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Complete Thermal-Grid User Guide

For use by Building/Home Owners, Portfolio Managers & Technicians

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1. Login and Access Levels

To log in go to: www.thermal-grid.com. Enter username/email and password, and then click the "LOG IN" button.

Figure 1.1 Login Page

Accounts

Accounts are created in one of two ways.

1. A new user is created by an existing user – In this situation the existing user gives the new user access to whichever sites they choose.

2. A user creates a new account using the "Sign up" link on thermal-grid.com. Users who register with the "Sign up" link will receive Advanced level access to Demo Sites (JV Washam and Quincy) by default. They may request access to other sites by emailing support@solarwave.com.

New User Created by Existing User

When a new user is created by an existing user the new user will receive a registration email from support@solarwave.com with a link to register their site. The new user must click on the link in the email to complete their registration. If a registration email is not received check spam folders for emails.

Create New Account / Register

To Create an account, go to www.thermal-grid.com and click the "Sign up" link beneath the "LOG IN" button, then enter your email address. The email address will become the username used to log into thermal-grid.com.

The user will receive a verification email where they can confirm their account. If a verification email is not received check any spam filters for lost emails.

New users may be registered by active users (Section 1.2), or may create their own account.

Figure 1.2 Registration Page

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support@solarwave.com

Forgot Password

If a user forgets their password they may receive a new password by clicking the "Forgot password?" link on the login page. This will direct the user to the Password Request page.

Enter email address used for login, then click the "Send" button.

A temporary password will be emailed. The email is titled "Solar Wave User Verification" and contains a link to retrieve the new password. If the email is not received, please check spam folders.

The link in the email will direct the user to a page with a new temporary password. Return to www.thermal-grid.com to login or follow the link in the email to be automatically logged in.

An email containing the new password will be sent to the e-mail address as well.

Once logged in it is recommended the user change their password immediately.

Thermal-Grid Password Request

Forgot your password? No problem.

We don't store passwords, so we can't send you your old one. But we can make you a new one. Enter your email address below, and we'll send you a link that will change your password.

Your password will not change unless you click the link emailed to you.

Email: [   ]
[Send]

Figure 1.3 Password Request Page

Message sent to support@solarwave.com . Check your spam folders!

Figure 1.4 Confirmation Screen

Your new random password is 3VjPLe

An email has also been sent to support@solarwave.com with that password (this is the only situation passwords are emailed).

You are now logged in, go ahead and head over to your profile.

Feel free to keep the random password or change your password to anything you prefer.
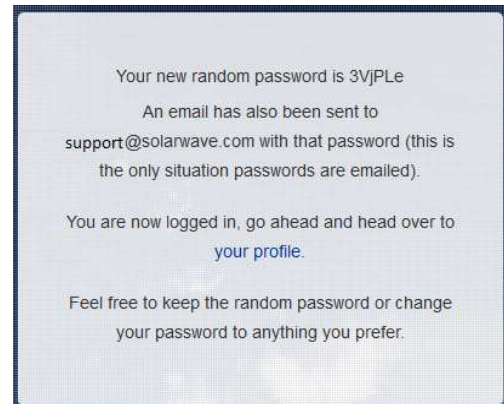
Figure 1.5 Linked Page from Email

1.1 User Access Levels

There are four User Access Levels. Technician (highest), Owner, Advanced, and Basic (lowest). Access levels are assigned per site. Users who create their own account will receive Advanced level access to two demo sites. See Section 5. for more detailed information on Access levels.

2 USER PROFILE

The User Profile provides account information and tools for the user. The USER PROFILE link is located below the user name in the top left of the page seen after logging in. Outlined in yellow in figure 1.6.
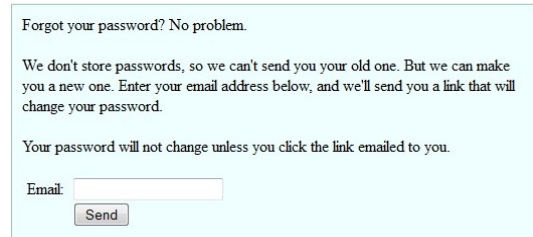
User **Demo**
SITE PORTFOLIO   USER PROFILE

Basic Info:
Email: **Demo**
Receiving emailed alerts.
Opt out?

Sites:
JV Washam Advanced User
Quincy   Advanced User
Demo sites are on
Turn off?
Add sites

Manage team
Logout

Change My Password:
[New password]
[Again]
[Change]

Figure 1.6 USER PROFILE Page

2.1 Manage Team (add or modify users team members access)

Figure 2.1 Team Management Page

Once an existing user creates a new user, existing users have the ability to manage those users and create new ones using the "Manage team" link in the USER PROFILE. Created users are part of the active user's team.

Create A New User

To begin go to the USER PROFILE and click the "Manage Team" link listed under "Basic Info", then click the "Create a new user" link to create a new user.

