

A stylized world map composed of white dots of varying sizes, arranged to form the continents. The map is set against a light green background with a grid of thin white lines. The map is positioned in the upper half of the page, with the lines extending downwards towards the title.

Communication Hub

Installation and Operational Manual

CH120M11 & CH120M12

Why you should choose SPARQ

Simpler and smarter,
SPARQ microinverters
give you, for the first
time, a highly reliable,
lightweight and compact
product with 25 years
of hassle-free performance



SPARQ's products are:

More efficient: Our patented maximum power point tracking algorithm ensures that optimal energy is harvested from all panels at all times, and is extremely fast, even in the changing shade and lower light conditions of urban installations.

Highly reliable: SPARQ's software-based solution eliminates unreliable components, guaranteeing that your power conversion system now lasts as long as your solar panel – an industry first.

Smaller and lighter: AC panels with "SPARQ Inside" cost you less and return your investment sooner.

Greener: SPARQ's environmental footprint is tiny – our microinverters harvest more energy, are highly efficient, and have fewer parts.

Adaptable: our products meet all North American and European grid standards. They are also completely compatible with international Feed-in Tariff (FIT) programs.

Versatile: SPARQ's design meets the needs of module manufacturers, distributors and installers.



Communication Hub

Installation and Operational Manual

CH120M11 & CH120M12

Contact Information:

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Website: www.sparqsys.com

FCC Compliance:

This product has been tested and was found to be compliant with the accepted limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

Revision Table:

Version	Date
Version 1.1	January 1, 2011
Version 1.2	June 11, 2011
Version 1.3	September 14, 2011
Version 1.4	November 22, 2011
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IMPORTANT SAFETY INFORMATION

READ THIS FIRST

SAVE THESE INSTRUCTIONS: This manual contains important instructions to follow during installation and maintenance of the SPARQ Communication Hub.

To reduce risk of electrical shock, and to ensure safe installation and operation of the hub, the following safety symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

The wireless Ethernet sections of this manual only pertain to those models (CH120M12) that have this capability.



WARNING: This indicates a situation where failure to follow instructions may cause serious hardware and/or software failure. Use extreme caution when performing this task.



NOTE: This indicates information particularly important for optimal system operation.



WARNING:

- Perform all electrical installations in accordance with all local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.
- Be aware that only qualified personnel shall install or replace the SPARQ Communication Hub.
- Do not attempt to repair the SPARQ Communication Hub; it contains no user-serviceable parts. If the hub fails, please return the unit to your distributor for maintenance. Tampering with or opening the hub will void the warranty.

Before installing or using the SPARQ Communication Hub, please read all instructions and cautionary on the hub.

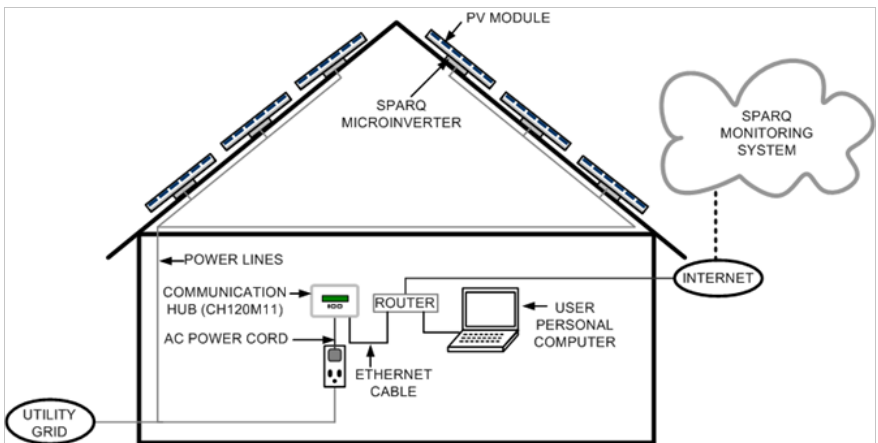


NOTE: For the SPARQ Communication Hub warranty terms and conditions, please see page 24.

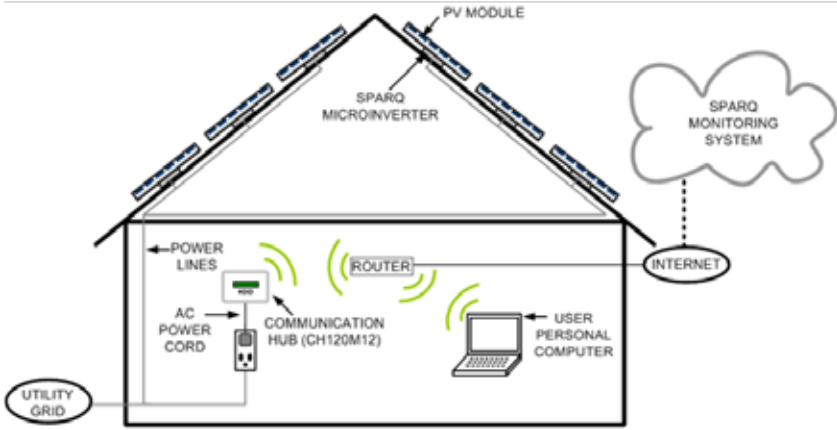
1 INTRODUCTION

1.1 The SPARQ Communication Hub

The SPARQ Communication Hub is an integral part of the overall SPARQ Microinverter system. It enables the user to quickly view the performance of every component of their SPARQ Energy System. The hub achieves this by continuously monitoring the status of every SPARQ microinverter that is attached to solar panels in their system. This communication is performed over normal AC power lines (PLC-Power Line Communications). It also allows the user to be more engaged with their photovoltaic system as it enables direct interaction between the user and their solar panel(s). The hub also functions as a link between the microinverter(s) and the SPARQ Monitoring System through the internet. The SPARQ Monitoring System gathers, analyzes, and displays detailed performance data from each microinverter.



System Diagram with Communication Hub Model# CH120M11 (wired internet)



System Diagram with Communication Hub Model# CH120M12 (wireless internet)

1.2 How the SPARQ Communication Hub Works

The operation of the SPARQ Communication Hub is both easy and intuitive. A certified SPARQ installer will perform the initial setup process by scanning all the microinverters that are associated with the site into a software application. The Communication Hub gathers data from every connected microinverter and processes the information. Basic performance information is displayed to the user via the hub liquid crystal display (LCD), which is updated every five minutes. The hub also transfers detailed performance data to the remote SPARQ Monitoring System every 5 minutes.

1.3 The Elements of the SPARQ Energy System

1.3.1 SPARQ Microinverter

The SPARQ Microinverter is a device that is connected to a photovoltaic (PV) panel to convert the DC output of the panel into grid-compliant AC power. PV systems that use SPARQ Microinverters produce an optimal energy harvest by employing proprietary maximum power point tracking methods (MPPT). The SPARQ Microinverter is a 'plug-and-play' device and is auto-grid configurable worldwide, so it is very easy and safe to install.

The SPARQ Microinverter unit is light, compact, and efficient. It is designed to have a lifetime matching that of the photovoltaic module. The result is high-quality power

generation and excellent system availability. In addition, the microinverters are very robust and deliver excellent performance even under adverse conditions such as snow, dust, shade and low-light conditions.

1.3.2 The SPARQ Monitoring System

The SPARQ Monitoring System is a web-based monitoring and analysis tool. Once configured, it automatically collects data from each PV module so that you can view detailed real-time performance information regarding any PV module in your system. Information such as energy production, operational status, power output etc. can be easily reviewed at a glance. The monitoring system keeps a database of historical performance data of all the panels associated with a particular site. The information is presented graphically for easy understanding. The monitoring system also allows the user to calculate the amount of monetary savings the PV system has provided.

1.3.3 The SPARQ Local Configuration Website

The SPARQ Communication Hub has an embedded local configuration website where the user can enter and view installation information on every panel in the system. (e.g. internet connectivity, panel configuration, time settings, etc.) Access to this website does not require an internet connection.

2 SPARQ COMMUNICATION HUB INSTALLATION

2.1 Preparation

Before installing the communication hub, please make sure that the following minimum site requirement are met:

- Standard AC electrical outlet
- An Ethernet crossover cable OR an Ethernet switch OR an Ethernet router
- A computer
- Web browser (Internet Explorer 8 and above, Google Chrome, Firefox, etc.)

Check the shipping box for the following items:

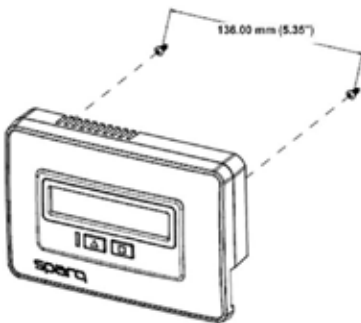
- SPARQ Communication Hub
- Standard Ethernet cable
- AC power cord
- User manual

2.2 Placement

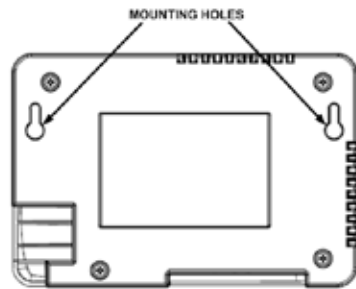
If the SPARQ Communication Hub does not incorporate the wireless option, it is recommended to place the hub where it can be easily be connected to the internet.

2.3 Wall Mounting

To mount the SPARQ Communication Hub onto a wall, use two screws (with or without anchor) as shown in the illustration below.



Front View



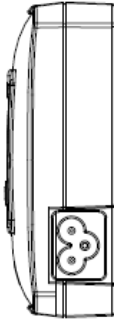
Back View



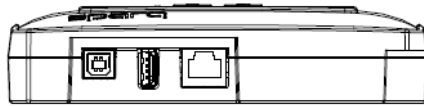
NOTE: Screws and anchor types can vary, depending on the type of wall (drywall, masonry, etc.) Use pan head screws with maximum head diameter of 0.28" (#6 or M3).

