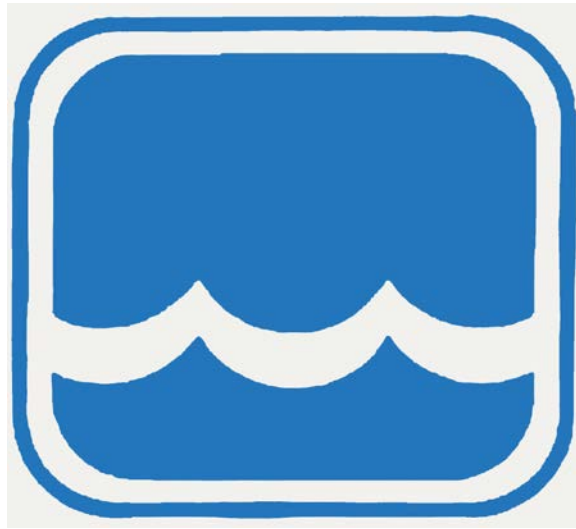


Global Water Instrumentation

SIT60 User's Manual



Global Water

Instrumentation, Inc.

151 Graham Road
P.O. Box 9010
College Station, TX 77842-9010
T: 800-876-1172
Int'l: (979) 690-5560, Fax: (979) 690-0440
E-mail : globalw@globalw.com

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INTRODUCTION

The SIT60 Field Station has been designed to provide the user with a means to monitor, and/or control, remote sites. SIT60 Field Stations can be placed almost anywhere that there is a clear view of the sky. The system does not require an investment in a base station. A computer with access to the Internet is all that is required to view the data.

The SIT60 Field Station communicates, by VHF radio, with any one of 30 Low-Earth Orbiting satellites. Two different services for monitoring the SIT60 system are available: Monitoring Only, or Monitoring and Control.

The SIT60 database is hosted at <http://www.mini-sat.net>. The database uses a third-party program called FileAmigo® for its front-end (the user interface for accessing the data in the database). The following instructions will focus on the use of the database. Information and instructions for the SIT60 Field Station can be found in the hardware manual supplied with your equipment, or by contacting Global Water.

ACCESSING THE DATABASE

In order to access the data from the SIT60 Field Station, your computer must have a connection to the Internet. In the *Address* text box or your browser, type www.mini-sat.net and press enter (or click on the Go button). Some browsers add the www automatically. If you encounter trouble, try leaving off the www and just type [mini-sat.net](http://www.mini-sat.net). Access to the website can also be found on the Global Water website at <http://www.globalw.com/sit60ui.html>.

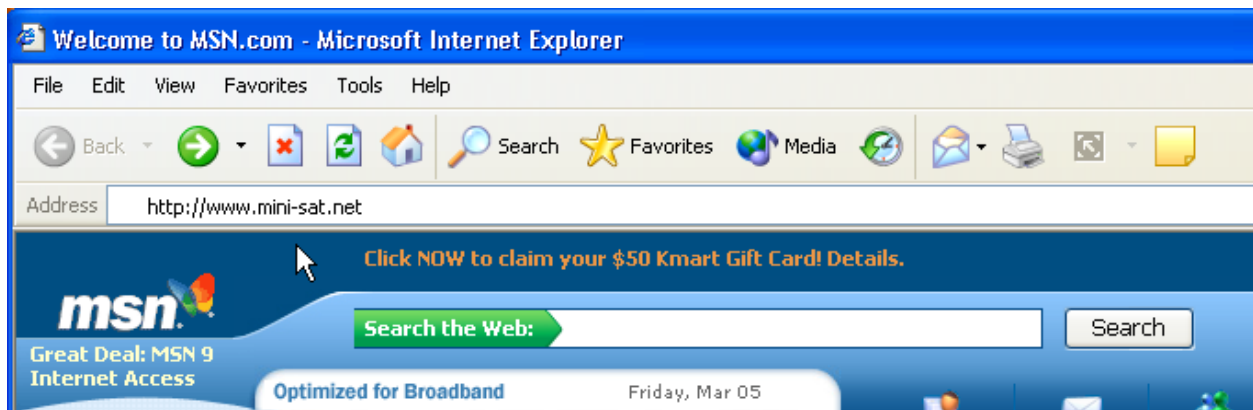


Figure 1. Type www.mini-sat.net in the address text box and press ENTER

The Home page for the SIT60 database displays the “FileAmigo.com” and database logon page.

Logon:

1. From the **Group** pull-down, select your database name (customer or company name).
2. Enter your **Member** name and **Password** supplied to you by Global Water (they are case sensitive).
3. Click **Logon**.

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Sample data can be viewed by selecting the Global Water Group and entering “user” for both the Member and Password.

