calibrating, click the **OK** button. To cancel changes, click **Cancel**.



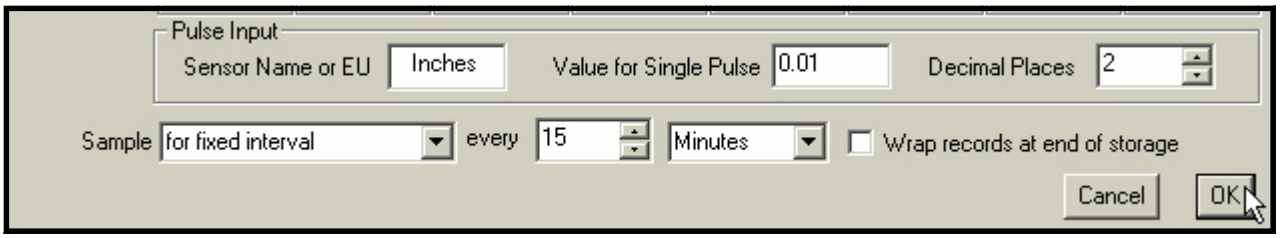
Pulse Channel Calibration

To change pulse channel settings, refer to the **Pulse Input** fields in the **Global Logger Setup** window. The pulse channel records a predetermined value each time the sensor detects a pulse signal. This feature is often used to track rainfall levels.

To change the displayed unit type (i.e. meters, feet, etc.), tap the **Sensor Name or EU** (engineering units) field and enter the unit type you are calibrating to. Note that the **Sensor Name or EU** field only serves as a text label.

To set the recorded value for a single pulse reading, tap the **Value for Single Pulse** field and enter the desired predetermined value.

To set the number of decimal place values to display, tap the **Decimal Places** field and enter the number of decimal places (0 – 6), or click the up/down arrows to the right of the text field to increase or decrease the value by 1. After changing settings, click the **OK** button. To cancel changes, click **Cancel**.



Recording Interval and Memory Management

Select the interval type by clicking the down carrot of the **Sample** field. To repeatedly record values at a specified interval, click **for fixed interval**.

Note, that if you choose to record at fixed intervals, memory will fill up according to the following product-specific charts. Refer to battery maintenance chart for battery life to available memory comparisons*.

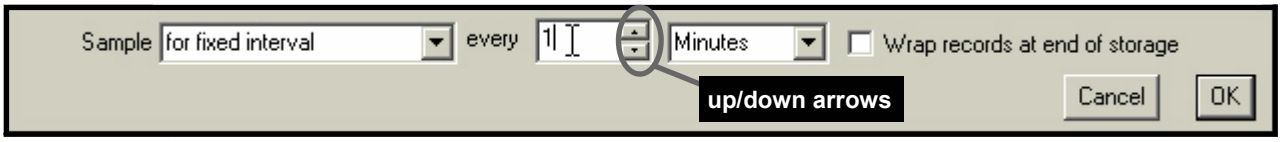
GL400-1-1

Recording Interval	Time
1 second	5 hours, 31 minutes
1 minute	13 days
5 minutes	68 days
15 minutes	206 days
30 minutes	413 days, 30 hours
1 hour	827 days

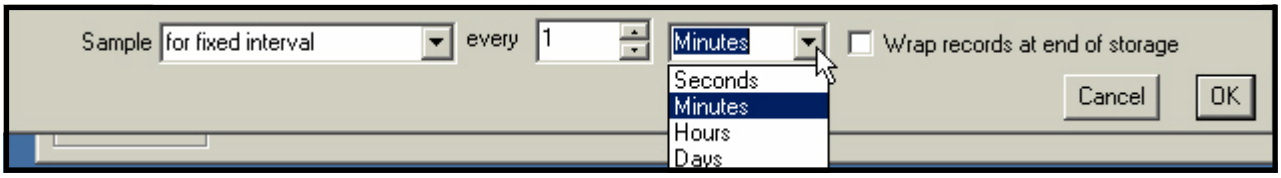
GL400-7-1

Recording Interval	Time
1 second	2 hours, 20 minutes
1 minute	5 days, 20 hours
5 minutes	29 days
15 minutes	87 days
30 minutes	175 days
1 hour	350 days

Set the recording interval digit, by clicking in the **every** text field, and typing the desired number. You may also click the up/down arrows to the right of the text field to increase or decrease the value by 1.