2.4 Installation

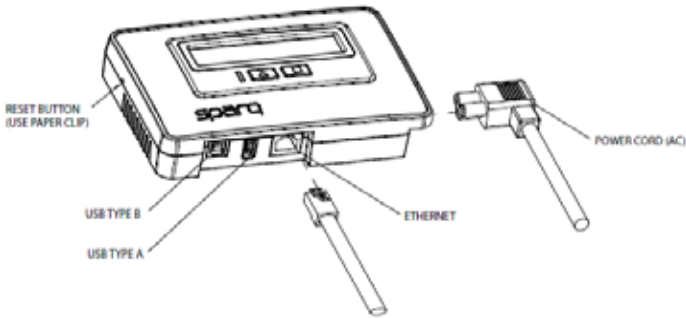
To install the SPARQ Communication Hub, please connect the cables to their proper terminals.



Right Side View: AC



Bottom View (left to right): USB cable plug, USB plug, Ethernet cable plug



WARNING: Do not plug the SPARQ Communication Hub into a power bar, surge protector, or uninterruptable power supply (UPS). This may disrupt the communication between the solar modules and the hub.

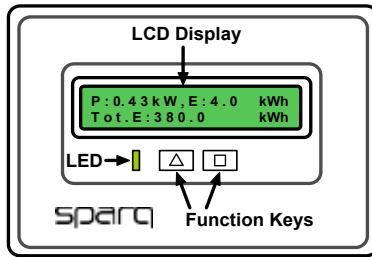


NOTE: Please refer to the Installer Quick Guide for installation instructions

3 SPARQ COMMUNICATION HUB OPERATION: LCD INTERFACE

Main features: System Display, Panel by Panel Display, System Configuration, and Alarmed Panel List.

3.1 Interface Map



- LCD Display: 2 lines, 20 Characters per line
- LED (Light Emitting Diode):
 - Solid Red = there are alarmed panels and the server is connected
 - Flashing Red = there are alarmed panels and the server is not connected
 - Solid Yellow = there are no alarmed panels and the server is not connected
 - Solid Green = there are no alarmed panels and the server is connected.
- Function Keys:
 - Δ: Scroll
 - □: Select
 - (Hold) □: Confirm and Enter Data
 - (Hold) Δ: Return
 - 5 seconds – Return to previous menu
 - 10 seconds—Return to main system display screen from any menu (quick escape)

3.2 Basic Navigation: System Display Menu

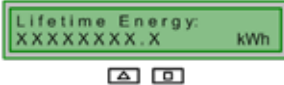
This display mode shows all the pertinent information regarding the whole system. The main system overview screen displays the following information:

- Instantaneous System Power: The power generated by all the panels at the present time (values are refreshed every 5 minutes)
- System Day Energy: The energy that all the panels have generated so far throughout the day (this value is reset every day at midnight)
- Total System Energy: The energy that all the panels have generated so far since last reset. This allows the user to track the amount of energy generated by the system for a specific duration (e.g. a week, a month, etc.). Please **<HOLD>** □ to reset the total energy counter (Tot. E).



The main system overview is page 1 of the system display menu. To view other system parameters, please <PRESS> ▲ to progress from page 1 to 7:

- Page 2: Lifetime Accumulated Energy



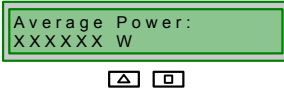
- Page 3: Grid Voltage and Frequency



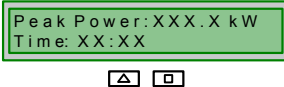
- Page 4: Server Connection Status and Number of Alarmed Panels (number of alarmed panels/total number of panels)



- Page 5: System Average Power



- Page 6: System Peak Power (and its corresponding time)



- Page 7: IP address and Hub series number (14 numbers)



NOTE: To access other menus (panel by panel display or system configuration or alarmed panel list), please <PRESS> □ at any system page. For more details on using the LCD menu, please refer to **Appendix A** for further instructions.

4 SPARQ COMMUNICATION HUB CONFIGURATION INTERFACE

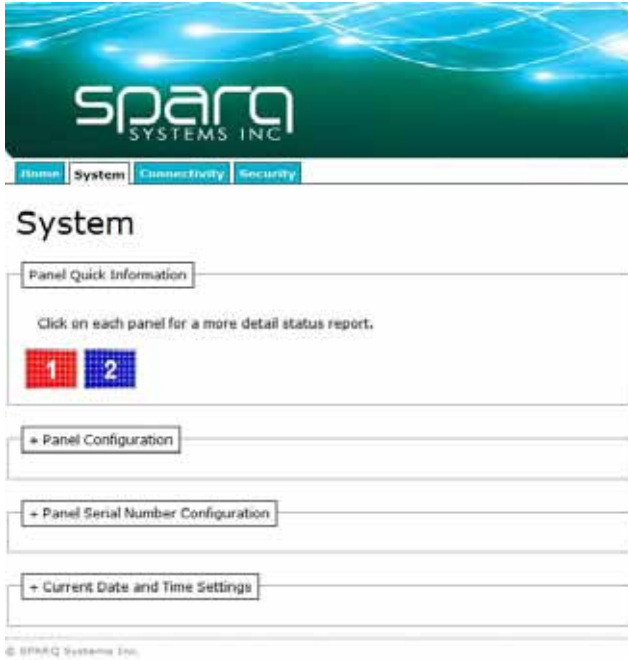
The local website can be accessed through an internet browser (see web browser requirements on page 6) without actual live internet access. To view the local website, please type: <http://sparqch/> and you will arrive at the landing page below. There are four tabs:

- Home: Landing page
- System: View **OR** edit information regarding the system
 - Panel Status
 - Panel Configuration
 - Panel Serial Numbers
 - Date and Time Settings
- Connectivity: Hub connectivity settings
 - Network Time Protocol settings
 - Monitoring System Settings
 - Internet Settings (Wired and Wireless Settings)
- Security: User security settings
 - HTTP Authentication
 - FTP Authentication



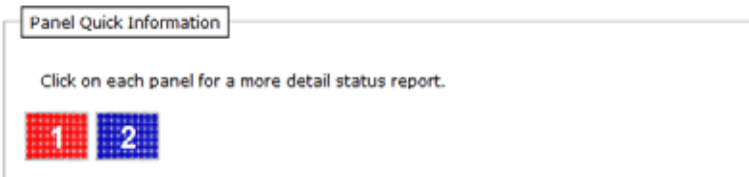
NOTE: This section will discuss the System tab portion of the SPARQ local website. For information regarding the Connectivity and Security tabs, please refer to **Appendix B**.

4.1 System Tab



4.1.1 Panel Quick Information

Within the system tab, the user can easily view information regarding the performance of the photovoltaic modules that make up their system. All the panels in the system are represented by color-coded solar panel icons. A red panel icon signifies an alarmed panel, while working panels are different shades of blue that correspond to their power output (brighter blue indicates higher power output).



To view information regarding a specific panel, click on the desired panel and a pop-up window will appear, showing:

- Serial Number (at the top denoted by “SN”)
- Current time and date
- Current output power
- Panel status
- Panel information



4.1.2 Panel Configuration

Press the “+” beside the “Panel Configuration” box to expand the box to edit the number of panels within the system. Please press “save” to change the number of panels.

To edit the serial number of the panels in the system, click the text box corresponding to the desired panel and enter the correct panel serial number.



WARNING: Please note that a communication error between the hub and the panels may occur if the serial numbers do not match the panels in the system. Please use caution when editing the serial numbers.

4.1.3 Adding Panels to the System

Initially, when the system is set up, the installer will scan all the panels into the system. If you choose to add panels to your system at a later time, please follow these simple steps to do so:

1. Expand the Panel Configuration box and enter the new number of panels and click “save”
2. Expand the Panel Serial Number Configuration box and input the new serial numbers and click “save”



WARNING: Please use caution when entering the serial number. If the serial number is incorrect, the panel will not be able to communicate with the hub.

4.1.4 Current Date and Time Settings

To edit the current date and time, expand the “Current Date and Time Settings” box. Click the “save” button to confirm time settings. Network Time Protocol (NTP) is a quick and easy way to automatically update the time settings (enable the automatic NTP setting in the Connectivity Tab).

– Current Date and Time Settings

Use this form to correct the date and time configuration. For quick and convenient automatic updates, enable the NTP Sync. in the connectivity tab.

Day (1-31):

Month (1-12):

Year (2010):

Hour (0-23):

Minute (0-59):

Second (0-59):

Timezone (-12 - +12):

5 SPARQ MONITORING SYSTEM

The monitoring system is accessed through the SPARQ website (www.sparqsys.com). It is located under “Monitoring System” at the top right-hand corner of the page. The monitoring system can be directly accessed through the following web address: <http://mon.sparqsys.com>

To use the monitoring system, the following computer system requirements must be met:

- Internet Explorer 7.0 (or later) **OR** Firefox 5.0 (or later) **OR** Google Chrome
- Silverlight Plug-in version 4 or later
- Adobe Flash Plug-in version 10.3 or later

Through the monitoring system you can:

- View the power generated by each panel through a graphical representation of the installed panels.
- View the energy generated by each panel throughout the day, over 7 days, over 30 days, over its lifetime, and even over a user-defined period.
- Graphs showing the energy and power output over a user-defined period of time
- Detailed information regarding active panel alarm statuses and the system’s alarm history
- View/edit the site information
- View/edit the information regarding the hub associated with the site
- View/edit/add registered panels
- View/edit the panel layout (move and rotate panels according to its actual physical site location)
- View/edit the user profile



NOTE: This section will discuss the SPARQ Monitoring System registration process. For a more in-depth description of the monitoring system’s functionality, please refer to **Appendix C**.



5.1 System Registration

To register a new system, please click the “New User” button. There are four main steps to the registration process:

1. User Registration: register user information and future log-in information
2. Site Registration: register information regarding the site location
3. Hub Registration: register information regarding the hub linked with the site to enable communication between the web monitoring system and the communication hub.
4. Add Panels: register the panels associated with the site to facilitate data acquisition.



5.1.1 User Registration

To complete the user registration the following information is required:

- User name: for accessing the monitoring system in the future
- Email address: used for retrieving lost passwords, receiving system notifications, etc.
- Password: for accessing the monitoring system in the future
- User address information (address, city, province/state, and country): to allow SPARQ to forward any updated new documentation, information, or promotions. Also used for warranty purposes.