- Enter the new users email address in the text box. (An email address is required for the new user to receive a registration email)
- Choose if the user will receive Demo sites (default)
- Choose if the user receives alerts. Alert emails are only received by users with Technician level, Owner level, or others given special permission. Users may opt out of alerts at any time.
- Click the "Create" button to finish. The new user will immediately receive a registration email.

Figure 2.2 Create New User

- After the new user has been created, a site access level must be given to the new user in order for them to see their sites. Choose site access levels individually using the "None", "Basic", "Advanced", "Ower", and "Technician" buttons. A user may only have one access level. A user may only give out an access level equal to or lower than their own.
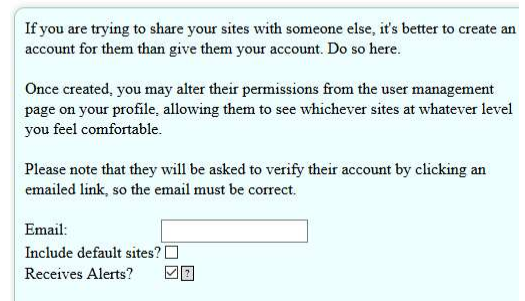

Figure 2.3 Give user access

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support@solarwave.com

Manage Users

To view and manage created users, select the "Manage Team" link, then Select a user. You may change the site access level for each user that you have created. Site access levels can only be equal to or less than your own, but not higher.

Figure 2.4 Manage Team

To return to the USER PROFILE select the "Back to profile" link on the "Manage Team" page. Or click the SITE PORTFOLIO tab at the top of the page.

2.2 Change Password

Enter a new password where it says "Change My Password:", then click "Change". A user may only change their own password.
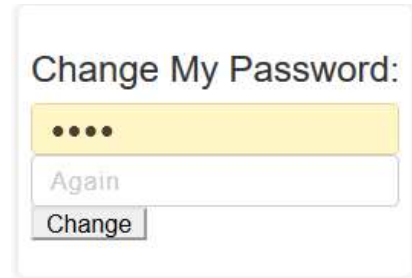

Figure 2.5 Change Password

2.3 Opt in/out of Emailed alerts

If the user does not wish to receive emailed alerts, then select the "Opt out?" link in the USER PROFILE. Users may opt back into receiving alert emails at any time. Alerts will still appear on the user's timeline.

Figure 2.6 Turn off Demo sites

2.4 Demo Sites

Demo Sites are intended to show new users examples of existing thermal-grid sites. Users have the option of removing Demo Sites "JV Washam", and "Quincy". To remove them using the "Turn off?" link. The user may turn Demo Sites back on at any time.

3. Site Portfolio
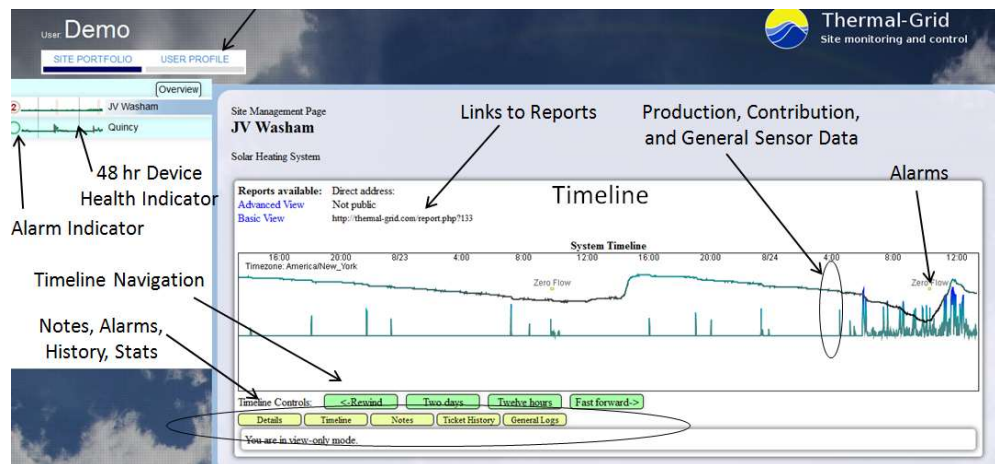

Figure 3.1 Site Portfolio

3.1 Initial Screens

Initial screens depend on the number of sites to which the user has access. At any time, the user may navigate between the REPORT, SITE PORTFOLIO, and USER PROFILE tabs simply by clicking them.

