SolarVu® AE500TX Inverter Installation Guide

Site Preparation

SolarVu® is an energy portal that provides remote monitoring of solar PV renewable energy generation sites over the web. It requires the installation of an M504 gateway (datalogger) which continuously transfers data from the inverter(s) to the SolarVu servers. This guide explains how to connect the M504 gateway to an AE500TX inverter using ModBus RTU RS485 serial communications which is a standard feature of this inverter. The M504 gateway connects to one or more inverters using twisted pair wire, typically cat5e, daisy chained for multiple inverters. A persistent internet connection is required either by connection to an RJ45 ethernet jack connected to the building LAN or by installing the optional 3G cellular modem in the SolarVu enclosure. A source of 120VAC must be available to power the SolarVu equipment. The LAN must have high speed internet service to an ISP to provide a connection to the internet as shown in figure 1.

SolarVu Enclosure Installation

Before starting, review the drawings and instructions in the document pouch on the SolarVu enclosure door. The multiport 504-485 comms board should be connected correctly according to the SLD (single line drawing) provided. Use the SLD for specific terminal connections for this project with this guide for general instructions. Mount the SolarVu enclosure with conduit to the inverter for the RS485 serial cable, ethernet cat5e cable to the building LAN (unless 3G cellular is installed) and 120VAC control power as shown in fig 2. Normally the SolarVu enclosure will be mounted in the same electrical room as the inverter. However, the RS485 serial cable can run long distances, over 1000 feet, if necessary.

Power Supply: Wire 120VAC control power from a suitable 15A circuit to the circuit breaker, N and G terminals.

RS485 Serial: Consult the AE500TX installation manual chapter 6 Data Monitoring Modbus RTU-RS485 for instructions on connecting the serial wires to the inverter. Route the twisted pair cable away from power conductors into the inverter low voltage communications compartment to the terminals marked + - shield as shown in fig 3. Connect the other end of the twisted pair cable in the SolarVu enclosure to the 504-485 comm board terminals. Shielded twisted pair wire is preferred for noise immunity but standard Cat5e, 8 wire, UTP, #24 cable may also work. If more than one inverter is to be monitored, daisy chain from the first inverter to the second etc. Do not connect in star configuration.

Ethernet: Plug an ethernet patch cable from the SolarVu enclosure to the building LAN jack

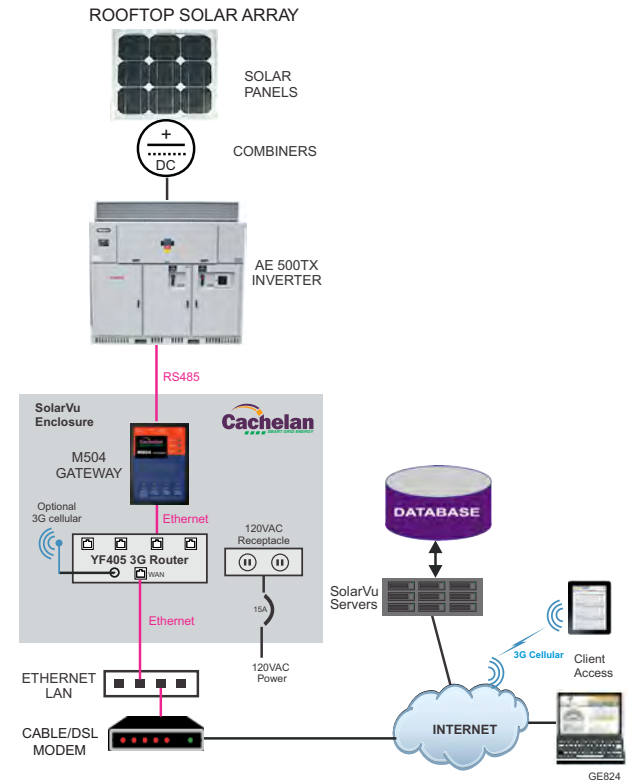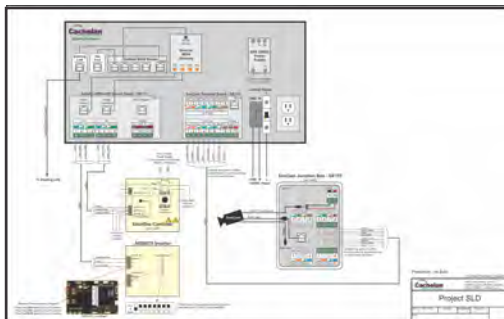*Fig 1 Internet Connection*