NOTE: The user information can be edited at a later time. To view/edit user information after the registration process, go to the “Profile” option in the Configuration and Alarm Menu.

5.1.2 Site Registration

To complete the site registration, the following information is required:

- Site Name: the name by which the system is referred to
- Site Type: whether the SPARQ system is used for commercial or residential purposes
- Currency: the currency that is used in the country where the site is located

Symbol	Currency
\$	USD, CAD, SGD, HKD, NTD, AUD
€	Euros
£	Sterling Pound
Rs	Indonesian Rupees, Indian Rupees
CNY	Chinese Yuan Renminbi
¥	Japanese Yen
Other	Any other currency that is not in the list

- Utility Cost/Subsidy per kWh: the monetary amount that the local government offers per kWh of generated solar energy
- Site Location (Address, City, Province/State, and Country): where the SPARQ microinverters are located.



NOTE: The utility cost entered will be used to estimate the financial benefits of the system. To facilitate an accurate estimate, please ensure that the entered information is correct. For more information, please refer to **Appendix B**.

Page: 24 of 41

Site Name:

Site Type:

Capacity:

Utility contribution per kWh:

Site Location

Address 1:

Address 2:

City:

Province/State:

Postal Code:

Country:

Installer Information

* Mandatory Fields

Optional: Installer information can be added to the profile. To edit/view installer information please check the “Installer Information” box. The following information is required to register the installer information:

- Installer Company Name
- Installer Company Address (Address, City, Province/State, and Country)

Page: 24 of 41

Postal Code:

Capacity:

Installer Information

Installer Company:

Address 1:

Address 2:

City:

Province/State:

Postal Code:

Country:

Installer Information

* Mandatory Fields



NOTE: The site information can be edited at a later time. To view or edit the site information after the registration process, go to the “System>Site” option in the Configuration and Alarm Menu.

5.1.3 Hub Registration

To complete the hub registration, the communication hub serial number (Hub ID) is required.



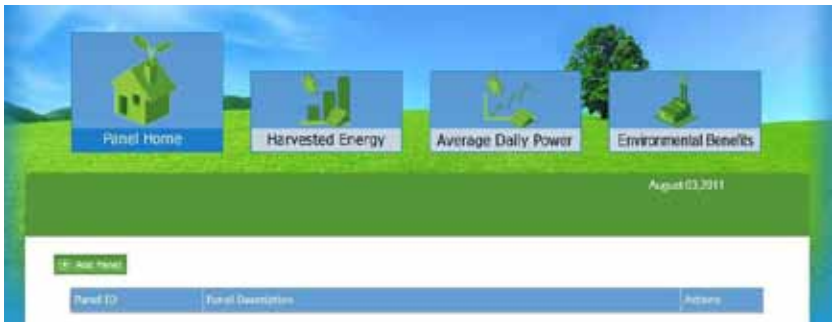
WARNING: Please note that if the Hub ID is incorrect, no data will be acquired or displayed by the web monitoring system.



NOTE: The hub information can be edited at a later time. To view/edit hub information after the registration process, go to the “System>Hub” option in the Configuration and Alarm Menu.

5.1.4 Add Panel

In order to associate the solar panels to the registered site, please click the “Add Panel” icon.



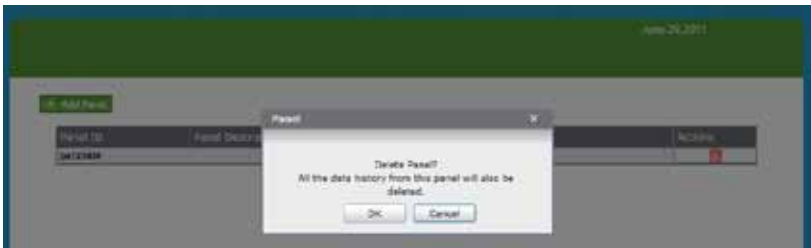
After the “Add Panel” icon is clicked, enter a Panel ID (the panel serial number) and a corresponding panel description (optional).



WARNING: Please note that if the Panel ID is incorrect, no data will be acquired or displayed.



NOTE: To delete a panel, please click the red “trash can” icon beside the panel. Once clicked, a dialog box will appear to caution you that all the data history from the panel will be deleted. Once “OK” is clicked, the panel will be deleted.



Panels can be added, deleted, or edited at a later time. To make changes to the panel list after the registration process, go to the “System>Panel>Registration” option in the Configuration and Alarm Menu.

6 TROUBLESHOOTING

Communication Hub:

Problem	Solution
Nothing is displayed on the Communication Hub LCD.	Ensure the power supply is plugged in and powered on.
The Communication Hub LCD shows: "SD card not found".	This is a technical failure. Please contact support at support@sparqsys.com
The Communication Hub cannot connect to the internet.	<ol style="list-style-type: none"> 1. Check the Ethernet Cable and the router. 2. Perform a factory reset (See Appendix A).
Forgot password.	Restore to factory settings (See Appendix A).
Panel(s) not responding.	This indicates that there is no communication between the microinverter and the hub. Try moving the hub to a closer plug.
Incorrect time.	<ol style="list-style-type: none"> 1. If there is internet connection and auto date update (NTP) is disabled, enable this feature through the internal website (see Network Time Protocol Section in Appendix A). 2. If there is no internet connection, set time through the communication hub (see Real Time Clock (RTC) Setup Option Section in Appendix A).
The Communication Hub LCD is frozen (does not respond to any button press).	Unplug the power cable of the Communication Hub. Wait one minute before plugging the power cable back in.
Upon boot-up, the main system overview screen is not shown.	<ol style="list-style-type: none"> 1. <HOLD> □ for 10 seconds. 2. Unplug the device and wait for one minute before plugging it back in. 3. Restore to factory settings (See Appendix A).

If problem persists, please contact support at: support@sparqsys.com

Monitoring System:

Problem	Possible Cause	Solution
Cannot connect to the Monitoring system page. When attempted, message says: "Internet Explorer cannot display the webpage"	Internet connection is not available.	Make sure there is internet connectivity by visiting another site (e.g. www.google.com) If not available, contact your internet service provider.
Cannot connect to the site. When attempted, message says : "Server Error: 404 : File or Directory not found"	Misspelled the website ID (URL).	Ensure that the URL is correct: www.mon.sparqsys.com
Cannot login to the system.	User ID does not exist in the system OR Password is incorrect	Make sure the user credential (user id and password) is correct If password is forgotten, get it back using Forgot Password button.
Successful login but the page says "loading" and freezes.	Silverlight plug-in and/or Flash plug-ins are not installed.	Make sure the mentioned plug-ins are installed.
One or more panels on the Panel Home page are red.	The inverters attached to the panels have problems that cannot be cleared automatically and require manual reset.	Please refer to the Alarms Section in Appendix C.

If problem persists, please contact SPARQ support at: support@sparqsys.com

7 TECHNICAL DATA

SPARQ Communication Hub Technical Data

Model: CH120M11/CH120M12

Hub Communicaton Interface	
Communication (Hub to Microinverter)	Powerline
Local/Remote Internet	LAN
Optional	802.11b/g Wireless LAN
Hub User Interface	
Display	Liquid Crystal Display (LCD) 2 lines: 20 characters per line
Function Keys	2 buttons
Alarm Indicator	Light Emitting Diode (LED)
Power Requirements	
AC Outlet	132 ~ 102 V _{ac} , 60 Hz, 100mA
Typical Power Consumption	3 W (wired internet) 3.7 W (wireless internet)
Mechanical Data	
Dimensions (WxHxD) in cm	15.7 x 10.6 x 4.2
Weight	300 grams
Operating Temperature Range	0°C – 65°C
Cooling	Natural Convection
Enclosure Environmental Rating	Indoor (NEMA 1)
Additional Information	
Installation	Local Setup
Maintenance	Remote Troubleshooting
Standard Warranty Term	1 Year
Compliance	UL 60950, EN 60950 FCC Part 15 Class B

8 WARRANTY INFORMATION

SPARQ Systems Inc. (“**SPARQ**”) has developed a highly reliable SPARQ Communication Hub that is designed to withstand normal operating conditions when used for its originally intended purpose in compliance with the SPARQ User Manual supplied with the originally shipped system. The SPARQ limited warranty (“**Limited Warranty**”) covers defects in workmanship and materials of the SPARQ Communication Hub (“**Defective Product**”) for a period of one (1) year from the date of original purchase of such SPARQ Communication Hub at point of sale to the originally installed end user location (the “**Warranty Period**”). During the Warranty Period, the warranty is transferable to a different owner as long as the SPARQ Communication Hub remains installed at the originally installed end user location.

During the Warranty Period, SPARQ will, at its option, repair or replace the Defective Product free of charge, provided that SPARQ through inspection establishes the existence of a defect that is covered by the Limited Warranty. SPARQ will, at its option, use new and/or reconditioned parts in repairing or replacing the Defective Product. SPARQ reserves the right to use parts or products of original or improved design in the repair or replacement of Defective Product. If SPARQ repairs or replaces a Defective Product, the Limited Warranty continues on the repaired or replacement product for the remainder of the original Warranty Period or ninety (90) days from the date of SPARQ’s return shipment of the repaired or replacement product, whichever is later.

The Limited Warranty covers both parts and labor necessary to repair the Defective Product, but does not include labor costs related to uninstalling the Defective Product or reinstalling the repaired or replacement product. The Limited Warranty also covers the costs of shipping by SPARQ to locations within Canada and the United States (including Alaska and Hawaii), but not to other locations outside Canada or the United States. The Limited Warranty does not cover, and SPARQ will not be responsible for, shipping damage or damage caused by mishandling by the freight carrier and any such damage is the responsibility of the freight carrier.

To obtain repair or replacement service under this Limited Warranty, the customer must comply with the following policy and procedure:

- All Defective Product must be returned with a Return Merchandise Authorization Number (RMA) which customer must request from SPARQ. Before requesting the RMA, however, the customer should contact a SPARQ technical support representative to evaluate and troubleshoot the problem while the SPARQ Communication Hub is in the field, since many problems can be solved in the field.