Set the recording interval time unit, by clicking the down carrot of the time unit field (not labeled) and clicking **Seconds**, **Minutes**, **Hours** or **Days**.



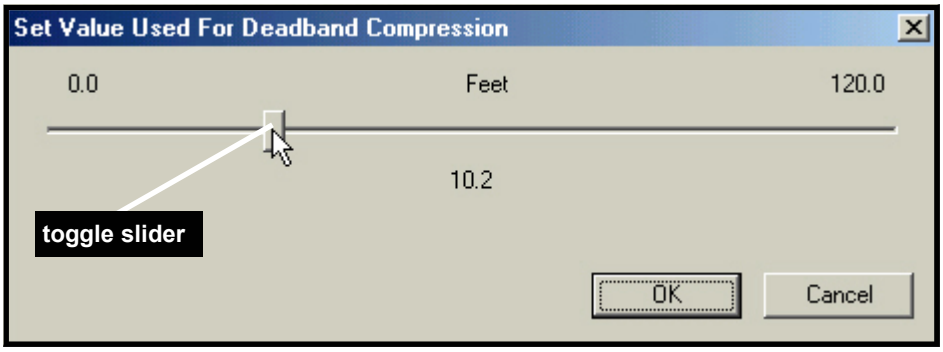
*See **Battery**, page 31

To record values according to a logarithmic curve, click **for logarithmic interval**. See chart for timeline specifications.

Time Frame	Readings per time unit	Expected total readings during Time Frame
0-19 seconds	As fast as possible	1000
20-59 seconds	1 per 1 second	40
60-599 seconds	1 per 12 seconds	45
10-99 minutes	1 per 2 minutes	45
100-999 minutes	1 per 200 minutes	45
1000-9999 minutes	1 per 1440 minutes	45

To take readings upon exceeding a specified unit range, click **upon exception**. This setting sets the logger to record a single reading after detecting a ± variance from the previously recorded exception reading. Click the long bar appearing at the bottom of the **Global Logger Setup** menu

Click and hold toggle slider with left mouse button (i.e. do not click and release). Move slider left or right to select desired exception range, and release mouse button. Click **OK** to preserve selection or **Cancel** to revert to the previous setting.