Single Site View - A user with access to a single site will see the REPORT tab and be brought immediately to the default Report.
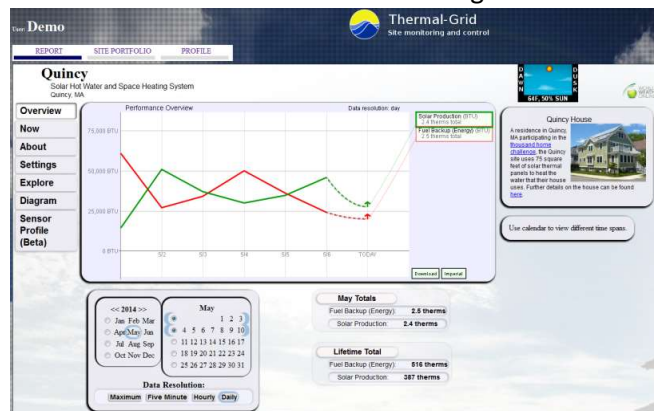

Figure 3.2 Single Site Initial Screen Default Report

Multiple Site View - A user with access to multiple sites will be brought to the SITE PORTFOLIO and will NOT see the REPORT tab.
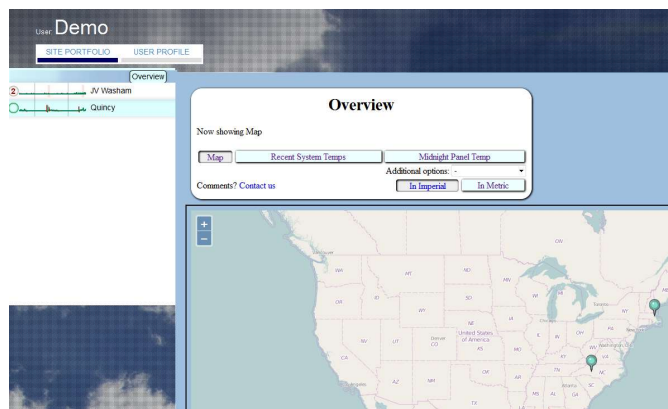

Figure 3.3 Multiple Site View

3.2 Site List

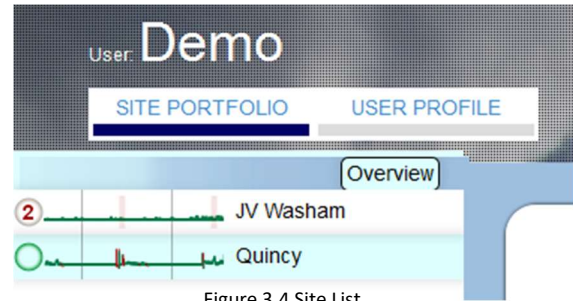The site list shows all sites available to the user.

Figure 3.4 Site List

Figure 3.5 sparkline

To the left of the site name in the "Site List" is a small graph called a "sparkline" which shows status, data, and alarms in a 48 hour time frame. The sparkline shows a single sensor, usually Solar Production if available. If not available, the sparkline will show tank bottom temperature or another indicator of system performance.

If no data is available, the sparkline will show network connection status instead.

 Green line - Site is connected, but no data is coming in.

 Yellow line - Site is partially connected.

 Red line - Site is completely disconnected

 Gray line - Site has been completely disconnected for more than 2 days

 If a site is completely gray, as seen to the left, it means the site is deactivated. Sites are manually deactivated if they have never been connected or it they have been disconnected for too long.

Alarm occurrence and duration is shown on the sparkline by a shaded area (See shaded areas on Green line)

To the left of the spark line is an alarm indicator. Indicators include:
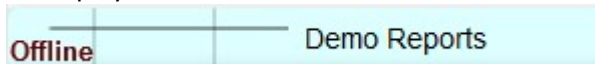- ○ Green Circle - no alarms in the last two days.
- ③ Circle with a number - How many alarms have occurred in the previous 48 hrs.
- ⚠ Warning symbol indicates there is an active alarm.

Note: If a network connection of a site has been down for two days or longer the alarm indicator will not be displayed. Instead there will be a notification that the site is offline.

3.3 Site Management Page

The Site Management Page Shows report links, a timeline with select sensors, a history of alarms, and a history of general logs for each site. It is a platform for quickly viewing site operation and a jumping off point to view further information.
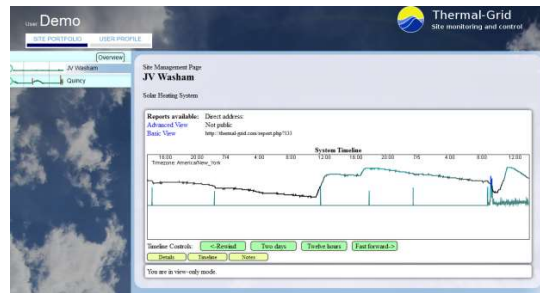

Figure 3.6 Site Management Page

To open the "Site Management Page" click on any site in the site list. The Site Name will become highlighted and the "Site Management Page" will appear.

Report links

Links to the site reports are listed as "Reports available:" The reports will give an in depth look at site operation and show useful information and schematics as well. Users with higher access levels will see more available reports. More information for site reports is shown in Section 4 of this manual.

Public Reports show a URL (ex. http://thermal-grid.com/report.php?42) next to them. The link for that report can be given out so others may view the report without requiring a log in.