- If in-field troubleshooting does not solve the problem, Customer may request a RMA number, which request must include the following information:
 - Proof-of-purchase of the Defective Product in the form of (1) the dated purchase receipt from the original purchase of the product at point of sale to the end user; or (2) the dated dealer invoice or purchase receipt showing original equipment manufacturer (OEM) status; or (3) the dated invoice or purchase receipt showing the product exchanged under warranty.
 - Model number of the Defective Product.
 - Serial number of the Defective product.
 - Detailed description of the defect.
 - Shipping address for return of the repaired or replacement product.
- All Defective Product authorized for return must be returned in the original shipping container or other packaging that is equally protective of the product.
- The returned Defective Product must not have been disassembled or modified without the prior written authorization of SPARQ.

The Limited Warranty does not cover normal wear and tear of SPARQ Communication Hubs or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. The Limited Warranty does not apply to, and SPARQ will not be responsible for, any defect in or damage to any SPARQ Communication Hub: (1) that has been misused, neglected, tampered with, altered, or otherwise damaged, either internally or externally; (2) that has been improperly installed, operated, handled or used, including use under conditions for which the product was not designed, use in an unsuitable environment, or use in a manner contrary to the SPARQ User Manual or applicable laws or regulations; (3) that has been subjected to fire, water, generalized corrosion, biological infestations, acts of God, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the SPARQ Communication Hub specifications, including high input voltage from generators or lightning strikes; (4) that has been subjected to incidental or consequential damage caused by defects of other components of the solar system; or (5) if the original identification markings (including trademark or serial number) of such SPARQ Communication Hub has been defaced, altered, or removed. The Limited Warranty does not extend beyond the original cost of the SPARQ Communication Hub.

THE LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY SPARQ AND, WHERE PERMITTED BY LAW, IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OR WARRANTIES AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES,

COSTS OR EXPENSES HOWEVER ARISING, WHETHER IN CONTRACT OR TORT, INCLUDING WITHOUT LIMITATION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY PERSONAL INJURY.

To the extent any implied warranties are required under applicable law to apply to the SPARQ Communication Hub, such implied warranties shall be limited in duration to the Warranty Period, to the extent permitted by applicable law. Some states and provinces do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply. This Limited Warranty gives the customer specific legal rights, and the customer may have other rights that may vary from state to state or province to province.

APPENDIX A: LCD INTERFACE

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1 RESTORE FACTORY SETTINGS

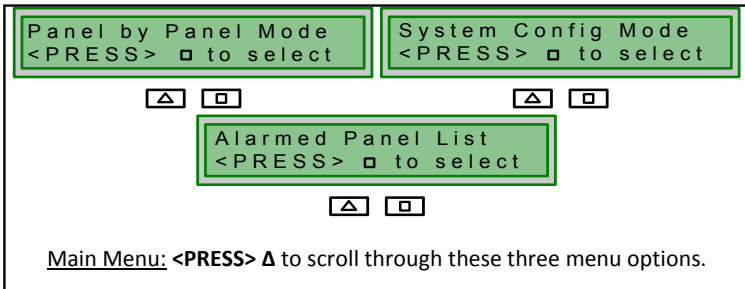
To restore factory settings:

1. Unplug the communication hub power cable.
2. **<HOLD>** □ while plugging in the communication hub power cable.
3. **<PRESS>** Δ to restore factory settings (**<PRESS>** □ to cancel factory reset).




2 MAIN MENU

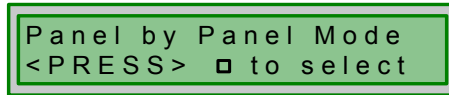
To access other menus (panel by panel display or system configuration or alarmed panel list) **<PRESS>** □ at any System Display Menu page (refer to Section 3.2 in the Hub main manual). Please refer to the appropriate section for further instructions regarding the three menu choices. The main menu choices are illustrated below:



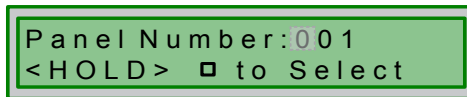
To return to main system overview page from the main menu, please **<HOLD>** Δ for at least 5 seconds.




3 PANEL BY PANEL DISPLAY MODE

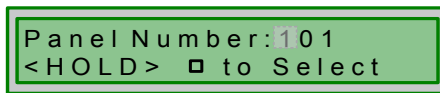
To select the Panel by Panel display mode, <PRESS>  when the selection is shown (see illustration below).






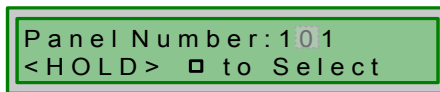
After you have selected the Panel by Panel display mode, you will be brought to the panel selection menu where you are prompted to enter the number of the panel you would like to view. The digit selected for modification will be flashing.




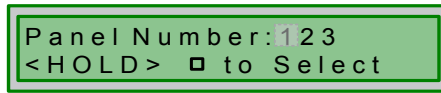
<PRESS>  repeatedly to scroll through numbers (0-9). Please **do not** <HOLD>  as it will cancel any changes made (i.e. cancel panel selection) and you will be returned to the main menu. It is also important to note than holding  for 10 seconds or more will activate the quick escape function and you will be brought back to the main system overview page.



<PRESS>  to move to next digit to modify it. If you would like to go back and change a number, <PRESS>  repeatedly to move from one digit to the next, until you arrive at the desired digit (when at the last digit, pressing  will bring you back to the first digit).





Once you have finished entering the panel number, **<HOLD>**  to confirm the entered panel number and you will be brought to the first of the panel display pages for your desired panel.



If the panel does not exist (i.e. incorrect panel number), an error message will appear for three seconds and you will be brought back to the panel selection screen.



At any time during your panel selection, **<HOLD>**  for 5 seconds and your panel selection is cancelled. You will be brought back to the Panel by Panel Mode selection page. **<HOLD>**  for 10 seconds for quick escape to the main system overview page. If the chosen panel exists and is not responding, the following error message will appear for three seconds and you will be able to view the panel’s current status.



To scroll through the panel parameters **<PRESS>**  to progress from page 1 to 4:

- Page 1: Operational Status (Op) and Inverter Temperature (Inv. Temp)
Operational Status legend (read from left to right):
 - 1st digit: Panel/Microinverter Failure
 - 2nd digit: inverter five-minute timer (0 = normal, 1 = waiting)
 - 3rd digit: inverter status (0 = ON, 1 = OFF)
 - 4th digit: hub status (0 = normal, 1 = sleeping)
 - 5th digit: under bus voltage (UBV)
 - 6th digit: over bus voltage (OBV)

- 7th digit: over temperature protection (OTP)
- 8th digit: islanding
- 9th digit: under frequency protection (UFP)
- 10th digit: over frequency protection (OFP)
- 11th digit: output under voltage protection (UVP)
- 12th digit: input under voltage protection (UVP)
- 13th digit: output over voltage protection (OVP)
- 14th digit: input over voltage protection (OVP)
- 15th digit: output over current protection (OCP)
- 16th digit: input over current protection (OCP)

Op:XXXXXXXXXXXXXXXXXX
Inv. Temp: ±XXX C



- Page 2: Alternating Current (AC) Output Power

AC Output Power:
XXX W



- Page 3: Panel Day Energy and Accumulated Energy

Panel Day E:XXX.X Wh
Accu. E:XXXXX.X kWh



- Page 4: Panel Serial Number

Panel Serial:
XXXXXXXXXXXXXXXXXX



Please <HOLD> **Δ** for 5 seconds to return to the main menu. Or, if you would like to quickly escape to the main system overview page, please <HOLD> **Δ** for 10 seconds.

4 SYSTEM CONFIGURATION

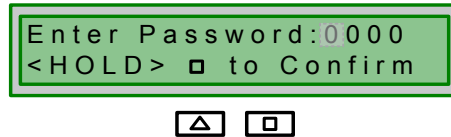
At the main menu, <PRESS> Δ to scroll through the options. Once at the System Configuration option, <PRESS> \square to select it.



If System Configuration is selected, then you will be brought to a security interface where you will be asked to enter your password for authorization.



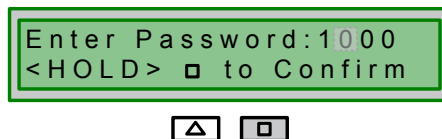
NOTE: The default factory set password is "0 0 0 0".



<PRESS> Δ to scroll through the digits (0-9).



<PRESS> \square to move to the next digit. When at the last digit, pressing \square will bring you back to the first digit.



After you have finished entering your password, please <HOLD> \square to confirm password.



If the password is incorrect, you will be brought back to the 'Enter Password' screen accompanied by an error message (please see illustration below).

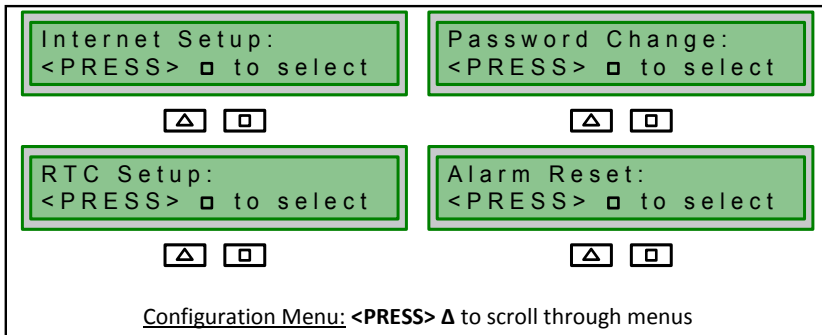


At any time during password input, you may <HOLD> Δ for 5 seconds to return to the menu selection screen. Holding Δ for 10 seconds will allow you to quickly escape to the main system overview screen.

If the password is correct you will be brought to the configuration menu. The configuration menu has 4 main options:

1. Internet Setup
2. Password Change
3. Real Time Clock Setup
4. Alarm Reset

The four menu options will appear as follows and you can proceed from one to another by the key Δ (<PRESS> Δ to scroll):



When at the desired option, please <PRESS> □ to select option.