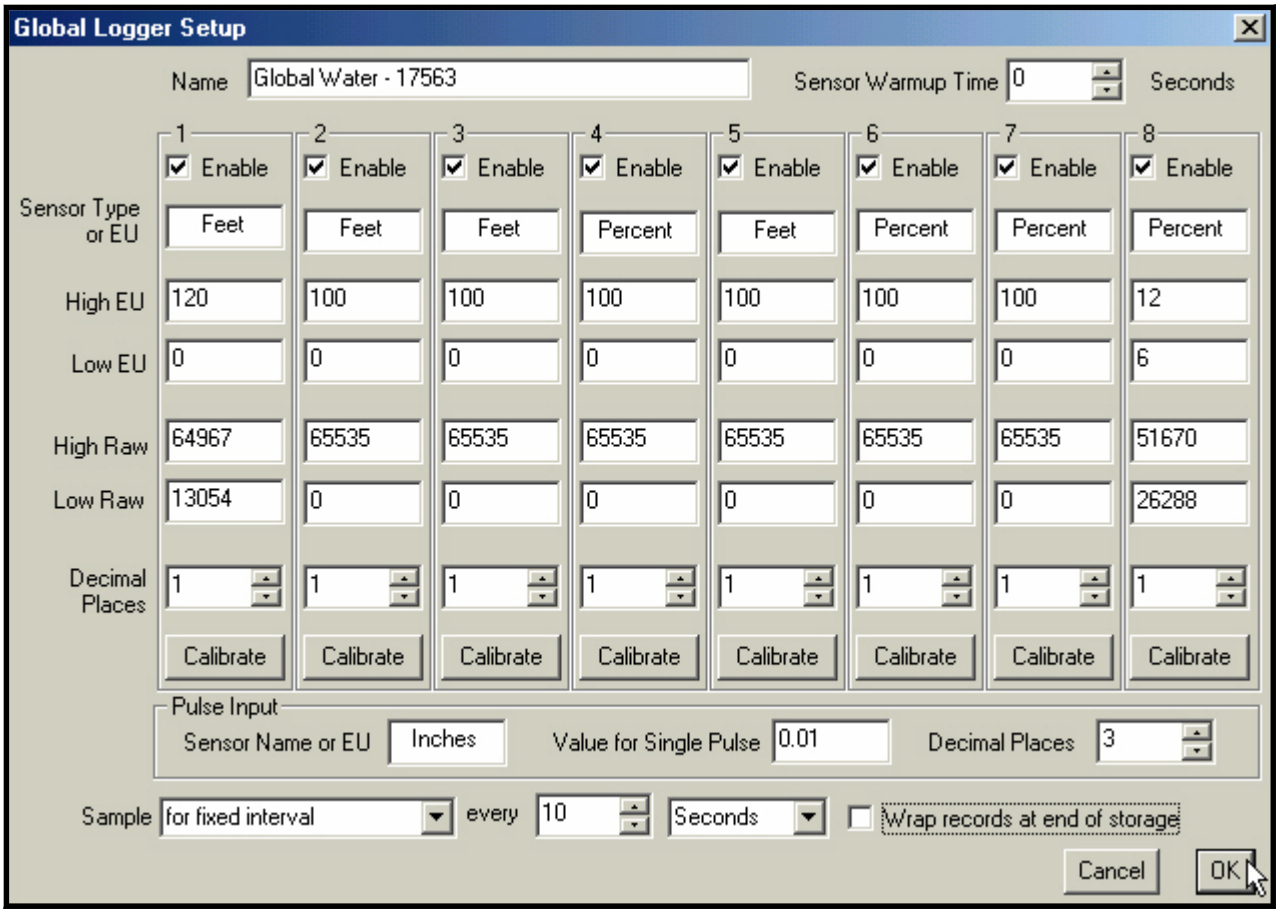


The bar should change to reflect the latest exception setting. The setting in these screenshot examples sets the logger to record a single reading after reading changes (rises or falls) by 10.2 feet from the previous exception.

The **Wrap records at end of storage** checkbox dictates whether or not the logger continues to record readings after its memory is filled. To overwrite readings in synchronous order (earliest readings are overwritten first) after memory is filled, click the checkbox. To preserve readings and stop recording after memory is filled, leave box unchecked.

After calibrating and/or changing interval recording settings, click the **OK** button. To cancel changes, click **Cancel**.

You may also manually change GL400 settings directly using a terminal program*.



*See **Appendix C: Terminal Programming**, page 38

Maintenance 4

Battery

Global Water recommends that the battery voltage be physically checked based on your recording interval*. Refer to the following table.

Note, that the GL400 uses 160µA while "sleeping" and 10mA plus the signal current while taking readings. This table is based on the worst-case scenario where all sensors are providing the maximum signal of 20mA.

Temperature can also affect battery life. A GL400 in an environment that has a sustained temperature of 23° C will run 5% longer than a unit that has a sustained temperature of 0° C.

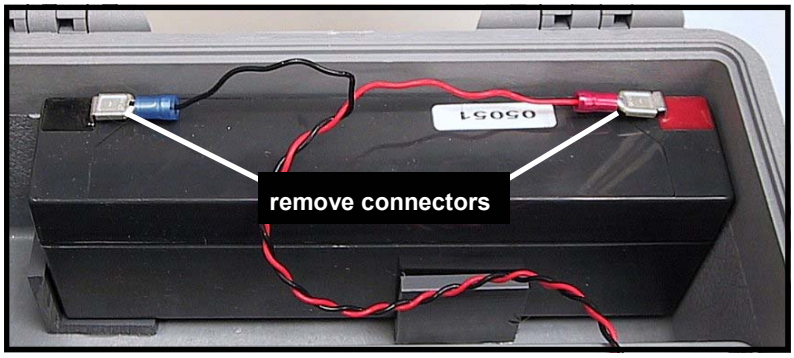
GL400-1-1

Sample Period	Theoretical Battery Life	Recommended Time Between Battery Check
1 second	88 hours	72 hours
1 minute	65 days	2 months
30 minutes	478 days	6 months
1 hour	536 days	6 months
1 day	607 days	6 months

GL400-7-1

Sample Period	Theoretical Battery Life	Recommended Time Between Battery Check
1 second	15 hours	12 hours
1 minute	12 days	1 week
30 minutes	234 days	6 months
1 hour	338 days	6 months
1 day	591 days	6 months

Checking the battery requires the GL400 enclosure be opened.