3.4 SITE PORTFOLIO Site Comparison

The Site Comparison allows users to quickly compare all sites in their portfolio. The user will first see a map with site locations. From there they can choose various comparison fields from the list of comparisons (see below).

Figure 3.7 User Profile Overview Button

SITE PORFTOLIO Overview Comparisons

- Recent system Temps - Average temperature for the last hour for the Panel and Tank sensors.
- Midnight Panel Temp - Collector and outdoor ambient temperature at midnight. Temperatures are usually within a few degrees of each other. If they are not, it could be a sign of Thermosiphoning.
- Recent Production - Solar Production/Area for the current day and the total Production/Area for the last year. If site has been offline for a year it shows total Solar Production/Area to date.
- Recent Pressure - The average pressure value for the last hour for sites with a pressure sensor.
- Recent Runtime - Last 24 hours of runtime for the solar loop pump.
- Recent Tank Temp - Average tank temperature for the last hour, and daily average tank temperature.
- Solar Loop Delta + Panel Tank Delta - Last hours average Temperature difference (delta) while pump is running. If pump is not running this will be blank.
- Cycling - How many times the solar loop pump has turned on and off for the current day.

To get back to the SITE PORTFOLIO Overview click the "Overview" button located directly under USER PROFILE tab.

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3.5 Timeline

The timeline provides a quick view of system operation, alarms, and device network health. Use the timeline tools to add or remove items from the timeline.

- **Scrolling:** Click on the left and right edges of the timeline, or the <-Rewind, Fast Forward-> buttons to scroll backwards and forwards in time.
- **Clicking:** Click on timeline to open a graph in the Explore tab of the default Report.
- **Sensors:** Common sensors include Tank Bottom Temperature, Solar Production, Solar Contribution and Irradiance. Move cursor over sensor to see value at that time. A sensor will not appear if it has a value of zero for the timespan shown.
- **Alarms and Logs:** The Alarms and logs are displayed as they occur. A history of alarms and logs can be seen in the "Ticket History", and "General Logs" sections.
- **Data Health:** If there is no sensor data, the Data health indicator appears by default. To show data health on sites with data select it in the "Timeline" tools.

Figure 3.9 Data Health

Data health consists of two lines at the bottom of the timeline. The top line shows network connection. A red dash indicates site is disconnected, a green dot indicates site is connected, and the black line indicates a network reconnection.

The bottom line shows data feed. A red rectangle indicates data feed has stopped, a brown rectangle indicates the data feed has paused, and the green square indicates that the data feed is fine. The user may mouse over each indicator to view the status.

3.6 Site Details

Additional site and device information. Additional information includes:

- Primary Supervisor. (User with Authority): Only users with technician access can take authority.
- Privacy Level: Public sites allow public reports to be created. These reports can be seen without logging in. Private sites require login for all site information.
- Controller ID: Each differential solar controller has a unique ID. Some ID's are alike between different vendors. A list of controllers and ID's is available in the appendix of this manual.
- Number of settings available for the controller. This is blank if there is no controller.

Technician and Owner Level Users Only

- Other devices/sites which are combined with this one: Reports have the ability to show data from multiple devices.
- List of Site Owners and Technicians if available (See section 5. Technicians for more details)

3.7 Timeline Tools

Timeline tools allows the user to customize what is shown on the timeline. The settings will stay for the user's current session, and will reset to default when the user logs out or the session expires.
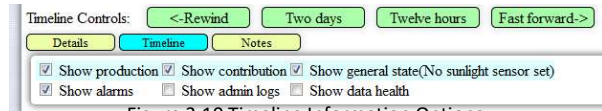

Figure 3.10 Timeline Information Options

3.8 Notes

Users may enter their own notes about a site. This can be used to keep a service history record. It is highly encouraged that site Technicians and Owners use this for historical records. Some notes are shown in the about section of the Report.
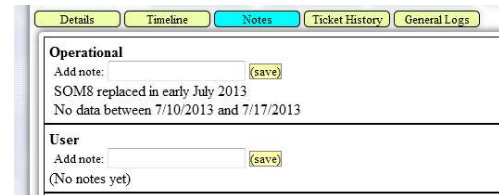

Figure 3.11 Notes

Personal Notes can be deleted. Users cannot delete other users notes.

Note: Most notes are created by a Solar Wave admin user.

3.9 Ticket History/General Logs

For Owner and Technician Level users there are two yellow boxes labeled "Ticket History", and "General Logs" Each box provides a historical record of events.
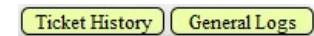

Figure 3.12 Ticket History/General Logs

Ticket History - Tickets are created for alarms, communication disconnects, or Technician taking authority of a site. Some tickets allow Technicians the opportunity to resolve them manually, which is done in this menu. Most tickets will resolve themselves automatically.

General Logs - These logs are created as a tracking system to keep track of various controller activity, when authority is taken at a site, sensor recalculations and Device restarts.

4. Reports (Site information and analysis)

Each site has one or more reports which give the user an in-depth view of how their site is performing. Reports show sensor data, controller settings, site information, and weather information.