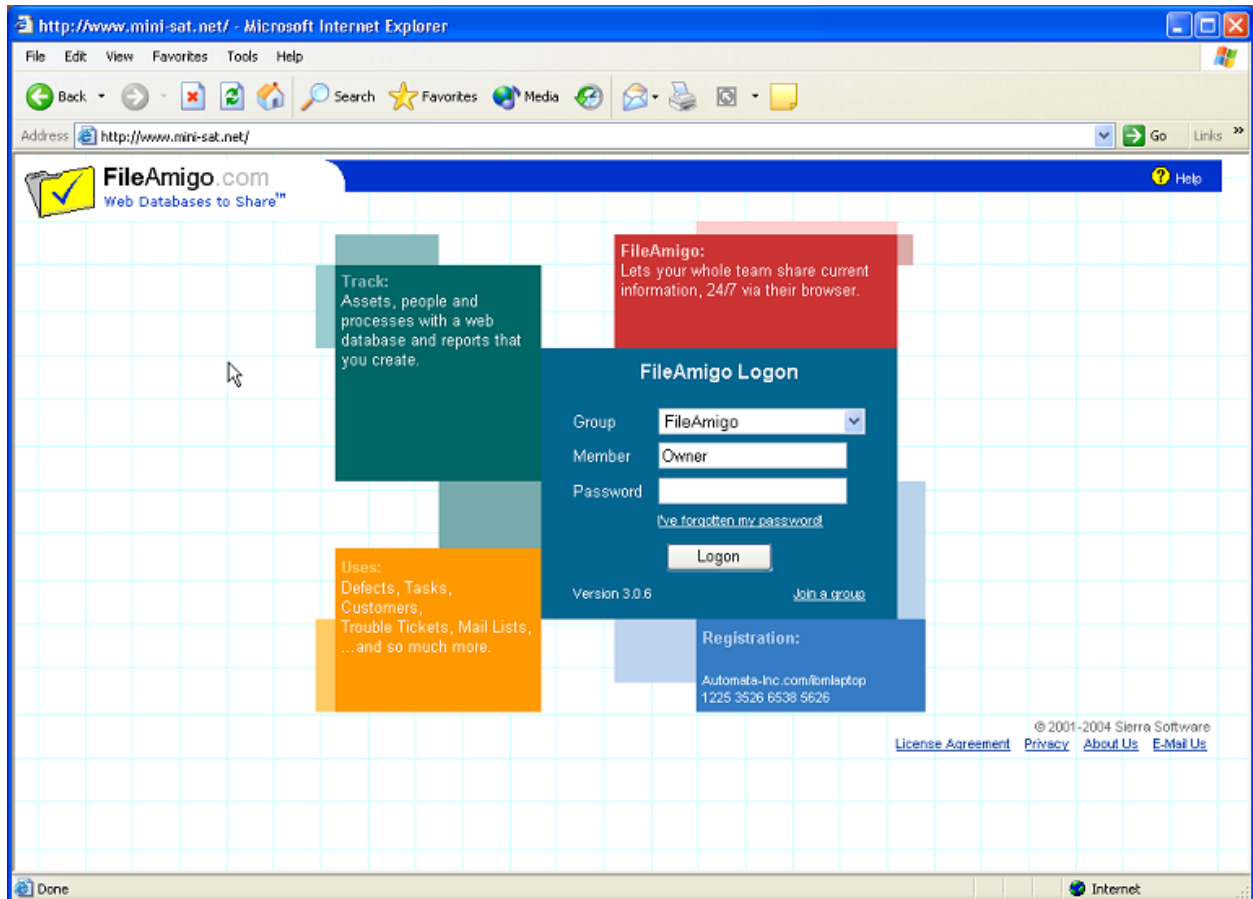


Figure 2. The SIT60 uses FileAmigo.com for the user interface.

4. If a page shows up that says the session is locked or processing could not continue, it may be due to the **Privacy** setting in your browser.

To correct this:

- a. Click on **Tools** (on the menu bar in Internet Explorer), and select the **Internet Options...** menu.
- b. Select the **Privacy** tab near the top of the **Internet Options** window.
- c. Click on the **Edit...** button for Web Sites near the bottom of the window.
- d. Type in the IP address: <http://63.203.172.198> and click the **Allow** button.
- e. Click OK on the bottom of the page, and then again on the Internet Options window.
- f. Repeat Logon steps 1-3 above.

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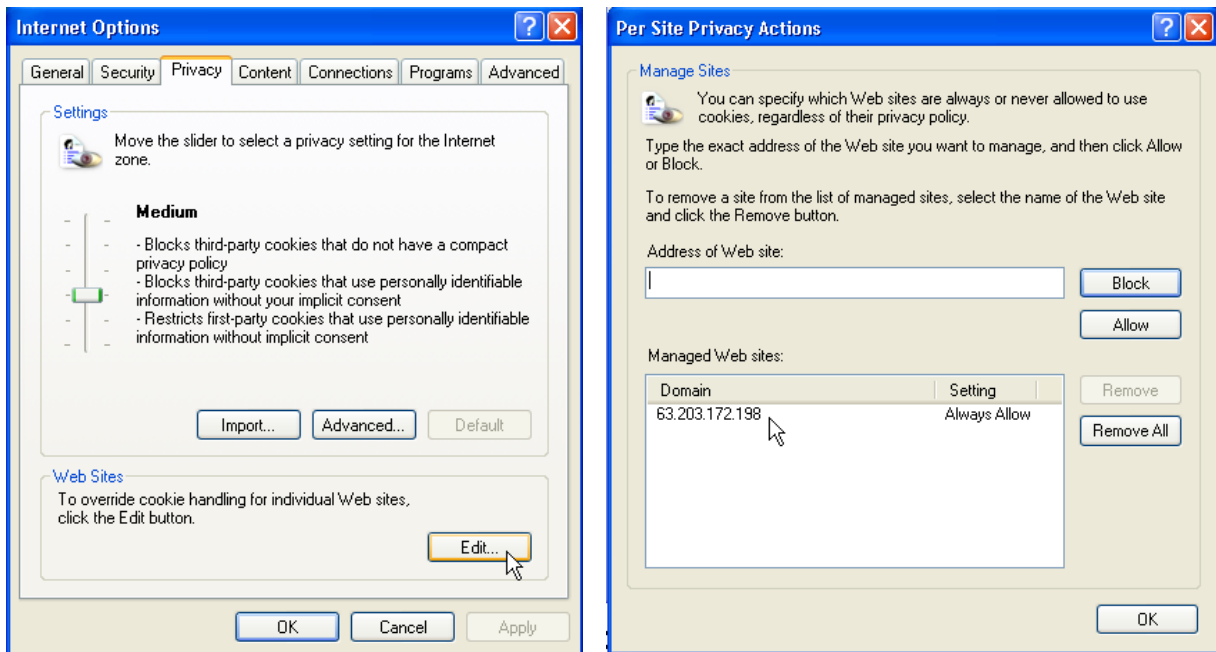


Figure 3. Privacy settings may need to be changed to access the database

5. If your login is successful, a “blank” page will be displayed with a pull-down menu labeled **File** in the upper-left corner.