Test the battery with a voltage meter. The datalogger will not work reliably if the battery voltage is below 10V. If the battery is allowed to drain below 9V it may not charge back to 12V when the charger is applied. The battery can be recharged using the included transformer, see Appendix D for charging instructions. If the battery needs to be replaced, use a 12V, 2 AH lead acid gel cell for reliable service. Insert the battery into the battery slot and reattach the battery connectors to terminals (blue connector to black terminal first and red connector to red terminal second).

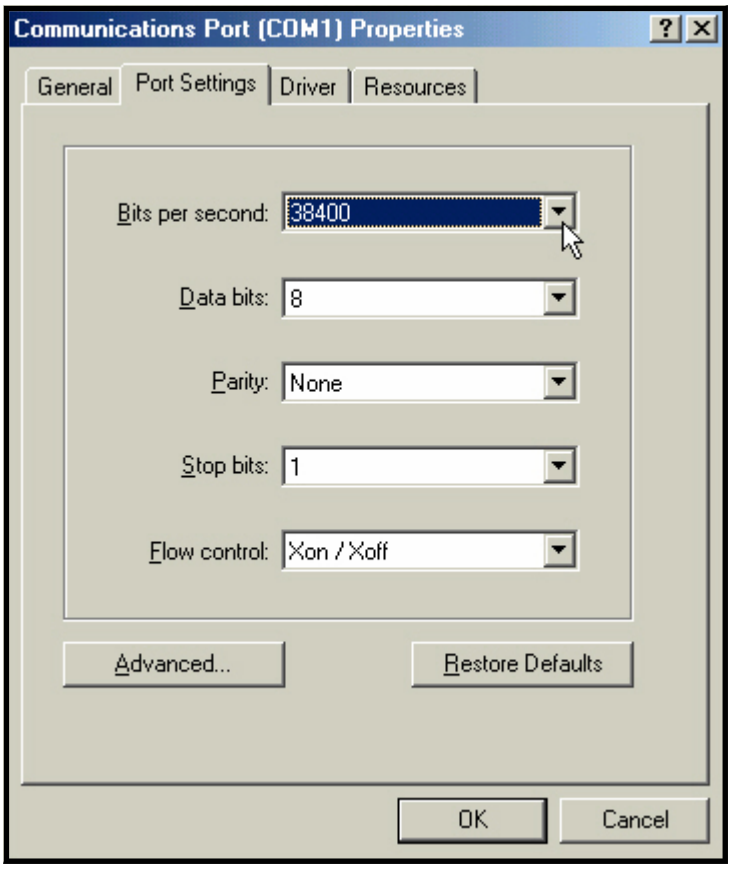
*See **Recording Interval and Memory Management**, pages 28 – 30

Troubleshooting 5

Comm Failure

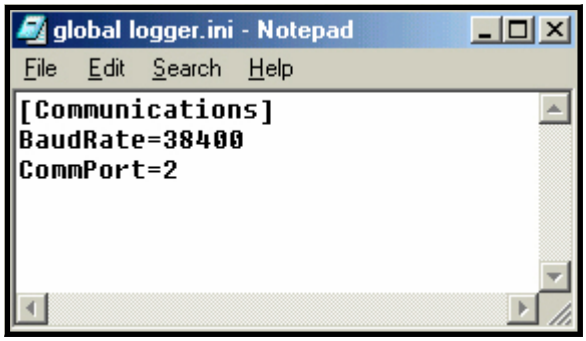
If Global Logger software displays **Comm Failure** in the **Logger Name** field, perform the following steps

- Verify that the communication cable is securely connected to the data logger and to your computer*.
- Check the battery voltage on the logger**.
- Make sure that your computer is correctly set up to use your communication channel 1 (COM 1). Refer to the settings below for comparison.