Available reports vary based on user access level.

NOTE: Users with more than two sites will not see the "Link to Site Report" in figure 4.1.
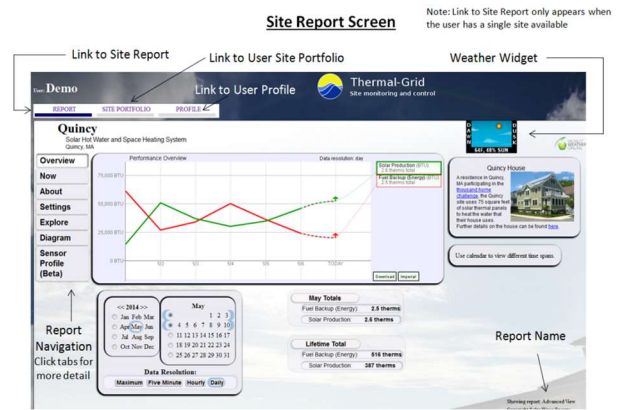

Figure 4.1 Example Report

4.1 Weather Widget

In the top right corner of the reports is the weather widget. It shows the current temperature and amount of sunlight at the site. Users may click on the "World Weather Online" logo to view more detailed weather information. Site location is required for weather widget data.

Figure 4.2 Weather Widget

4.2 Basic Report Tabs

- Overview: Monthly and lifetime summaries of Energy calculations, and a graph of daily totals. If there is no Energy sensor, then other performance indicators will be used. Pictures can be added to this page if available.
  For the first week of a month the plot will show the previous month plus the first seven days of the current month. The month summaries will also reflect this.
- Now: Graph of the current system operation. Most often Collector, Tank Bottom, and Solar Loop Relay sensors. Additional sensors may be added by a Technician level user.
- About: Description of the system, installer, parts, and specifications.
- Settings: A list of controller parameters. A user with Technician level access can remotely change controller parameters using this tab.
- Explore: A list of all available sensors, graph and calendar to allow users to view all of their system data for general use and diagnosing issues.

4.3 Diagram and Schematic Tabs

Schematics provided by the installer show the physical layout of the system. Sensors are overlaid on top of Diagrams and Schematics to give a live look at the system. A scrollbar below the schematic allows the user to see historical data as well. Historical dates can be chosen as well. A simple diagram based from a schematic or system drawing may be created for the site.

Figure 4.3 Diagram

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4.4 Graphs

Graph features:

Figure 4.4 Graph

- Click on graph to zoom in and out. Max 6 hrs.
- Change from metric and imperial units by clicking "imperial" button lower right. Default is Imperial. Changing units here also changes units on Diagram and Schematic tabs.
- Download data to a .csv file. Click "Download" button in the lower right.
- Highlight a sensor by moving cursor over sensor name in legend. Only units for that sensor shown.
- Show sensor values by moving cursor over a sensor on the graph. This opens a pop-up with sensor name and value at the given time. Every plotted sensor will show its value in the legend.
- Averages and Totals are shown by moving the cursor off the graph. Values are shown in the legend.

4.5 Calendar

The calendar allows users to select any timespan. Click and drag on the days to select the span. Click on a month to view an entire month or click and drag on months to view multiple months. Click on the year to view the entire year. Users may click the arrows to select from a different month or year.

Figure 4.5 Calendar

Clicking on the data resolution will change how the data is viewed on a graph. Note that loading a large timespan with a high data resolution will take more time to load due to the high amount of data to be displayed
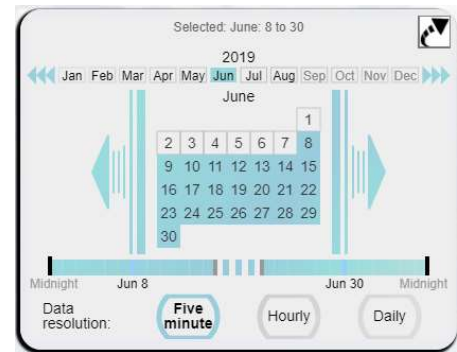
The arrow in the top right corner will increase the size of the calendar. This is best used when viewing on a phone or tablet.

4.6 Sensor Profile

The Sensor Profile tab shows hourly averages over 24 hours. This is useful to find maximum and minimum values for sensors. Various time spans may be selected using the calendar, default is a month.
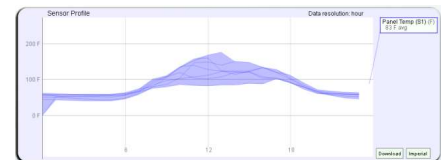

Figure 4.6 Sensor Profile

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5. Technician Tools

5.1 Technician Access Levels (user categories)

There are different Authority Levels available to users; they are "Basic" (View-Only), "Advanced" (View-only with engineering detail), "Owner" (advanced view plus holiday setting), and "Technician".