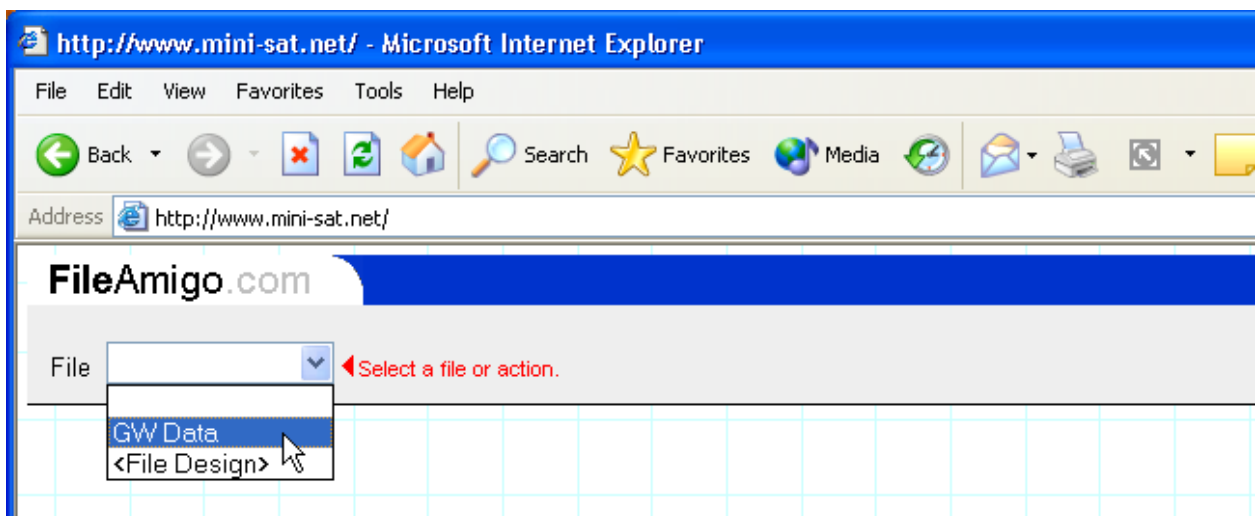


Figure 4. Select the user name from the pull-down menu.

6. Click on the drop-down arrow and select the file name that is there. (If a file name does not exist, contact Global Water. Administrators will have an additional item named <File Design> for more information on this, please refer to the **Administrator Responsibilities** section.)

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- After clicking on the file name, the **Site Information** table is displayed showing any stations that are currently configured.

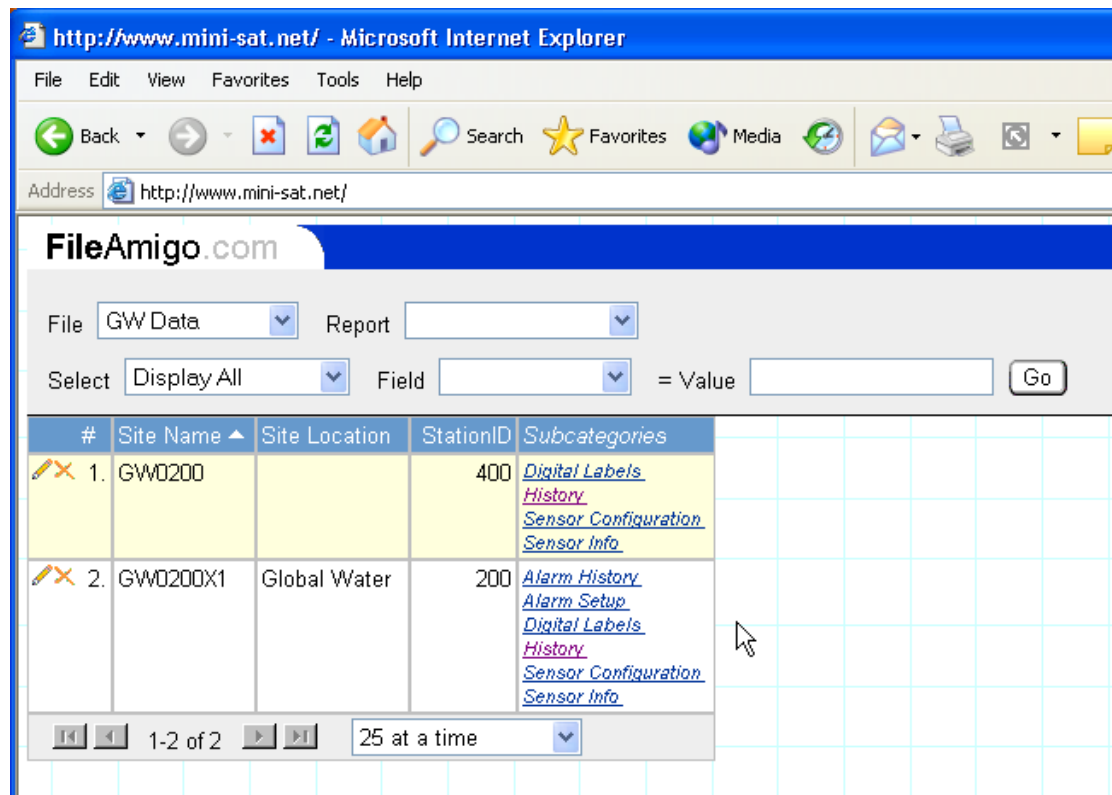


Figure 5. Site Information window showing site information and links to subcategories.

Site Name is a user-defined field to help identify what the station is monitoring.

Site Location is another user-defined field to help identify where the station is located.

Station ID is fixed and refers to the SIT60's Station ID as labeled on the field station itself and in the hardware manual supplied by Global Water.

Subcategories are additional tables that are required in order to receive data and provide configuration, alarms and data history.