* See **Hardware Connection**, page 18
See **Battery, page 31

- If you only have access to COM 2, then an *.ini file must be created. Open **Notepad** or a similar basic text editor and type the text exactly as it appears in the following screenshot. Change the directory to the **Windows** folder of your main drive if you are using Windows 95, 98, ME or XP* or to the **WINNT** folder of your main drive if you are using Windows NT or 2000*. Save the file as **global logger.ini**.



- Make sure that no other software or device is using COM 1, such as an infrared port or palm synching software.

Other Issues

- Call Global Water for tech support: 800-876-1172 or 916-638-3429 (many problems can be solved over the phone). Fax: 916-638-3270 or Email: **globalw@globalw.com.** When calling for tech support, please have the following information ready;

  1. Model number
  2. Unit serial number
  3. P.O. number the equipment was purchased on.
  4. Our sales number or the invoice number.
  5. Repair instructions and/or specific problems relating to the product.

  Be prepared to describe the problem you are experiencing including specific details of the application, installation, and any additional pertinent information.

- In the event that the equipment needs to be returned to the factory for any reason, please call to obtain an RMA number (Return Material Authorization). Do not return items without an RMA number displayed on the outside of the package.

  Clean and decontaminate the GL400 sensors if necessary.

  Include a written statement describing the problems.

  Send the package with shipping prepaid to our factory address. Insure your shipment, since Global Water's warranty does not cover damage incurred during transit.

*Windows® 95, 98, ME, NT, 2000 & XP are trademarks of the Microsoft Corporation

Appendix A: GL400 Detailed Specifications A

Datalogger

Inputs
- Channels:
  - GL400-1-1: 1 Analog, 1 Pulse
  - GL400-7-1: 7 Analog, 1 Pulse
- Analog: 4-20 mA, pulse contact closure
- Resolution: 1/4095 (12 bit)

Data Storage
- Memory Size:
  - GL400-1-1: 25,600 Logs/Channel
  - GL400-7-1: 11,600 Logs/Channel
- Type: non-volatile Flash
- Intervals: 1 to 256 seconds, 1 to 256 minutes, 1 to 256 hours, or 1 to 256 days
- Time Accuracy: 0.0015%
- Time Format: Month/Day/Year Hour/Minute/Second

Communication
- Speed: 38,400 kbs
- Data Transfer: 2MB/4 min.
- Type: RS232C (Serial)

Electrical
- Battery: 12V Sealed Rechargeable (2A/h)
- Back-up Battery: 3V Lithium (950 mA/h)
- Sleep Current: 160μA
- Wake Current: 100mA + Sensor (4-20 mA)
- Communication Current: 100mA

Environmental
- Operating Temperature: -40 to 75°C (-40 to 170°F)
- Storage Temperature: -50 to 90°C (-60 to 200°F)
- Humidity: 0 to 95% Non-Condensing (Conformal Protection Coating)

Physical Dimensions - Datalogger
- Length: 191mm (7.5”)
- Width: 76mm (3”)
- Height: 70mm (2.75”)
- Weight: ~680 g (1.5lbs)

Physical Properties - Severe Environment Enclosure (Loaded)

- Length: 254mm (10”)
- Width: 191mm (7.5”)
- Height: 114mm (4.5”)
- Weight: ~2.268 kg (5lbs)
- Vent Port: Open or Closed
- Lockable
- Entry Port: 7.8mm (.307”) maximum cable diameter
- Water Resistant

Appendix B: Worksheets

B

Calibrating the Bar Graph to Higher or Lower Range

With some sensors it is either impractical or unfeasible to reach the full-scale or lower scale of its range. This will not affect the actual reading of the datalogger but it will cause the bar graph to work incorrectly.

Here are the equations for finding new limits on the bar graph. First take the two coordinates that were found during calibration*.

(High EU _____, High Raw _____) and
(Low EU _____, Low Raw _____).