- "Owner" access allows user to modify "safe" adjustments such as "holiday mode" on controllers that have those setting to be used while owners are away for long periods of time.
- "Technicians" have a highest level of access and can create alarms, change sensor names, and remotely change parameters of a controller. "Technicians" must have legal authority from the system owner to access and service their system.

Owner and Technician level users will be able to see Monthly Reports listed as an available report on the Site Management Page. These Monthly reports are also emailed on the first of every month.

5.2 Technician Tools

Figure 5.1 Site Management Features

Technician level users have additional "Site Management" features. To Open Site Management features click the "Site Management" button

5.3 Alarms

Alarms take sensors and apply logic to notify users if there is a problem at a site. These alarms are shown on the Site Management Page timeline as well as emailed to users with Technician level access.

Technicians can create, edit, disable, and delete alarms.

The alarm name will show up on the timeline on the SITE PORTFOLIO if the alarm is triggered. If the alarm is active for longer than the Escalation delay then an email will be sent to anyone with site access equal to the Priority set for the alarm.

Note: Solar Thermal sites come with preset alarms for each site. These may be edited by a Technician user as needed. New alarms may also be created.

To Configure alarms, click "Alarm Config" from the Technician tools.

Click an Alarm from the list to edit, or Select the "Create a new alarm" link to create a new alarm.

- Alarm name: The Alarm name will appear on the page after it is saved. Alarm Name is seen in the Subject line of an email and on the Timeline
- Alarm text: Alarm text is seen in the body of an email if the alarm is emailed.
- Priority: Specifies what Access level users will receive this alert. Default is Technician
- Enabled: Enables or Disables an alarm. Enabling can also be done in the list of alarms.
- Initialization Delay: Amount of time (in seconds) the alarm is ignored before being triggered. This helps prevent alarms going off prematurely in some situations.
- Escalation Delay: Amount of time (in seconds) the alarm is active before an email is sent.

Figure 5.2 Alarm Config Page

- Alarm Time Restrictions: Defines a time range when the alarm can be triggered. Enter times in the form hh.mm (19.30 for 7:30 pm). Enter '0' for no time limits.
- New condition: Conditions compare a sensors value to a set value using logic operators. Multiple conditions may be used together. The set value entered must be the metric. Only sensors selected in the Sensor Definitions page will be available for use.
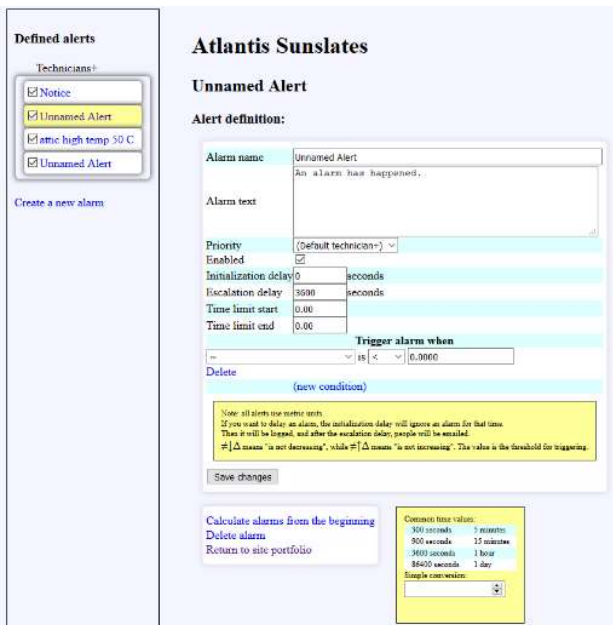
Note: Clicking "new condition" link will erase any unsaved changes! Save changes frequently.

Available logic operators:

- greater than **>**,
- less than **<**,
- greater than or equal to **>=**,
- less than or equal to **<=**,
- equals **=**,
- does not equal **!=**,
- is not decreasing **≠↓Δ**,
- is not increasing **≠↑Δ** .

There are additional alarms which will be sent to users with Technician and Owner level access. These include: Network disconnect, empty data uploads, site paused, and assuming control. These alarms are not configurable. They can be turned off by opting out of alarms in the USER PROFILE

5.4 Define Sensors

The Sensor Definition page gives a list of all sensors available. This page is empty until data available. From this page the user can see which sensors are sending data and which sensors are enabled for reports and alarms.