4.1 Internet Setup Option

When the Internet Setup Option is selected, there will be two configuration choices:

- Automatic internet setup
- Manual internet setup
- Wireless internet (available only with the wireless communication hub models)

Auto Setup(DHCP)
<PRESS> □ to select



Manual Setup
<PRESS> □ to select



Wireless Connection
<PRESS> □ to select



<PRESS> Δ to move between the three internet configuration choices, and <PRESS> □ to select the desired option. By default, the Automatic setup is selected. If Manual setup has been chosen, and the Automatic setup is desired once again, then **a reset of the system is required**. Therefore, if the Automatic setup is selected, you will be asked to confirm the selection and the system will require you to reboot the hub; press the reset button on the hub (for location of the reset button, see illustration on page viii).

4.1.1 Automatic Setup

You will see a confirm prompt like the one below if the Automatic Setup is chosen:

CONFIRM AUTO CHOICE?
<HOLD> □ to select



4.1.2 Wireless Connection

If Wireless Connection is selected, you will be brought to a screen showing whether the wireless module is currently ON or OFF. **<HOLD>** to turn the wireless module ON or OFF.

Status: ON
<HOLD> : TURN OFF



Status: OFF
<HOLD> : TURN ON



If the wireless module is on: **<PRESS>** to view the SSID (name of the connected wireless network) and the signal strength of the wireless connection. **<PRESS>** again to scroll back to the wireless module **ON/OFF** status. **<HOLD>** for 5 seconds to go back to the main internet configuration choices.

SSID: SparqNetwork
 Signal: 95%

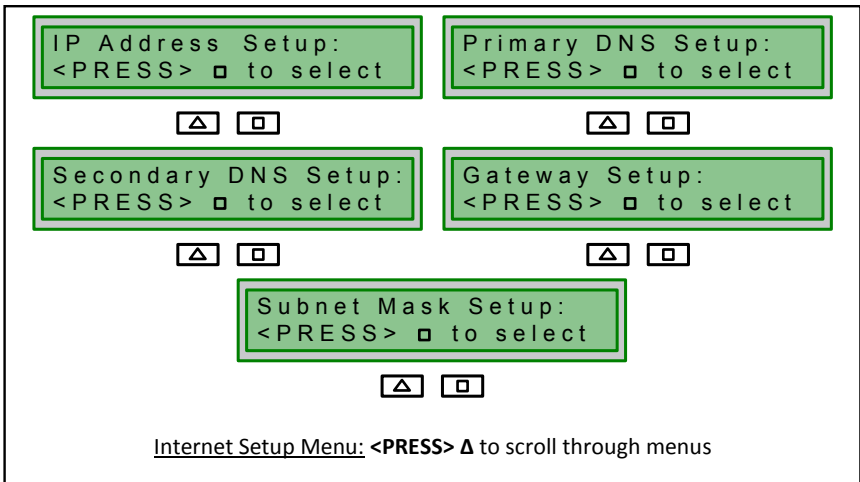


NOTE: The only way to set the SSID and password is to use the local communication hub website (See **Appendix B**).

4.1.3 Manual Setup

If the Manual Setup is selected, then you will be given the option to modify:

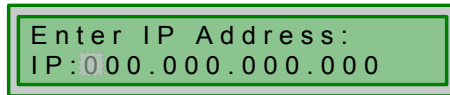
- IP Address
- Primary and Secondary DNS
- Gateway
- Subnet Mask



4.1.3.1 IP Address Setup

1. Select IP Address Setup: At the IP Address Setup selection page, <PRESS> □
2. Modify digits: <PRESS> Δ to cycle through digits (0-9)
3. Move from one digit to another: <PRESS> □ to move onto the next digit (when at the last digit, pressing □ will bring you back to the first digit)
4. Confirm and Enter: When modification is complete, <HOLD> □ to confirm IP Address change and you will be brought back to the internet configuration menus.
5. Cancel: During IP Address input, <HOLD> Δ for 5 seconds to cancel change and you will be brought back to the internet setup menu. <HOLD> Δ for 10 seconds to quickly escape to the main system overview page.

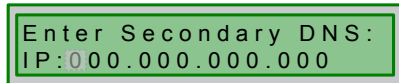
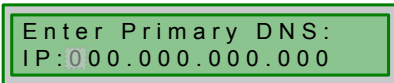
After IP Setup you will be brought back to the IP Address Setup choice (part of the internet configuration menu) so **<PRESS> Δ** to cycle through the other setup parameters (DNS, Gateway, and Subnet Mask Setup). **<HOLD> Δ** for 5 seconds to return to the choice of automatic or manual internet setup. **<HOLD> Δ** for another 5 seconds to return to the configuration menu (with Internet Configuration, Password Change, Alarm Reset, and Real Time Clock Setup choices). **<HOLD> Δ** for 10 seconds to quickly escape to the main system overview page.



4.1.3.2 DNS Setup (Primary and Secondary)

1. Select Primary DNS Setup or Secondary DNS Setup: At the specified DNS Setup selection page, **<PRESS> □**
2. To edit the primary and secondary DNS IP addresses, please refer to steps 2-4 of the IP Setup Section.
3. Cancel: During DNS input, **<HOLD> Δ** to cancel change and you will be brought back to the internet setup menu. **<HOLD> Δ** for 10 seconds to quickly escape to the main system overview page.

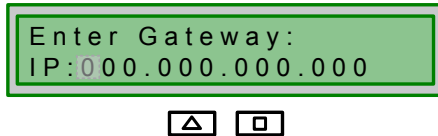
After DNS Setup you will be brought back to the DNS Setup choice (this is part of the internet configuration menu) so **<PRESS> Δ** to cycle through the other setup parameters (IP Address, Gateway, and Subnet Mask Setup).



4.1.3.3 Gateway Setup

1. Select Gateway Setup: At the Gateway Setup selection page, **<PRESS>** □
2. To edit the primary and secondary DNS IP addresses, please refer to steps 2-4 of the IP Setup Section.
3. Cancel: During Gateway input, **<HOLD>** Δ to cancel change and you will be brought back to the internet setup menu. **<HOLD>** Δ for 10 seconds to quickly escape to the main system overview page.

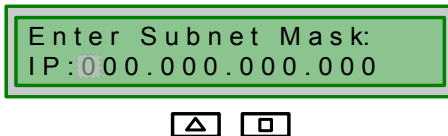
After Gateway Setup you will be brought back to the Gateway Setup choice (this is part of the internet configuration menu) so **<PRESS>** Δ to cycle through the other setup parameters (IP Address, DNS, and Subnet Mask Setup).





4.1.3.4 Subnet Mask Setup

1. Select Subnet Mask Setup: At the Subnet Mask Setup selection page, **<PRESS>** □
2. To edit the primary and secondary DNS IP addresses, please refer to steps 2-4 of the IP Setup Section.
3. Cancel: During Subnet Mask input, **<HOLD>** Δ to cancel change and you will be brought back to the internet setup menu. **<HOLD>** Δ for 10 seconds to quickly escape to the main system overview page.


After Subnet Mask Setup you will be brought back to the Subnet Mask Setup choice (this is part of the internet configuration menu) so **<PRESS>** Δ to cycle through the other setup parameters (IP Address, DNS, and Gateway Setup).



4.2 Password Change Option

Please cycle through the configuration menu (<PRESS> ) and <PRESS>  when you arrive at the Password Change menu option to select it.

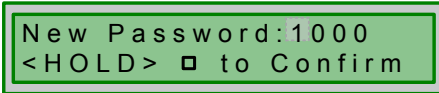




After pressing  to select password change, you will arrive at a page that allows you to type in your new password.




To enter your new password:

1. Modify digits: <PRESS>  to cycle through digits (0-9)



2. Move from one digit to another: <PRESS>  to move onto the next digit (when at the last digit, pressing  will bring you back to the first digit)



3. Confirm and Enter Input: When modification is complete, <HOLD>  to confirm Password change and you will be brought back to the configuration menus.

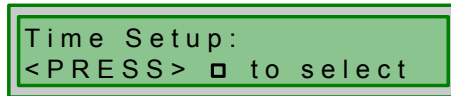


4. Cancel: During new password input, **<HOLD> Δ** to cancel change and you will be brought back to the configuration menus. **<HOLD> Δ** for 10 seconds to quickly escape to the main system overview page.

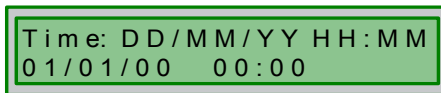
After Password Change you will be brought back to the Password Change choice (this is part of the configuration menu) so **<PRESS> Δ** to cycle through the configuration choices (Internet Setup, RTC Setup, and Alarm Reset). **<HOLD> Δ** for 5 seconds to return to the main menu (with Panel by Panel view, System Configuration, and Alarmed Panel list menu choices). **<HOLD> Δ** for 10 seconds to quickly escape to the main system overview page.

4.3 Real Time Clock (RTC) Setup Option

Please cycle through the configuration menu (**<PRESS> Δ**) and **<PRESS> □** when you arrive at the RTC Setup menu option to select it. Please note that the RTC is in 24-hour clock format (00:00 – 23:59).




After pressing **□** to select RTC Setup, you will arrive at a page that displays the current time setting and allows you to manually set the current time for the system.

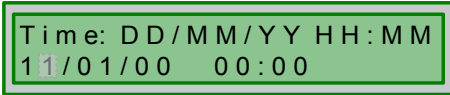



To enter the current time:

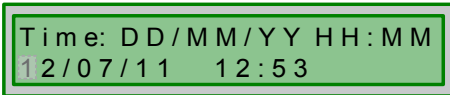
1. Modify digits: **<PRESS> Δ** to cycle through digits (Days: 1-31; Months: 1-12; Year: 00-99; Hours: 0-23; and Minutes: 0-59)







2. Move from one digit to another: **<PRESS>**  to move to the next digit (Day digit 1 → Day digit 2 → Month digit 1 → Month digit 2 → Year digit 1 → Year digit 2 → Hours digit 1 → Hours digit 2 → Minutes digit 1 → Minutes digit 2 → Day digit 1 →....