Fig 2 SolarVu Enclosure components and connection

Use the project SLD drawing in doc pouch for terminal connections and slave address assignment.

Consult AE500TX manual chapter 6 for communications connections and address programming.
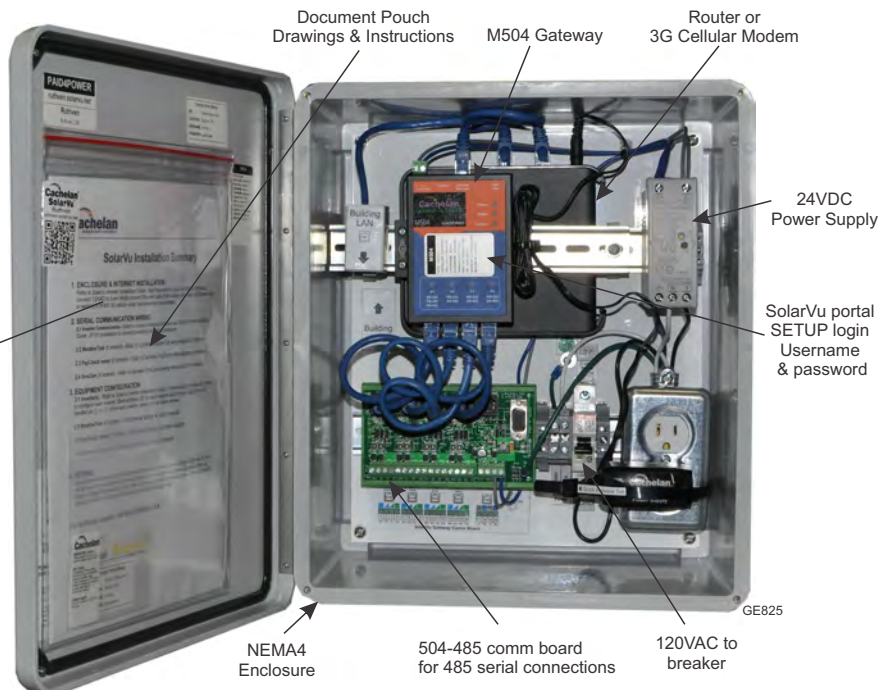
Fig 3 Communiction wiring between SoalrVu and the AE500TX inverter