Now calculate the slope using this equation:

m = (High Raw – Low Raw) / (High EU – Low EU)
m = _____

Next find the y-intercept:

b = High Raw - (m * High EU)
b = _____

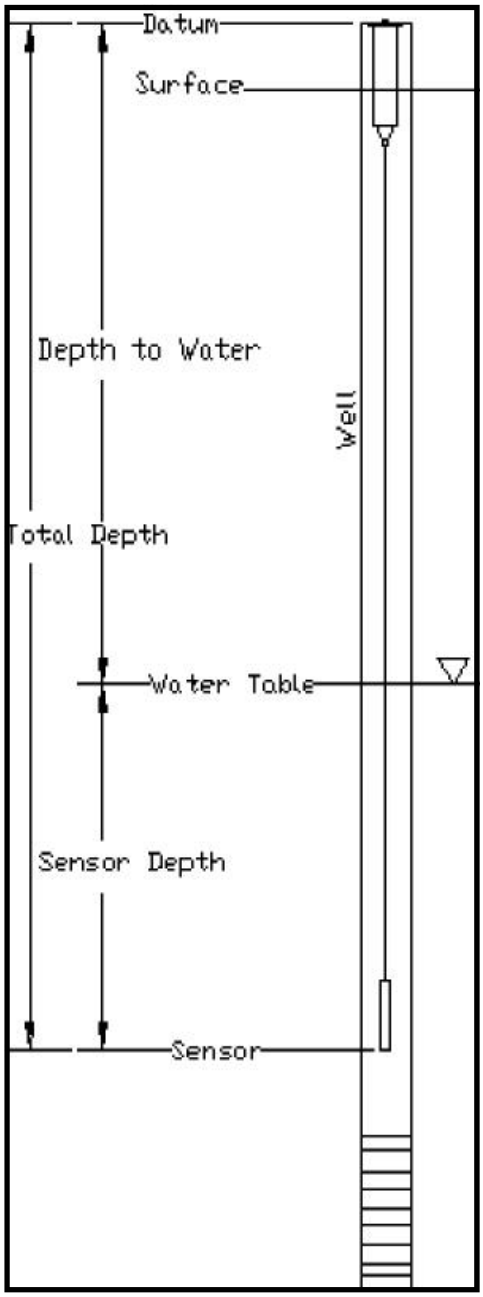
Now you can calculate the new "Raw" value for any Engineering Unit.

New Raw = (m * New EU) + b
New Raw = _____

Finally, enter these new "Raw" values into your datalogger and verify the readings are correct*.

*See **Analog Channel Calibration**, pages 25 – 27

Calibrating Level Sensors for Depth to Water Readings



Note, that to take depth to water readings, the bar graph must be calibrated to the full scale of the sensor. Follow the worksheet **Calibrating Bar Graph to Higher or Lower Ranges***.

The first step is to find the Total Depth of the sensor. This is the distance from the end of your sensor to your datum. (Cable lengths from the factory are not exact. You may need to measure for precise distances.)

Total Depth = _____

Next, find the maximum Sensor Depth (range of the sensor). In the **Calibration**** section of the software, you can find this value by using the following equation:

Sensor Depth = | High EU_____ - Low EU_____ |
Sensor Depth = _____

Now you can find your new Engineering Units using these steps:

New Low EU = Total Depth
New Low EU = _____

New High EU = Total Depth – Sensor Depth
New High EU = _____

Finally, enter these New EU values into your datalogger and verify the readings are correct**.

* See **Appendix B: Worksheets**, page 36
See **Analog Channel Calibration, pages 25 – 27

Appendix C: Terminal Programming

C

Communication Commands for Windows Datalogger

The following is a chart of commands that can be sent to the Windows Datalogger through a terminal program.

Command	Description
D	Set Date
T	Set Time
?	Get number of data points
h	Get first historical data point
a	Get historical data point again
X	Abort
i	Get next historical data point (increment)
E	Erase
r	Get real time data point
!	Set description
1	Get description
@	Set Units
2	Get Units
#	Set Raw Scale
3	Get Raw Scale
$	Set Engineering Unit Scale (EU)
4	Get Engineering Unit Scale (EU)
N	Set Name
n	Get Name
S	Set Sample interval
s	Get Sample interval