3. Confirm and Enter Input: When modification is complete, **<HOLD>**  to confirm time settings and you will be brought back to the configuration menus.





4. Cancel: During time setup, **<HOLD>**  to cancel change and you will be brought back to the configuration menus.

After RTC setup you will be brought back to the RTC Setup choice (this is part of the configuration menu) so **<PRESS>**  to cycle through the configuration choices (Internet Setup, Password Change, and Alarm Reset). **<HOLD>**  for 5 seconds to return to the main menu (with Panel by Panel view, System Configuration, and Alarmed Panel list menu choices). **<HOLD>**  for 10 seconds to quickly escape to the main system overview page.

If incorrect times are selected (e.g. 29 days in February, 31 days in November, 0th month, 0th day, etc) an appropriate error message will appear and you will be brought back to the RTC modification page. For example:





4.4 Alarm Reset Option

Please cycle through the configuration menu (<PRESS> ) and <PRESS>  when you arrive at the Alarm Reset menu option to select it.

Alarm Reset:
<PRESS>  to select



You will have two choices when the Alarm Reset option is selected. You can either choose to reset the alarms of all the panels in the system (System Reset option) **OR** reset the alarm of a single panel at a time (Single Panel Reset option). In the Single Panel Reset option, you will be given a list of the alarmed panels and you can select the particular panel for which you would like to reset the alarm. <PRESS>  to move between the two choices.


System Reset:
<HOLD>  to select



Single Panel Reset:
<PRESS>  to select




4.4.1 System Reset

To reset the alarms of all the panels in the system, <HOLD> . A message will notify you that all the alarmed panels in the system have been reset.

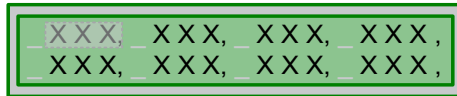
All alarmed panels
have been reset.



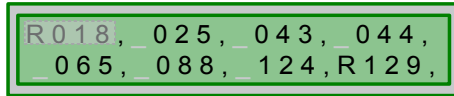
4.4.2 Single Panel Reset

When at the Single Panel Reset option, <PRESS>  to select it. Once this option is selected, it will give you a list of the alarmed panels (those that have an alarm status). Please note that there will only be a MAXIMUM OF 40 panels shown in this menu. If there are more than 40 alarmed panels, please refer to the local computer or server to obtain the information of the additional panels.

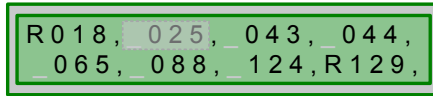
Once this mode is selected, the panel number of the alarmed panels will be listed on the page (max 8 per page). The currently highlighted panel will flash (in the example below the first alarmed panel -- top left -- would be flashing).



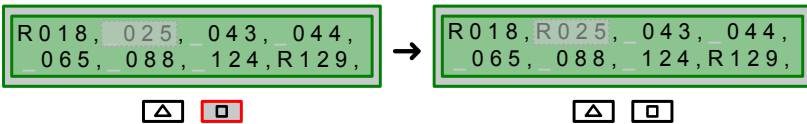
If the panel has been previously reset, it will have an 'R' prefix. See example below:



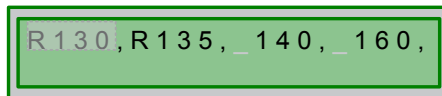
To select different panels on the same page, <PRESS> □.



If you would like to reset the alarm for the currently highlighted panel, please <HOLD> □.



If you would like to move from one page to another, please <PRESS> Δ.



At any time, <HOLD> Δ and you will return to the single panel reset page. <PRESS> Δ to scroll between single panel reset and system reset. <HOLD> Δ for 5 seconds when

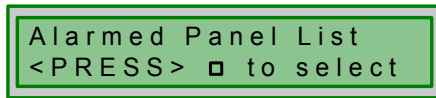
at the alarm reset sub-menu (Single Panel Reset and System Reset pages) to go back to the configuration menu (you will be at the Alarm Reset choice). **<PRESS> Δ** to cycle through the configuration choices (Internet Setup, Password Change, and RTC Setup). **<HOLD> Δ** for 5 seconds again to return to the main menu (with Panel by Panel view, System Configuration, and Alarmed Panel list menu choices). For quick escape to the main system overview page, **<HOLD> Δ** for 10 seconds.



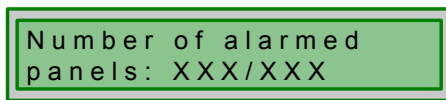
NOTE: After a panel has been reset, the panel will continue to have the ‘R’ prefix to denote that the panel has been reset before. It will not disappear until the panel no longer has an error and therefore is not in the list any longer. If the panel error has been corrected and the panel experiences an error once again, the panel will not have an ‘R’ prefix.

5 ALARMED PANEL LIST MODE

Please scroll to the Alarmed Panel List Option from the main menu (to scroll **<PRESS> Δ** at one of the main menu pages).



<PRESS> □ to select this option and view the number of alarmed panels (number of alarmed panels/total number of panels).

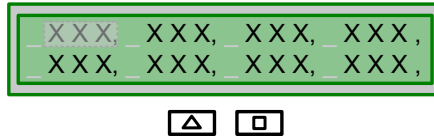


<PRESS> Δ to proceed and see the list of alarmed panels.

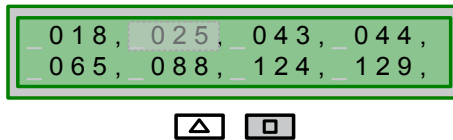


NOTE: There will only be a MAXIMUM OF 40 panels shown in this menu. If there are more than 40 alarmed panels, please refer to the local computer or server to obtain the information of the additional panels.

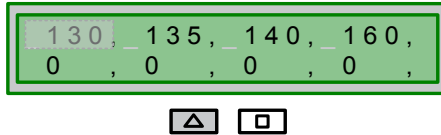
The panel number of the alarmed panels will be listed on the page (max 8 per page). The currently highlighted panel will flash (in the example below the first alarmed panel, top left, would be flashing).



The selected panel is the flashing panel (denoted by the grey box). To select different panels on the same page, <PRESS> □.

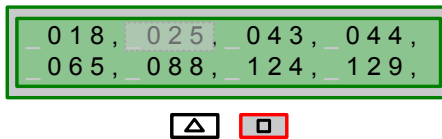


If you would like to move from one page to another, please <PRESS> Δ.



NOTE: The zeros are place holders so they do not represent any microinverters. They are, therefore, not selectable.

If you would like to view the panel information for the selected panel, please <HOLD> □.



Once the highlighted panel has been selected, <PRESS> Δ to progress from page 1 to 4 of the selected panel's information. The panel information is organized the same way as in the Panel by Panel View (see Section 3).

APPENDIX B: CONFIGURATION INTERFACE

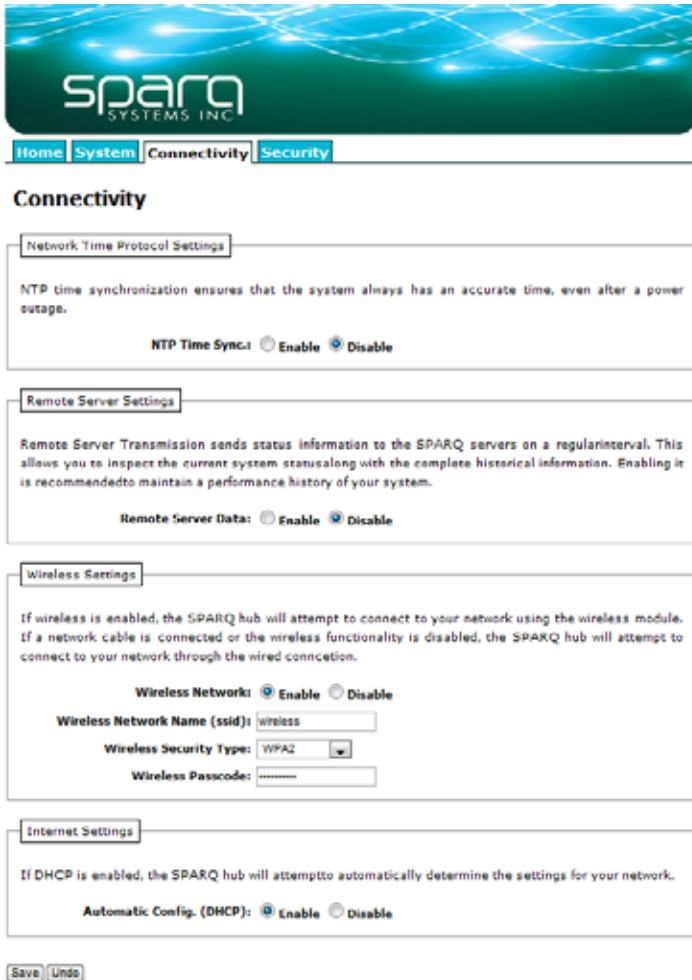
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1.3	Internet Settings	xxi
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1 CONNECTIVITY TAB

Within this tab, you can view and/or edit connectivity settings for the hub. The settings that can be changed are the following:

- Network Time Protocol
- Monitoring System
- Internet (wireless and wired settings)



The screenshot shows the SPARQ Configuration Interface with the 'Connectivity' tab selected. The interface includes a header with the SPARQ logo and navigation tabs for Home, System, Connectivity, and Security. Below the tabs, the 'Connectivity' section is displayed, containing four sub-sections: Network Time Protocol Settings, Remote Server Settings, Wireless Settings, and Internet Settings. Each sub-section has a title bar, a descriptive paragraph, and radio button controls for enabling or disabling the feature. At the bottom of the interface are 'Save' and 'Undo' buttons.

Connectivity

Network Time Protocol Settings

NTP time synchronization ensures that the system always has an accurate time, even after a power outage.

NTP Time Sync: Enable Disable

Remote Server Settings

Remote Server Transmission sends status information to the SPARQ servers on a regular interval. This allows you to inspect the current system status along with the complete historical information. Enabling it is recommended to maintain a performance history of your system.