	Show	Raw name	Display name	Units	Factor	Min	Max	Priority
	☑	DeltaSol BS 2009:000_2_0	Panel Temp (S1)	C	1.000000	0.000	0.000	-24
	☑	DeltaSol BS 2009:002_2_0	Tank Bottom Temp (S2)	C	1.000000	0.000	0.000	-23
	☑	DeltaSol BS 2009:004_2_0	Loop Hot (S3)	C	1.000000	0.000	0.000	-22
	☑	DeltaSol BS 2009:006_2_0	Loop Cold (Return)(S4)	C	1.000000	0.000	0.000	-21
	☑	DeltaSol BS 2009:008_1_0	Pump Speed (R1)	%	1.000000	0.000	0.000	-20
	☑	Relay 1 ON/OFF Cycles	R1 Cycles (ON)	#	1.000000	0.000	0.000	-19
	☑	R1 Runtime	R1 Runtime	s	1.000000	0.000	0.000	-18
	☑	Panel-Tank Delta	Panel-Tank Delta	K	1.000000	0.000	0.000	-17

Figure 5.3 Sensor Definitions Page

Sensor Data   Priority

Features:

- Sensor Data – Quick view of data for the last 4 hours. If data value has not changed the data bar will be flat. If there is no data, this section will be blank.
- "Show" Check Box – Enables or Disables which sensors are available for reports and alarms.
- Raw Name - The name which is given to the sensors by the Device sending data.
- Display Name - The User specified sensor name. The user may rename the sensor to better reflect its actual use. It is suggested that a suffix is used. (S#) for temperature, (R#) for relays.
- Units – Display unit of a sensor for Reports or Alarms. Metric units must be used. Eligible units include, Celsius (**C**), Liters per hour (**l/hr**), Liters per minute (**l/m**) Liters (**l**), Watt hours (**Wh**), Bars (**Bar**), Percent (**%**), Watts per square meter (**W/m2**), Hours (**h**), Minutes (**m**), Seconds (**s**), Watts (**W**). (Capitalization matters!!)
- Factor (external factor) - Adjusts the sensors value. Generally used to convert the unit of the sensor if data is received in a unit that differs from how a user wants it to be displayed. For example, RESOL controllers send flow rate in Liters/hour, and we convert to Liters/minute. Also commonly used for Production/Area sensors.
- Max and Min - Give the sensor a max and a min value used for the spark graph and schematic.
- Priority - Positions of the sensor on the explore tab of a Report. A higher number will rise to the top of the list.

Additional sensors may also be created by Solar Wave administrators.

5.5 Define Sensor Roles

Sensor roles allow the user to choose which sensors are shown on the timeline, and sparkline.

there is a link to Define Sensor Roles on the "Sensor Defs" page, or it can be accessed through the Technician Tools menu.

Figure 5.4 Sensor Roles

If a site doesn't have a certain sensor then leave field blank. The General health is used to quickly determine the site is operating. As a guideline, the Tank Bottom sensor is used as a General Health sensor. This page is normally set by a SolarWave Admin.

5.6 Parameters (controller settings)

Users with Technician level access can remotely check and change controller settings from the Settings tab of Reports.

WARNING: INCORRECTLY CHANGING SETTINGS MAY DAMAGE THE SOLAR THERMAL SYSTEM!!

Settings are shown in a menu with dropdowns. Each group shows the number of settings within. Click '+' to open the group. Each setting shows a name and below each name is the current value with a '+' symbol. Clicking the '+' symbol shows more information about the setting.
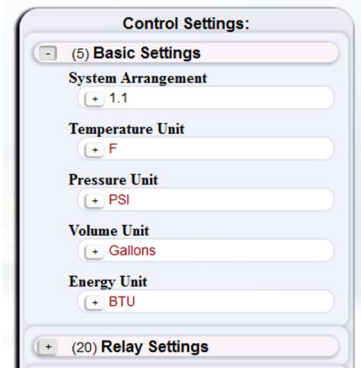

Figure 5.5 Parameters

Check for Changes

Figure 5.6 Settings Page Options

Check for Changes will check all parameter values on the controller and compare them with the current parameter values. If a difference is detected, it is shown in the menu.
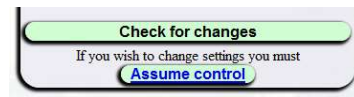
To update the setting in the database the user must "Accept new value". This is done by clicking on the white text box where the current and changed to values are displayed. Once that is clicked on an option to accept the new value or "Revert" to the old value appears. Select "Accept new value" to update the setting on the Settings Tab. Reverting will change the setting on the controller to the stored value.
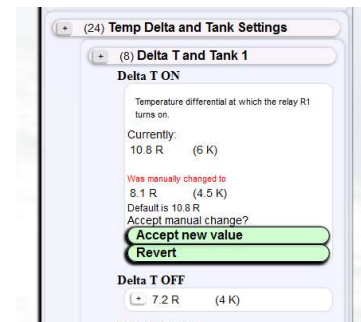

Figure 5.7 Confirm Change

Change Settings Remotely

A user must have authority of the site to change settings remotely. Assume Authority by clicking on the "Assume control" link. If the "Assume Control" link does not appear then you have authority, or do not have access. Changes cannot be made remotely if there is no network connection to the DL2. Users who do not have Authority of the site can still check for changes, but those changes cannot be verified in the database.

To change the setting click on the setting value.