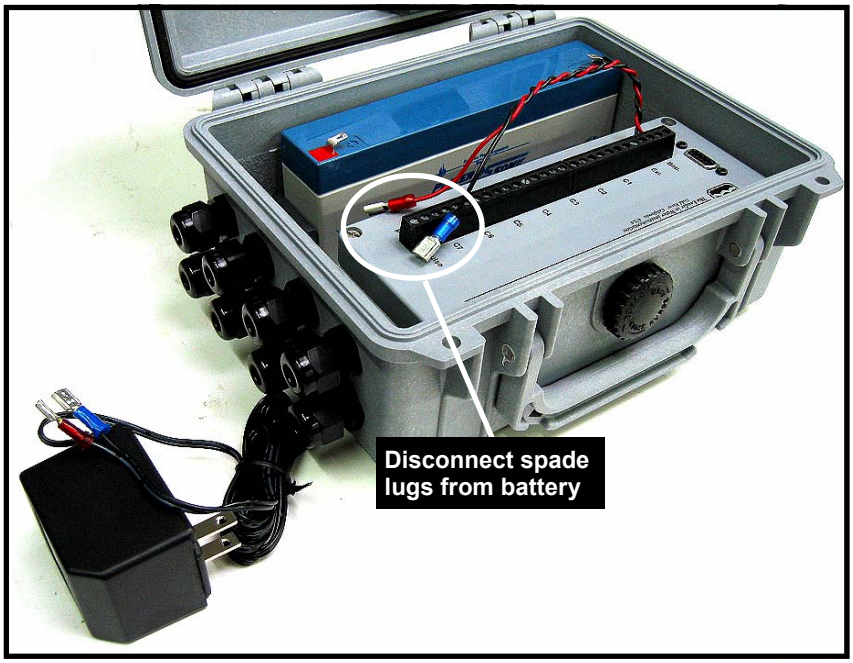
Appendix D: Recharging the Battery

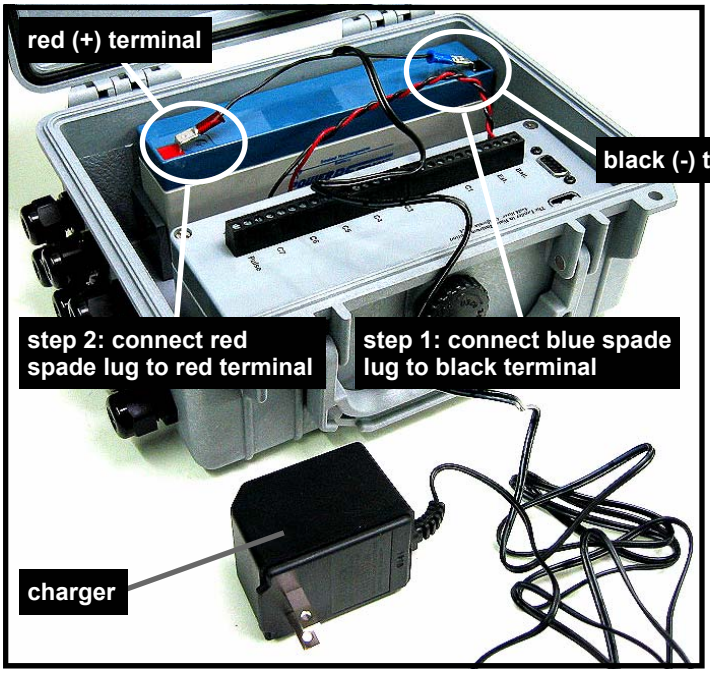
D

Please use the following cautions while charging the battery:

- Do not seal the enclosure while charging the battery.
- Do not leave the charger connected to the battery for more than 72 hours.

Disconnect the datalogger's red and blue spade lugs from the battery. Ensure that the battery charger is not plugged in.