Remote Server Data: Enable Disable

Wireless Settings

If wireless is enabled, the SPARQ hub will attempt to connect to your network using the wireless module. If a network cable is connected or the wireless functionality is disabled, the SPARQ hub will attempt to connect to your network through the wired connection.

Wireless Network: Enable Disable

Wireless Network Name (ssid):

Wireless Security Type:

Wireless Passcode:

Internet Settings

If DHCP is enabled, the SPARQ hub will attempt to automatically determine the settings for your network.

Automatic Config. (DHCP): Enable Disable

1.1 Network Time Protocol Settings

By default, the Network Time Protocol (NTP) synchronization feature is disabled. If you wish to enable, please select “enable” and you can specify the interval at which the system synchronizes itself with the specified NTP server. You can choose from various NTP servers from the drop-down menu. In order to save changes made, please click the “save” button at the bottom of the page.

Network Time Protocol Settings

NTP time synchronization ensures that the system always has an accurate time, even after a power outage.

NTP Time Sync.: Enable Disable

Update Interval:

NTP Server:

1.2 Monitoring System Settings

By default, the Remote Server (Monitoring System) feature is enabled to send panel performance data to the monitoring system for monitoring and analysis. The monitoring system (the remote server) address and settings are set by default. If you do not wish to send any data to the monitoring system, then please select “disable”. In order to save changes made, please click the “save” button at the bottom of the page.



WARNING: Changes to the monitoring system IP address and port may cause communication errors between the hub and the monitoring system.

Remote Server Settings

Enabling the Remote Server Transmission will send status information to the SPARQ servers on a regular interval. This allows you to inspect the current system status along with a complete historical information. This is recommended to maintain a performance history of your system.

Remote Server Data: Enable Disable

Update Interval:

IP Address:

Port:

1.3 Internet Settings

By default, the internet is automatically configured (DHCP). To manually edit the internet settings, please select “disable” and the IP Address, Subnet Mask, Gateway, Primary DNS, and Secondary DNS will be editable. In order to save changes made, please click the “save” button at the bottom of the page.

Internet Settings

If DHCP is enabled, the SPARQ hub will attempt to automatically determine the settings for your network. It is highly recommended that this is enabled. If the hub is unable to automatically determine your network settings, it will use the information below.

Automatic Config. (DHCP): Enable Disable

IP Address:

Subnet Mask:

Gateway:

Primary DNS:

Secondary DNS:

1.4 Wireless Settings

By default, the wireless module will be disabled. To configure the wireless settings, please click the “enable” dialog box. When the “enable” dialog box is selected, you can edit the wireless network name (SSID), wireless security type, and the wireless passcode.

Wireless Settings

If wireless is enabled, the SPARQ hub will attempt to connect to your network using the wireless module. If a network cable is connected or the wireless functionality is disabled, the SPARQ hub will attempt to connect to your network through the wired connection.

Wireless Network: Enable Disable

Wireless Network Name (ssid):

Wireless Security Type:

Wireless Passcode:

2 SECURITY TAB

Within the Security Tab, you can change the password for HTTP Authentication and FTP Authentication. HTTP Authentication is the password to access the configuration interface, and the FTP password is used to access the local FTP server. In order to change the HTTP or FTP password, you must enter the current password for authentication and click the 'change' button.



NOTE: The default username is 'admin' and the default password is 'password' for both HTTP and FTP Authentication



The screenshot shows the SPARQ SYSTEMS INC logo at the top. Below it is a navigation bar with tabs for Home, System, Connectivity, and Security. The Security tab is selected. The main heading is "Security". There are two sections: "HTTP Authentication" and "FTP Authentication". Each section contains a description, two password input fields, and "Change" and "Undo" buttons.

HTTP Authentication

Change the password for the local web interface. Default user is "admin".

Enter your new password:

Retype your new password:

FTP Authentication

Change the password for the local ftp server. Default user is "admin".

Enter your new password:

Retype your new password:

APPENDIX C: MONITORING SYSTEM

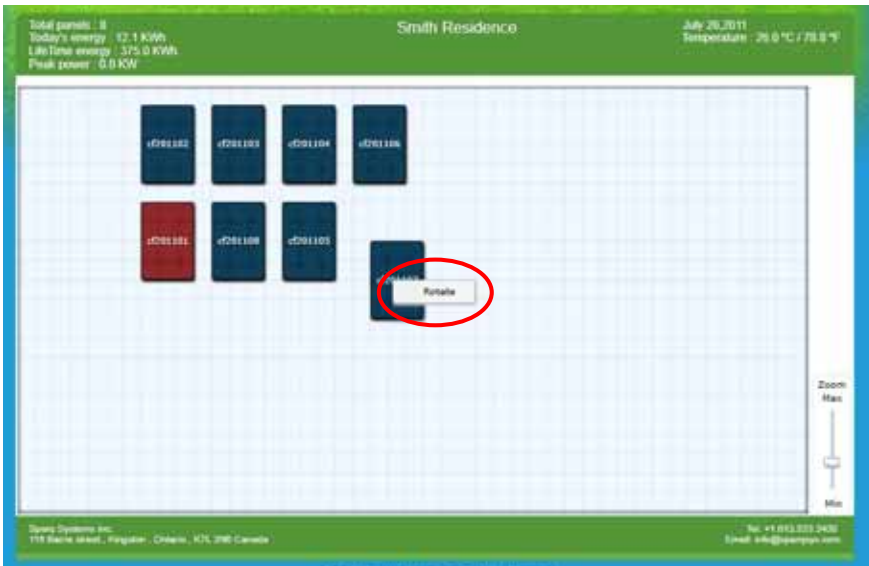
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3	Panel Home	xxvii
4	Harvested Energy.....	xxix
5	Average Daily Power	xxxi
6	Environmental Benefits.....	xxxiii
7	Alarms.....	xxxiv

1 PANEL LAYOUT

The “Panel Layout” page allows you to move or change the layout configuration of the panel icons in the monitoring system to “mirror” the physical layout of the actual solar panels of your system. To access this function, please navigate to: System>Panel>Layout.

To move the panels, simply click and drag a panel to the desired location. The panels will automatically ‘snap’ to the grid in the background. To rotate the panels, right-click onto a panel and select “rotate”. To zoom in and zoom out of the panel layout area, there is a zoom control slider on the right side of the panel layout area.



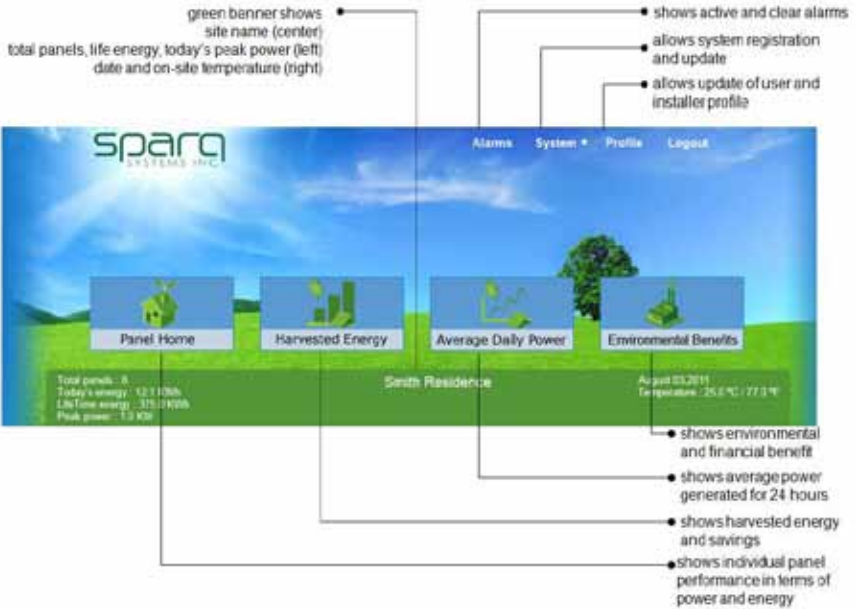
2 BASIC NAVIGATION

When you first log into the SPARQ web monitoring system, the “Panel Home” tab will be selected (as shown below). The web monitoring system is made up of two menus:

1. **System Information Menu:** it consists of four main tabs (from left to right): Panel Home; Harvested Energy; Average Daily Power; and Environmental Benefits. The selected tab will be larger and the label will turn blue (text will be white). To switch between tabs, simply click the desired tab. A brief description of each tab is provided below:
 - Panel Home: a system overview that shows the energy generated by each panel, and shows the layout of your panels.
 - Harvested Energy: shows a bar graph illustrating the amount of energy generated by your installed solar system.
 - Average Daily Power: shows a plot of the average power generated by your installed solar system.
 - Environmental Benefits: shows the amount of energy generated (over the system’s lifetime), carbon dioxide offset, and financial savings.

2. **Configuration and Alarm Menu Bar:** It is located on the top right-hand corner of the web page, and there are four options: Alarms; System; Profile; Logout. A brief description of each option is provided below:
 - Alarms: shows the installed system’s active alarms and alarm history.
 - System: view/edit registration information regarding the site, hub, and installed solar panels. The solar panel layout can also be viewed and edited.
 - Profile: view/edit user profile.
 - Logout: secure logout from the monitoring system.

Another main component of the web monitoring system is the system overview banner. The system overview banner is the green section below the System Information Menu tabs. It displays general information regarding the system: total number of panels; today’s generated energy; lifetime generated energy; today’s peak power; name of site; today’s date; and the site’s current temperature.



3 PANEL HOME

Within the “Panel Home” tab, you can view the system’s performance at a glance. The panels in the system are shown color-coded and can be arranged to mirror the site’s panel layout. To change the panel layout, please refer to the Panel Layout section (page i). A red panel represents an alarmed pane; to view alarm information please refer to the Alarms section (page xxxv). A blue panel represents a working panel and different shades of blue represent the amount of energy produced (see the generated energy legend beside the panel layout area).

Underneath the generated energy legend is the zoom control for the panel layout area. Please click and drag the slider up towards the ‘+’ to zoom in and drag the slider down to zoom out.