The **Site Information** and **Subcategories** are factors configured by Global Water and then maintained by the administrator(s) that are responsible for managing the data provided by the SIT60 Field Stations. Please refer to the **Administrator Responsibilities** section for more information.

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SUBCATEGORIES

The Subcategories provide information to the user and for the SIT60 Data Server so that incoming data can be processed and stored correctly.

Subcategory Descriptions:

Alarm History provides information about any alarms that were sent out.

Alarm Setup is the configuration for the Alarms to be sent out. The alarms are sent to up to 3 email addresses, which can be a standard email, a cellular phone with messaging enabled, or an alpha-numeric pager with email messaging capabilities (contact your cell phone or pager company for these services), or any combination of all three.

Digital Labels provides user defined labels for the status of digital outputs.

History provides access to all of the sensor reports from a particular SIT60 Field Station.

Sensor Configuration is required to define each sensor input that is being monitored by the SIT60 Field Station. It defines the engineering units, the sensor type, the digital labels (if applicable), and the Alarm Setup name (if any).

Without this information, the sensor data is not processed.

Sensor Info displays the last reported value and time stamp for each sensor.

REPORTS

Reports in the Site Information table are reports for specific data. Simple reports can be configured and stored as a query to the database. When selected, the data is shown in a formatted page, which can be printed. These reports can be created by Administrators only.

The **Select**, **Field** and **=Value** boxes are currently not used as they apply only to the Site Information window and should not be modified.

Excel®

In the upper right corner of the window is the **Excel** link for opening the currently viewed data in a Microsoft Excel® worksheet. This file can be saved to the desktop and manipulated by the user to provide data and reports. Experience with spreadsheets is recommended, and Microsoft Excel® must be present for the user to open the file. Global Water is not a reseller of Microsoft products.

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REMOTE CONTROL

SIT60 Field Stations that are set up for Remote Control capabilities can receive Control and Interrogate commands by standard email using the following formats:

For Interrogations:

To: minisat@automata-inc.net
Subject: **Interrogate**[space]**radioname**[space]**stationid**
Message Body: **nothing**

For Controls:

To: minisat@automata-inc.net
Subject: **Control**[space]**radioname**[space]**stationid**[space]**channel#**[space]**controlstatus**
Message Body: **nothing**

nothing means don't type anything in this area

radioname is the name given to the SIT60 Field Station and is provided by Global Water (Example:GW0200).

stationid is the SIT60 Field Station's Station ID (Example: 400).

channel# is the Control Channel to operate (1 to 4 outputs optional).

controlstatus (ON or OFF) is the desired state of the control output.

An acknowledgement that a command has been received will return by email from Automata (a hosting service) at the time the command is relayed to the satellite network. Some time delay may occur due to the performance of the servers and your Internet provider. **Note: Send Commands one at a time.** Sending a second command message before a first has been received by the SIT60 Field Station may result in one of them not getting through.

Interrogate Example:

To: minisat@automata-inc.net
Subject: Interrogate GW0200 400
Message Body

Or, for a Dual-SIT60 Field Station (a SIT60 with two Control boards in them), use the StationID of the second SIT60 board:

To: minisat@automata-inc.net
Subject: Interrogate GW0200 **410**
Message Body:

Control Example:

To: minisat@automata-inc.net
Subject: Control GW0200 400 1 ON
Message Body:

Note: Sending commands counts toward the amount of data being transmitted. Service Costs are based on the amount of data sent to/from the SIT60 Field Stations.

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ADMINISTRATOR RESPONSIBILITIES

Each customer's account will have an administrator assigned to it. The administrator is responsible for adding additional members and changing information for each SIT60. The information includes configuring alarms, adding/changing sensor configurations, and creating special queries for the reports.

ADDING NEW MEMBERS

The administrator will *Logon* to the database using the same steps outlined previously in the section, ACCESSING THE DATABASE. Once logged on, the administrator can add members by clicking on the **Members** link in the upper-right corner of the window. The Group Members window has the link **Add a member** near the lower-left area of the window. Click on this and fill in the information about the new member. Additionally, the permissions of the new member can be configured here to allow the member to edit, delete, and/or view only the data. The administrator is given full permissions.