- Text field: enter the new value in the text box, then press enter.
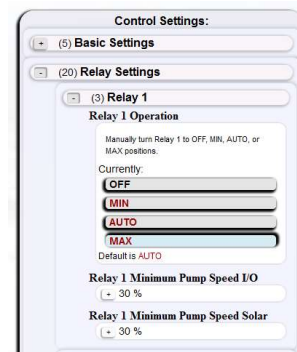- Button, click the new setting.

Figure 5.8 Remotely Change Settings

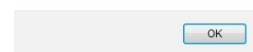After a change is made a verification pop-up window will appear.

Figure 5.9 Change Confirmation

Changes may not be cancelled. Users must wait until the change is complete, then change back. All remote changes will be logged and shown in the General Logs on the Site Management Page.

8/22/2019

5.7 Tweak Reports

Technician users have the ability to edit reports.

- Sensors listed on: graphs, summaries, and sensor lists.
- Report name, titles of a report, and report access level.

Changes made on one report will not effect other reports automatically. Changes must be done manually to each report.

Figure 5.10 Tweak Reports

Click on the "Tweak Reports" link in the Technician Tools menu to open the report editor.
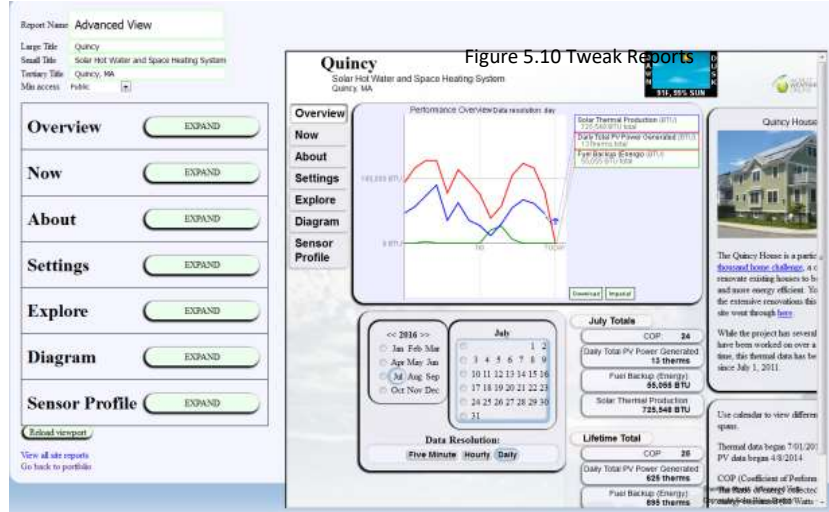
Changes are saved by clicking outside of the working area. There is no Save button.

Titles and Access Level

The Report Name can be changed by editing the Report Name field. This will change the name seen on the Site Management Page.

The Large, Small, and Tertiary title correspond to the top three lines in the report, seen as "Quincy", "Solar Hot Water and Space Heating System", and "Quincy, MA" respectively. The access level required to view the report may also be changed.

Tabs

To edit tabs of the report, click on an "Expand" button. This will open a menu which has a list of all widgets inside a tab. There are three widgets which may be edited. They are Summaries, Graphs, and Sensor Lists.

Widgets

Each widgets will have a list of all available sensors which are chosen in the Sensor Definitions page (Section 5.4). Select a sensor to add it to the widget, and unselect a sensor to remove it.
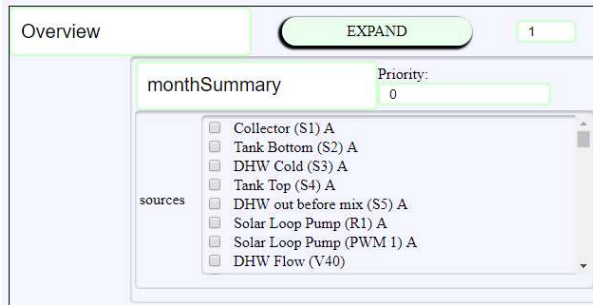

Figure 5.11 Edit Widget

Editing Schematics and Diagrams

Schematics may be edited by clicking on the "Edit Visually?" button. This will bring up a large view of the schematic with a list of sensors. Sensors may be added or removed by clicking them in the list of sensors. And sensors may be clicked and dragged around the schematic to place them.

Figure 5.12 Edit Schematics

Exit the window by clicking the "back" arrow in your browser.

Appendix A. Controller ID Reference

RESOL Controller	ID #	Alternative Controller	
DeltaSol BS Plus V1	4221	SOM 7 SI	iSolar Plus
DeltaSol BS Plus V2	427B	SOM 7+	
DeltaSol BS 1-4 V1	4221	SOM 6 SI	iSolar 1/4
DeltaSol BS 1-4 V2	427B	SOM 6+	
DeltaSol BX Plus	7112		
DeltaSol BX	7421	SOM 9	iSolar BX
DeltaSol MX	7E11	SOM 10	
DeltaSol M	7311	SOM 8	
DeltaSol ES	7411		
DeltaSol E	7721		
DeltaSol E Fahrenheit	7729		

Table 1. Controller ID