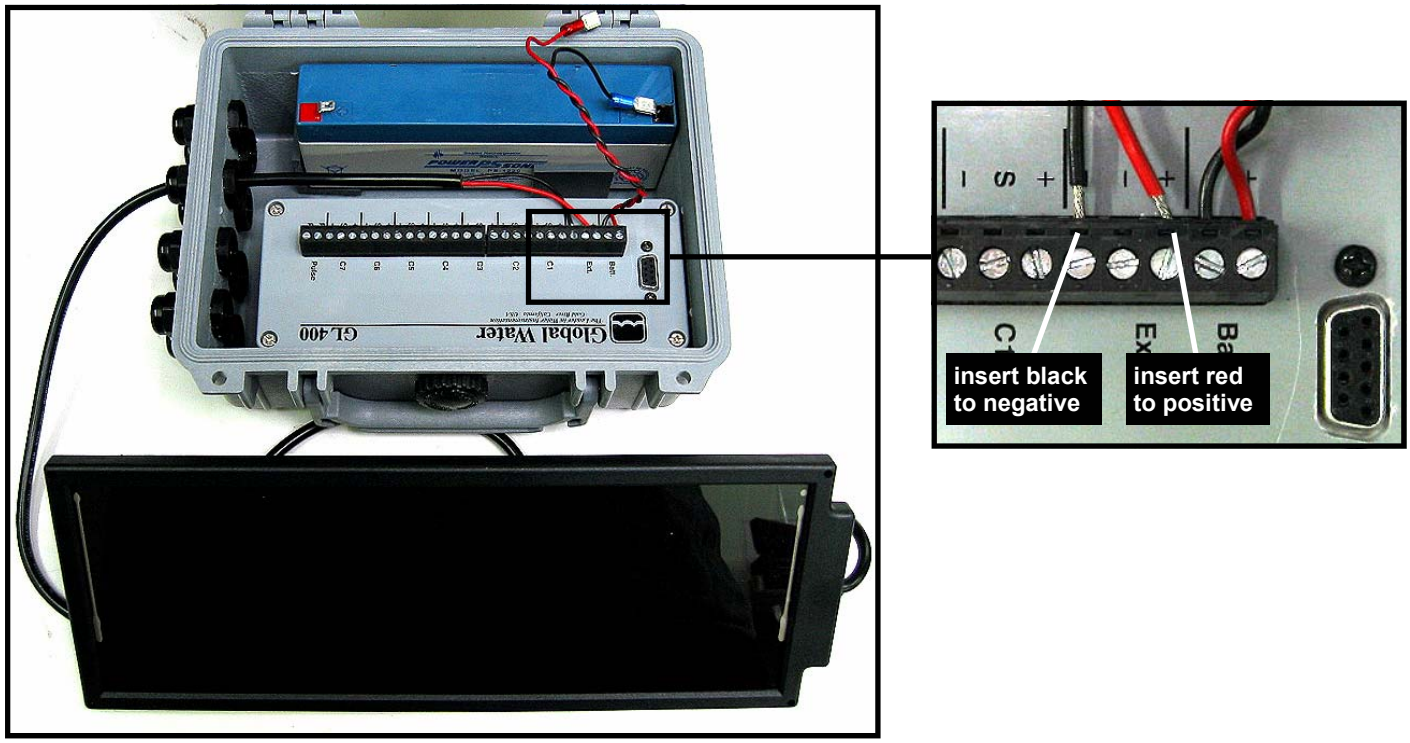
Connect the charger's blue spade lug to the battery's black terminal. Connect the charger's red spade lug to the battery's red terminal. Plug the charger into the wall.

The battery should charge a minimum of 12 hours. After charging the battery, unplug the charger and check the battery voltage using a multimeter. If the battery voltage has increased but not reached 12V it may need to be left on the charger longer. If the battery voltage has not changed, replace the battery. Otherwise disconnect the charger from the battery and reconnect the datalogger to the battery.

Appendix E: External Power Sources

The **EXT** terminals of the datalogger can be used to provide an external power source to the logger. The external power source however, must be chosen with care. The source voltage cannot be greater than 30 VDC and must fall within the input voltage range of each sensor attached to the datalogger.

To connect an external power source to the datalogger, thread the power source cable through an enclosure strain relief and attach wires to **EXT** terminals. Before inserting wires into terminals you may need to loosen terminal screws. Insert the black wire into either of the – (ground) terminals and tighten until secure. Insert the red wire into the + (power) terminal and tighten until secure.



The battery that was included with the GL400 will operate in parallel with the external. Thus, a supplemental 12V source, such as a solar panel, may be added to increase the battery life. If this method is chosen the external source must be diode protected from the battery voltage. The battery does not need to be protected, this allows the battery to remain charged while the external source has power. **CAUTION**: The enclosure must be vented or gasses could build up inside the case causing a rupture.

Alternatively, the 12V battery can be removed from the enclosure and the datalogger can be connected exclusively to the external power source. This method does not provide a battery backup for the logger to continue logging, however there is a battery backup to retain the data already collected.