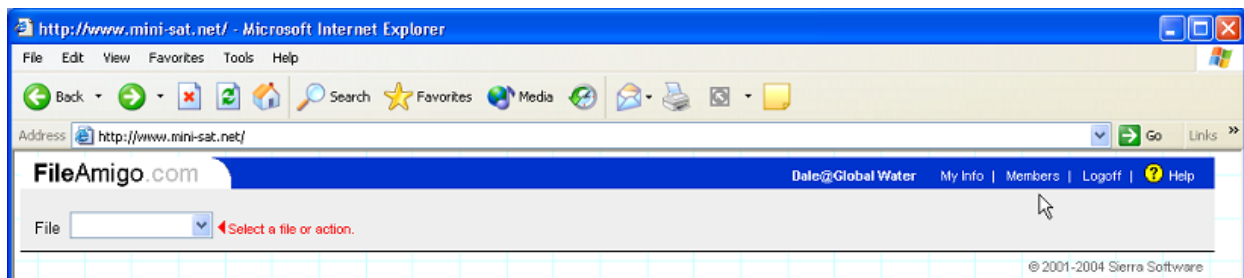


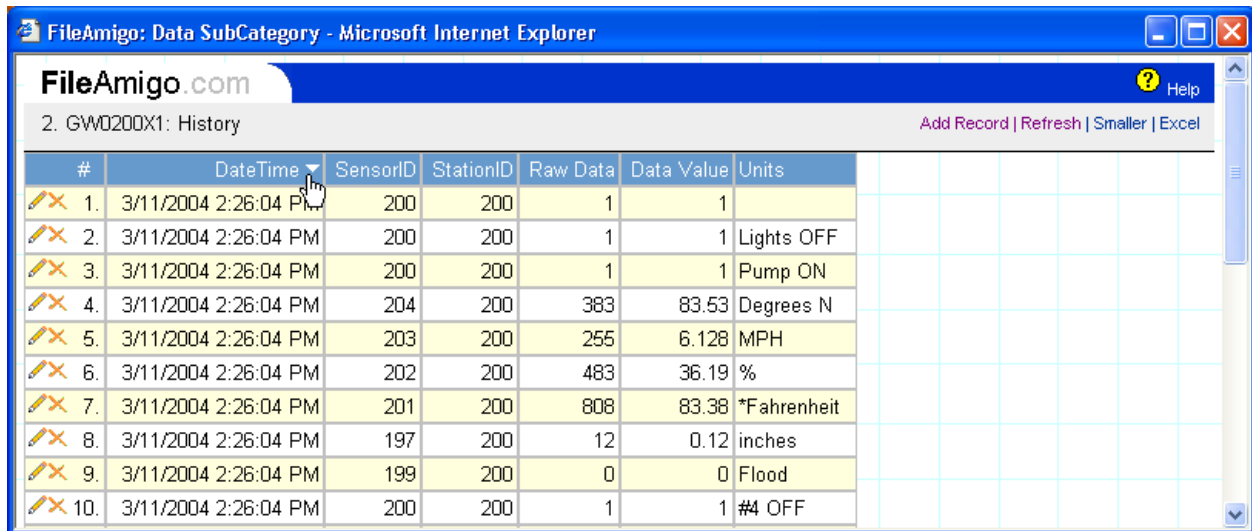
Figure 6. Add members by clicking the Members link.

Administrators have the ability to change all aspects of the database. This includes, but is not limited to; what and how data is displayed, the configuration of alarms and the contacts used during alarm conditions. They also have the ability to delete historical data, sensor information, sensor configurations, reports, and the limits used to trigger alarms. Great Care should be used when assigning permission to new members.

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VIEWING HISTORICAL DATA

Select the History subcategory from the Site Information Window by clicking on it. Data is first sorted in ascending order. To view the most recent data, change to descending order by clicking on the DateTime header.



#	DateTime	SensorID	StationID	Raw Data	Data Value	Units
1.	3/11/2004 2:26:04 PM	200	200	1	1	
2.	3/11/2004 2:26:04 PM	200	200	1	1	Lights OFF
3.	3/11/2004 2:26:04 PM	200	200	1	1	Pump ON
4.	3/11/2004 2:26:04 PM	204	200	383	83.53	Degrees N
5.	3/11/2004 2:26:04 PM	203	200	255	6.128	MPH
6.	3/11/2004 2:26:04 PM	202	200	483	36.19	%
7.	3/11/2004 2:26:04 PM	201	200	808	83.38	*Fahrenheit
8.	3/11/2004 2:26:04 PM	197	200	12	0.12	inches
9.	3/11/2004 2:26:04 PM	199	200	0	0	Flood
10.	3/11/2004 2:26:04 PM	200	200	1	1	#4 OFF

Figure 7. Click the DateTime header to view the most recent data

The data shown here is a single report from a weather station with Temperature (*Fahrenheit), Humidity (%), Wind Speed (MPH), Wind Direction (Degrees N), and Total Rain (inches). There is also a Water Alarm to monitor flood conditions (Flood). Two digital outputs are being used to control a pump and lights. Outputs 3 and 4 are unused in this system.

The data can be printed as a report or be exported to Excel by clicking on the word Excel in the upper right corner. Note: This function only works if the computer has Excel on it.

CHANGING INFORMATION

After logging on, the administrator will see two different items in the drop-down File box in the upper-left corner of the window (See Figure 4). The two items are the data file (the name of the file that contains the data reported by the SIT60 Field Stations), and <File Design>. *******DO NOT SELECT <File Design>, Instead select the Data File. Selecting <File Design> could result in the loss of data for the database if the database design is modified.*******

The name of the data file differs per customer, but is usually the only file name in the drop-down box after logging on. Selecting the data file will open the Site Information window as outlined previously with one exception, each row of data is preceded with a pencil for *Editing* the

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information in that row, or an (X) for **Deleting** that row. The same applies to each for the subcategories for each site.

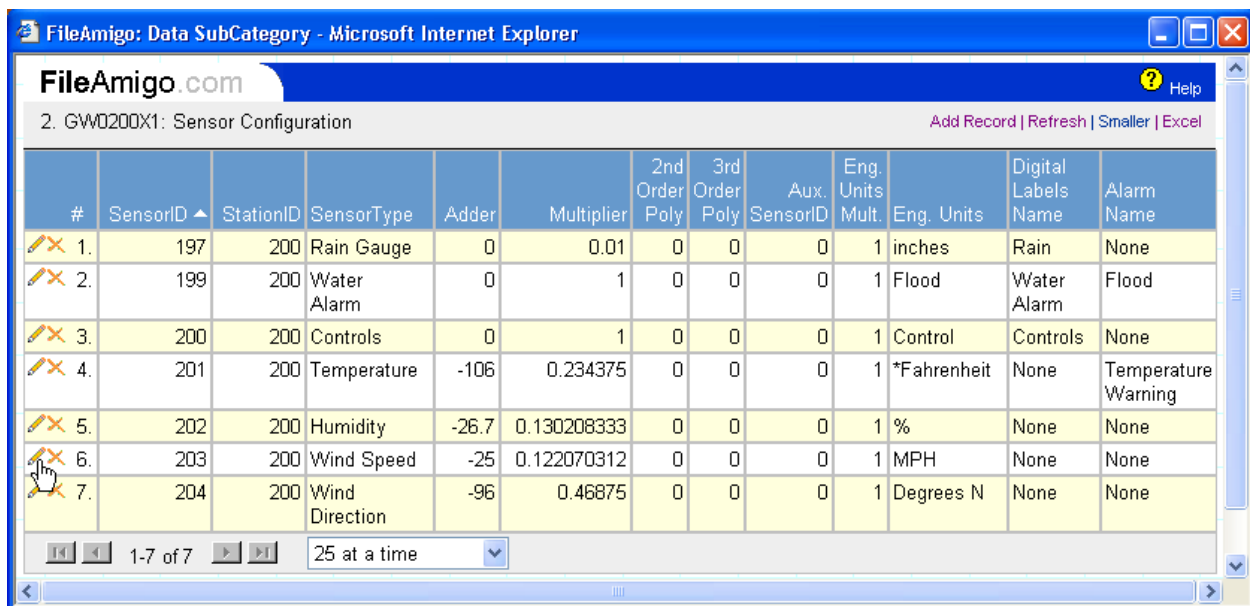
Editing the information for a row in the Site Information window differs from editing information in the subcategories because the subcategories are also listed in the editing window of the site information.