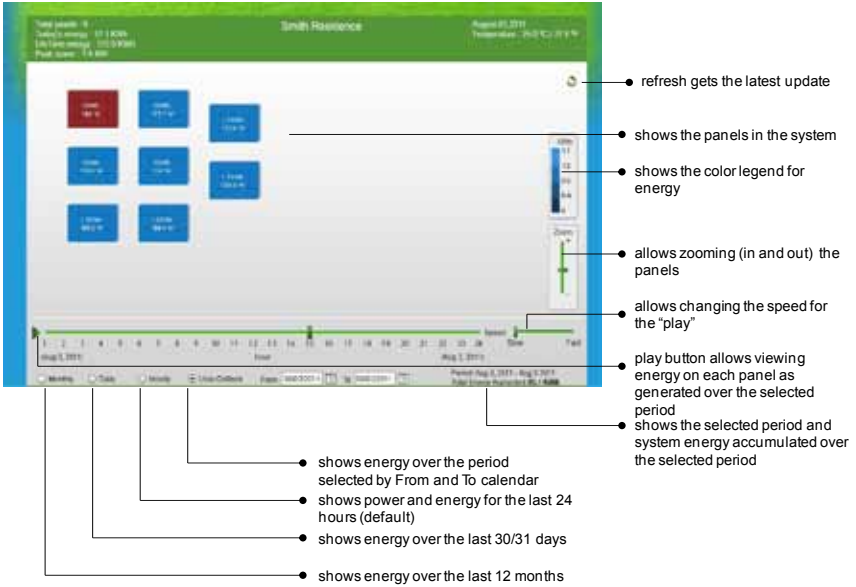
Below the panel layout area is the animation control. This allows you to view the performance of the system over any time scale: monthly; daily; hourly; and a custom user-defined period.

- The **monthly** view shows the average energy generated by each panel over each month for the past year.
- The **daily** view shows the average daily energy generated by each panel for the past 30 days.
- The **hourly** view shows the average hourly energy generated by each panel for the past 24 hours.

Click the desired time scale and press the triangular play button on the leftmost side of the animation control slider to view an animation of the panels’ performance. There is a speed slider on the righthand side, to adjust the animation speed.

Below the animation speed control you will find text describing the total amount of energy generated over a specified time period, depending on the selected time scale.

- If **monthly** is selected: the total amount of energy generated over the past 12 months is shown.
- If **daily** is selected: the total amount of energy generated over the past 30 days is shown.
- If **hourly** is selected: the total amount of energy generated over the past 24 hours is shown.
- If **user defined** is selected: the total amount of energy generated over the user defined time period is shown.



4 HARVESTED ENERGY

The “Harvested Energy” tab graphically illustrates the amount of energy harvested by the installed solar panels over a specified time. The time scale choices can be found below the graph and there are four different choices: Monthly; Daily; Hourly; and a custom User Defined period.

- **Monthly:** The graph shows the accumulated energy over the past 12 months. Place the cursor over each data point to reveal an informational pop-up box. The pop-up box shows both the harvested energy and savings in each month followed by the accumulated energy and savings up to the point starting from the first month in the view.
- **Daily:** The graph shows the daily accumulated energy over the past 30 days. Place the cursor over each data point to reveal an informational pop-up box. The pop-up box shows both the harvested energy and savings each day followed by the accumulated energy and savings up to the point starting from the first day in the view.
- **Hourly:** The graph shows the hourly accumulated energy over the past 24 hours. Place the cursor over each data point to reveal an informational pop-up box. The pop-up box shows both the harvested energy and savings each hour, followed by the accumulated energy and savings up to the point starting from the hour in the view.
- **User Defined:** The graph shows the accumulated energy over a user-defined period (the time scale will vary depending on the length of the defined time period). Place the cursor over each data point to reveal an informational pop-up box. The pop-up box shows both the monthly/daily/hourly (depending on the user-defined period) harvested energy and savings followed by the accumulated energy and savings up to the point starting from the first date/hour in the view.



refresh button gets latest update

tooltip shows energy accumulated since last hour followed by total energy accumulated since the first hour in the view

- shows accumulated energy over the period selected by From and To calendar
- shows accumulated energy for past 24 hours (default)
- shows accumulated energy for past 30/31 days
- shows accumulated energy for past 12 months

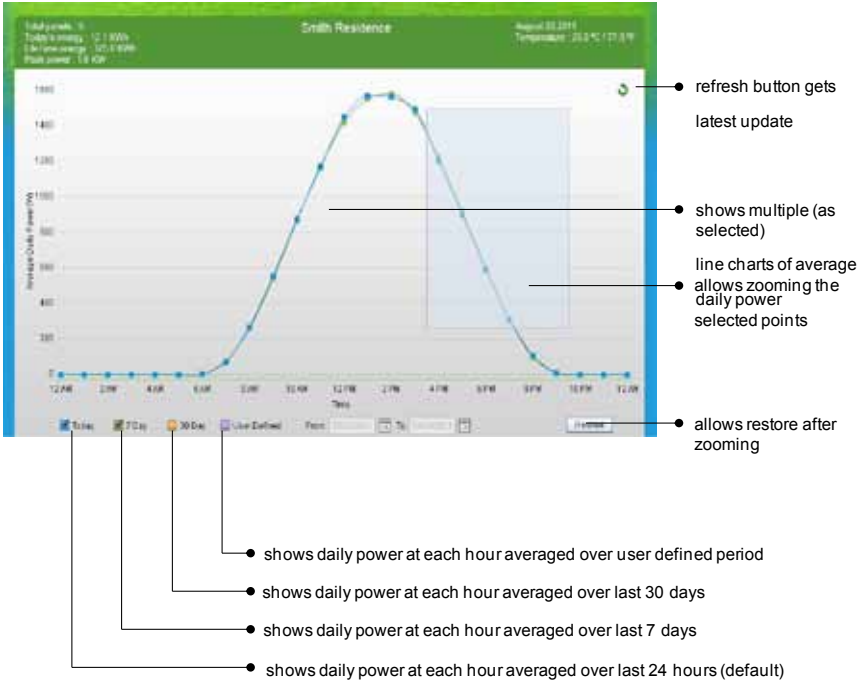
5 AVERAGE DAILY POWER

The graph in the “Average Daily Power” tab illustrates how much power is generated over a 24-hour period. There are four different averaging option found below the graph: “Today”; “7 Day”; “30 Day”; and “User Defined”.

- **Today:** The average hourly power generated by the panels over the current day is plotted.
- **7 Day:** Power at each hour averaged over past 7 days is plotted
- **30 Day:** Power at each hour averaged over past 30 days is plotted
- **User Defined:** Power at each hour averaged over the user-defined period is plotted.

You can view multiple graphs simultaneously; the screenshot below shows both the current day and 30-day average power graph.

You can also zoom into any part of the graph by clicking and dragging the selection box around the desired area (as seen in two of the following screenshots). Click the “Restore” button to exit out of the zoom view.



6 ENVIRONMENTAL BENEFITS

The “Environmental Benefits” tab illustrates the environmental equivalencies of the energy harvested by the installed solar system. It also shows the amount of money saved by harvesting solar energy. The calculation for “Savings” is done based on the cost per kilowatt hour of the harvested energy that may optionally include any subsidy provided by the local utility. This cost is provided by the site owner or installer during the registration process and can be updated later as described in the Site Registration Section.

$$\text{Savings} = (\text{Energy Harvested}) * (\text{Energy Cost})$$



7 ALARMS

The “Alarms” page allows you to view the system’s active alarms and alarm history. The entries are color-coded and the color scheme is provided in the legend on the bottom left-hand side of the screen. There are scroll buttons on the bottom of the screen to quickly move between pages of the alarm logs.

SPARQ SYSTEMS INC. Alarms System Profile Logout

Panel Home Harvested Energy Average Daily Power Environmental Benefits

Total panels: 8
Today's energy: 12.1 kWh
Life Time energy: 376.0 kWh
Peak power: 1.6 kW

Smith Residence August 03, 2011
Temperature: 25.3 °C / 77.6 °F

Alarms	Panel ID	Description	Date and Time
Active Alarms	f001100	Subopt COP (Over current protection)	02 Jun 11 8:42 PM
Alarm History			

SPARQ SYSTEMS INC. Alarms System Profile Logout

Panel Home Harvested Energy Average Daily Power Environmental Benefits

Total panels: 8
Today's energy: 12.1 kWh
Life Time energy: 376.0 kWh
Peak power: 1.6 kW

Smith Residence August 03, 2011
Temperature: 25.3 °C / 77.6 °F

Alarms	Panel ID	Description	Date and Time	Closed Date and Time
Active Alarms	f001106	Sleep mode	02 Aug 11 11:05 PM	03 Aug 11 04:13 AM
Alarm History	f001007	Sleep mode	02 Aug 11 11:00 PM	03 Aug 11 04:13 AM
	f001006	Sleep mode	02 Aug 11 11:00 PM	02 Aug 11 04:13 AM

The alarms are classified by a color code and are described as follows: Red – critical error; Yellow – an error that can be automatically resolved; and Green – normal operation. The following table explains all the possible alarms that can occur.

Alarm Description	Color Code	What to do
Input OCP (over current protection)	Yellow	Wait for 24 hours to allow system to correct itself. If problem persists for more than 24 hours, contact technical support at support@sparqsys.com
Output OCP (over current protection)	Yellow	
Input OVP (over voltage protection)	Yellow	
Input UVP (under voltage protection)	Yellow	
Output UVP (under voltage protection)	Yellow	
OFP (over frequency protection)	Yellow	
OTP (over temperature protection)	Yellow	
UBV(under bus voltage)	Yellow	
5-minute timer started	Yellow	
Output OVP (over voltage protection)	Red	
UFP (under frequency protection)	Red	
Islanding	Red	
OBV(over bus voltage)	Red	
Panel/Microinverter failure	Red	
Sleep Mode (Communication Hub)	Green	Normal operation
Inverter status down	Green	Normal operation
Panel not responding	Red	During the night or during bad weather, this is normal. However, if this error persists during a normal sunny day, then there is likely a communication problem between the microinverter and the hub. Try relocating the hub closer to the microinverter’s power entry point. If relocating the hub does not solve the problem, contact technical support at support@sparqsys.com
Comm. Link Weak	Red	

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