If a specific subcategory item is not listed in the Site Information, the administrator can add a record to that subcategory by clicking on the Edit icon for the Site, and then clicking on the **Add Record** link and filling in the appropriate information for that record. The **History** and **Alarm History** subcategories will automatically add records as data from the field stations are reported.

If a subcategory is opened from the Site Information table, then the **Add Record** link is in the upper-right corner of the window.

SENSOR CONFIGURATION

Information is sent to the database as raw data and must be adjusted to display in a recognizable format such as temperature, wind speed, etc. Select the Sensor Configuration subcategory from the Site Information Window by clicking on it. From the Sensor Configuration table, click on the Edit icon to display the Edit screen for a particular sensor.



#	SensorID	StationID	SensorType	Adder	Multiplier	2nd Order Poly	3rd Order Poly	Aux. SensorID	Eng. Units Mult.	Eng. Units	Digital Labels Name	Alarm Name
1.	197	200	Rain Gauge	0	0.01	0	0	0	1	inches	Rain	None
2.	199	200	Water Alarm	0	1	0	0	0	1	Flood	Water Alarm	Flood
3.	200	200	Controls	0	1	0	0	0	1	Control	Controls	None
4.	201	200	Temperature	-106	0.234375	0	0	0	1	*Fahrenheit	None	Temperature Warning
5.	202	200	Humidity	-26.7	0.130208333	0	0	0	1	%	None	None
6.	203	200	Wind Speed	-25	0.122070312	0	0	0	1	MPH	None	None
7.	204	200	Wind Direction	-96	0.46875	0	0	0	1	Degrees N	None	None

Figure 8. Click on the Edit icon to display the Edit screen for a particular sensor.

The Edit screen contains several fields that contain text and numbers, which define how sensor data is displayed. The column at the far right indicates which type goes into the field. Text fields are for display purposes only and provide labels that make the data easier to read.

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SensorID defines which input channel is being used and is defined in the hardware manual.

StationID is the SIT60 Field Station's Station ID code provided with the unit.

Sensor Type provides a name for the sensor such as Wind Speed, Humidity, etc.

Adder is an offset number used to bring the raw data into a desired range.

Multiplier is also used for manipulating raw data. The Multiplier is applied to the raw data to scale it before the Adder is used to shift it into a desired range. Raw data comes in as a number from 0-1023, zero being 0mA or 0VDC and 1023 being 20mA or 5VDC. The example shown is for a 4-20mA wind speed sensor that has a range of 0-100 MPH where 4mA = 0MPH and 20mA = 100MPH. See Addendum for details on using the Adder and Multiplier fields to scale raw data to engineering units.

2nd and 3rd Order Polynomials apply to non-linear sensors and are generally not used.

Aux SensorID is currently not implemented.

Eng. Units Mult. is a second multiplier used for changing units. For example: If the adder and multiplier scale wind speed to MPH but KPH is desired, you can enter 1.6093 into this field to convert to KPH without losing the original adder and multiplier values.

Digital Labels Name gives a name to digital inputs for display purposes.

Alarm Name gives a name to alarm conditions for display purposes

After filling the required fields, press the **Save** button to retain settings.

The screenshot shows a web browser window titled 'FileAmigo: Data Edit - Microsoft Internet Explorer'. The page header includes 'FileAmigo.com' and 'Dale@Global Water'. The main title is 'Edit Sensor Configuration Record for GW0200X1'. The form contains the following fields:

Field Name	Value	Field Type
SensorID *	203	Number
StationID	200	Number
SensorType *	Wind Speed	Text (20)
Adder *	-25	Number
Multiplier *	0.122070312	Number
2nd Order Poly	0	Number
3rd Order Poly	0	Number
Aux. SensorID	0	Number
Eng. Units Mult.	1	Number
Eng. Units	MPH	Text (30)
Digital Labels Name	None	Text (20)
Alarm Name	None	Text (20)

At the bottom of the form are three buttons: 'Save', 'Save / New', and 'Reset'. A mouse cursor is pointing at the 'Save' button. The footer of the page indicates '© 2001-2004 Sierra Software'.

Figure 9. The Edit screen contains several fields that define how the data is displayed.

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ALARM SETUP

Alarm conditions are defined in the Alarm Setup subcategory and determine when someone will be contacted in the event of an alarm condition. Select the Alarm Setup from the Site Information Window by clicking on it. A list of defined alarm conditions are shown as well as contacts. To define a new alarm condition, click on Add Record in the upper right corner. To edit an existing one, click the Edit icon. Any of the inputs can be set up to trigger alarms.

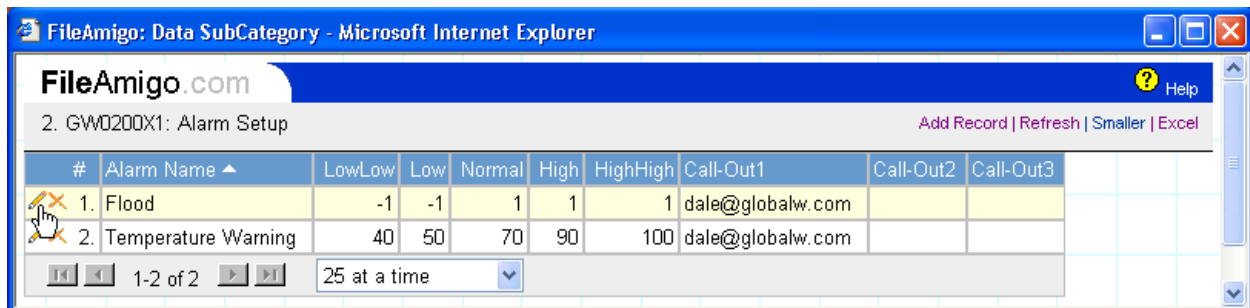


Figure 10. Click the Edit icon to change existing conditions or Add Record for a new one.

As with the Sensor Edit screen, the Alarm Edit screen contains several fields that have text and number fields that define when alarm events occur and what contacts are to be made. The Adder and Multiplier in the Sensor Configuration screen condition the incoming raw data and the result is compared to limits defined here to determine if the event is an alarm condition. The following example is for a water alarm sensor connected to a digital input. A switch closure connects this input to ground when water rises above a certain point. A raw data value of zero indicates no alarm condition has occurred. If there is a flood, a raw data value of one is transmitted.

The screenshot shows the 'FileAmigo: Data Edit - Microsoft Internet Explorer' window. The page title is 'FileAmigo.com' and the subcategory is 'Edit Alarm Setup Record for GWD200X1'. There is a 'Dale@Global Water' link and a 'Help' icon. A note indicates '* Indicates a required field'. The form contains the following fields:

- Alarm Name: Flood (Text (20))
- LowLow: -1 (Number)
- Low: -1 (Number)
- Normal: 1 (Number)
- High: 1 (Number)
- HighHigh: 1 (Number)
- Call-Out1: dale@globalw.com (Text (40))
- Call-Out2: (Text (40))
- Call-Out3: (Text (40))

At the bottom, there are buttons for 'Save', 'Save / New', and 'Reset'. The copyright notice '© 2001-2004 Sierra Software' is visible at the bottom right.

Figure 11. The Alarm Edit screen defines alarm conditions and what action is taken.

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This next example is for an Analog Temperature Sensor which is set to trigger an alarm condition if the temperature falls to 50°F and below or 90°F and above. Additionally, the LowLow and HighHigh limits of 40°F and 100°F respectively indicate a more dangerous alarm condition.

The screenshot shows a web browser window titled 'FileAmigo: Data Edit - Microsoft Internet Explorer'. The page header includes 'FileAmigo.com' and 'Dale@Global Water'. The main heading is 'Edit Alarm Setup Record for GW0200X1'. A legend indicates that an asterisk (*) denotes a required field. The form contains the following fields:

Field	Value	Type
Alarm Name	Temperature Warning	Text (20)
LowLow	40	Number
Low	50	Number
Normal	70	Number
High	90	Number
HighHigh	100	Number
Call-Out1	dale@globalw.com	Text (40)
Call-Out2		Text (40)
Call-Out3		Text (40)

At the bottom of the form are three buttons: 'Save', 'Save / New', and 'Reset'.

Figure 12. The Alarm Edit screen defines alarm limits for the temperature sensor.

Alarm Name gives a name to an alarm condition. This text field is sent to email accounts and text messaging devices on detection of an alarm event to indicate what has happened.

LowLow: A number **less than** this number is a LowLow alarm condition.

Low: A number **less than** this number is a Low alarm condition.

Normal: A number defining a normal condition.

High: A number **greater than** this number is a High alarm condition.

HighHigh: A number **greater than or equal to** this number is a HighHigh alarm condition.

Call-Out1,2,3 are email and text message addresses that are sent a message when an alarm occurs.

After filling the required fields, press the **Save** button to retain settings.

A sample alarm message for the Digital Water Alarm looks like this:

Station#_200	The StationID.
[1_Flood]	The data value_Alarm Name defined in Alarm Setup.
[HighHigh]	The defined limit that triggered the alarm
[12:07_PM]	The time the alarm occurred

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A sample alarm message for the Analog Temperature Sensor looks like this:

Station#_200	StationID
[94.62_Temperature Warning]	Temperature reading
[High]	Limit
[3:25_PM]	Time stamp

DIGITAL LABELS

The Digital Labels Subcategory assigns labels for the status of the digital outputs. When an output is turned ON by a Control message, the open-drain output is driven low, sinking current to ground. An OFF message turns off the output transistor. Since this active-low signal can either turn on or off any number of devices, assigning labels to the output status helps to make sense of the state the devices being controlled are in. Select the Digital Labels subcategory from the Site Information Window by clicking on it. The current labels are shown. To change them, click the Edit icon. Enter the desired labels for the ON and OFF states of each output. Press the **Save** button to store the changes and return to the Digital Labels window.

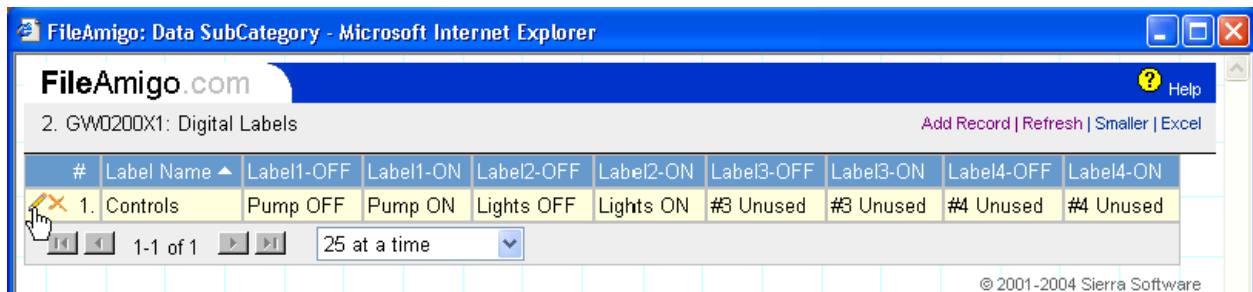


Figure 13. Click on the Edit icon to enter the Digital Labels edit screen.

CREATING REPORTS

Reports are created using queries on existing data in any of the subcategory tables. Experience with database queries is highly recommended for creating these reports. The **Report** drop-down box, is similar to the **File** drop-down box, and provides the administrator with the ability to create specific queries on existing data. To create the report, the administrator clicks on the **Report** drop-down box and selects **<Report Design>**. To add a new report:

1. Click on the **Add a Report** link.
2. Enter a name for the report and click on the **[Next]** button.
3. Click on **Add a Column** to add a field to the report.
4. Select the Category:Field from the drop-down for the data that you wish to view (Example: History:SensorID, to be able to query the data in the history category (table) by SensorID).

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5. Enter the Caption for that Column for the report.
6. Select which column it should represent: First, Last, or After a previously selected column.
7. Select if the column should be listed by order. Ascending or Descending.
8. If special requirements are to be considered, enter the information in the Rule area. For more information, refer to the Hint or Help links on the web page.
9. Add additional columns to complete the Report and the click **Save**.

The new report will be viewable by all of the members of that database.

CONTACT INFORMATION

If you have questions regarding your data or need further assistance configuring your SIT60 Field Stations, please contact us:

Global Water Instrumentation
151 Graham Road
P.O. Box 9010
College Station, TX 77842-9010
T: 800-876-1172
Int'l: (979) 690-5560
Fax: (979) 690-0440
E-mail : globalw@globalw.com

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Addendum

Scaling SIT60 Raw Data to Engineering Units Using the Multiplier and Adder Fields in the Sensor Configuration Menu

- 1) Define Engineering Units (EU) and desired range (0 to 100 MPH, -50°C to +50°C, etc).
EU(min) = Minimum EU
EU(max) = Maximum EU
EU(span) = EU(max) – EU(min), observe polarity
- 2) Define Raw Data (RD) span.
For 0-20mA and 4-20mA current (I) sensors:
I(min) = Loop current @ EU(min)
I(max) = Loop current @ EU(max)
RD(min) = I(min) / 20 x Raw(20mA), round down to nearest integer
RD(max) = I(max) / 20 x Raw(20mA), round up to nearest integer
RD(span) = RD(max) – RD(min) *****Raw(20mA) provided with Configuration Report**
For 0-5 volt (V) sensors:
V(min) = Output voltage @ EU(min)
V(max) = Output voltage @ EU(max)
RD(min) = V(min) / 5 x Raw(20mA), round down to nearest integer
RD(max) = V(max) / 5 x Raw(20mA), round up to nearest integer
RD(span) = RD(max) – RD(min)
- 3) Calculate Multiplier for Sensor Configuration menu.
Multiplier = EU(span) / RD(span)
- 4) Calculate Adder for Sensor Configuration menu.
Adder = - (Multiplier x RD(min)) + EU(min), observe polarity

Example 1: 4-20mA, 0-100 MPH Wind Speed sensor. Raw(20mA)=1023

$$\begin{aligned}\text{EU}(\text{min}) &= 0 \text{ MPH} & \text{EU}(\text{max}) &= 100 \text{ MPH} \\ \text{EU}(\text{span}) &= \text{EU}(\text{min}) - \text{EU}(\text{max}) = 100 - 0 = 100 \text{ MPH} \\ \text{I}(\text{min}) &= 4.004\text{mA @ } 0\text{MPH} & \text{I}(\text{max}) &= 19.984\text{mA @ } 100\text{MPH} \\ \text{RD}(\text{min}) &= 4.004 / 20 \times 1023 = 204.8 \cong 204 \\ \text{RD}(\text{max}) &= 19.984 / 20 \times 1023 = 1022.2 \cong 1023 \\ \text{RD}(\text{span}) &= \text{RD}(\text{max}) - \text{RD}(\text{min}) = 1023 - 204 = 819 \\ \text{Multiplier} &= \text{EU}(\text{span}) / \text{RD}(\text{span}) = 100 / 819 = .12210012 \\ \text{Adder} &= -(\text{Multiplier} \times \text{RD}(\text{min})) + \text{EU}(\text{min}) = -(.12210012 \times 204) + 0 = -24.908425\end{aligned}$$

Example 2: 4-19mA, -50°C - +50°C Temperature sensor with units in °F. Raw(20mA)=1023

$$\begin{aligned}\text{EU}(\text{min}) &= -50^\circ\text{C} = -58^\circ\text{F}, & \text{EU}(\text{max}) &= +50^\circ\text{C} = 122^\circ\text{F}, & [^\circ\text{F} &= (^\circ\text{C} \times 9 / 5) + 32] \\ \text{EU}(\text{span}) &= 122^\circ\text{F} - (-58^\circ\text{F}) = 180^\circ\text{F} \\ \text{I}(\text{min}) &= 3.846\text{mA @ } -58^\circ\text{F}, & \text{I}(\text{max}) &= 18.988\text{mA @ } 122^\circ\text{F} \\ \text{RD}(\text{min}) &= 3.846 / 20 \times 1023 = 196.7 \cong 196 \\ \text{RD}(\text{max}) &= 18.988 / 20 \times 1023 = 971.2 \cong 972 \\ \text{RD}(\text{span}) &= \text{EU}(\text{max}) - \text{EU}(\text{min}) = 972 - 196 = 776 \\ \text{Multiplier} &= \text{EU}(\text{span}) / \text{RD}(\text{span}) = 180 / 776 = .23195876 \\ \text{Adder} &= -(\text{Multiplier} \times \text{RD}(\text{min})) + \text{EU}(\text{min}) = -(.23195876 \times 196) + (-58) = -103.46392\end{aligned}$$