Communication Configuration

The AE500TX inverter is normally connected to Port 1 of the M504-485 comm board with the other 3 ports used for options. These must match the assignment configured in the M504 gateway as shown in the SLD drawing for this project. After wiring, program the slave address DIP switches in the AE500TX to match the address value shown in the SLD. Usually the slave ID =1. Switch 8 must be set off for 9600 baud. Biasing should be set off LOW=off, HIGH=off on the AE500 board with termination on LINE=on for the last inverter in the daisy chain or if only one inverter. Otherwise set LINE=off. Biasing and termination is usually set on for the M504-485 Comm board as shown in fig 4.
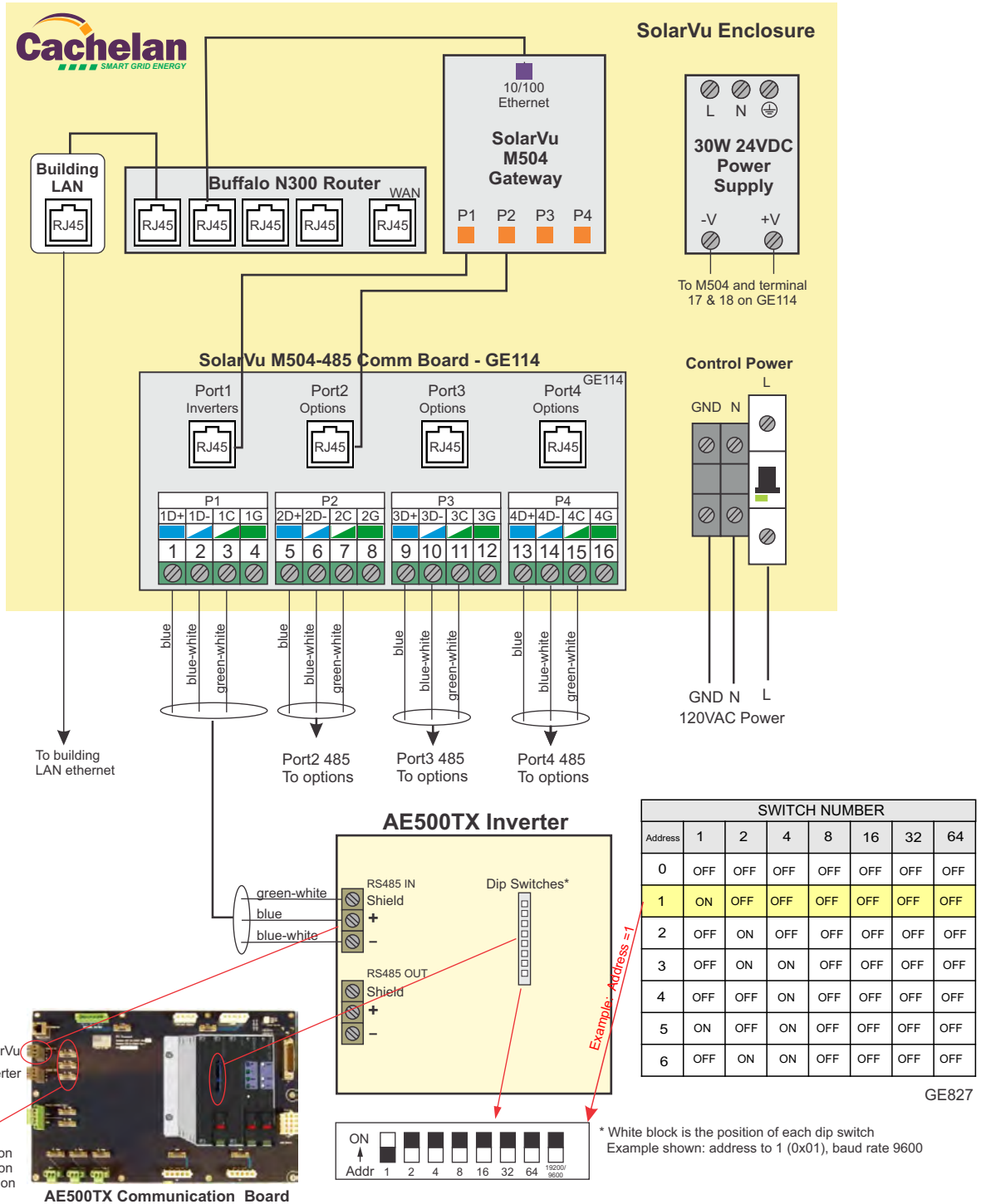

		SWITCH NUMBER						
Address	1	2	4	8	16	32	64
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF
3	OFF	ON	ON	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF

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* White block is the position of each dip switch
  Example shown: address to 1 (0x01), baud rate 9600

AE500TX Communication Board

Modbus Communication Jumpers for termination on and bias off**
Place the **LOW switch in the off position
Place the **LINE** switch in the on position
Place the **HIGH** switch in the off position

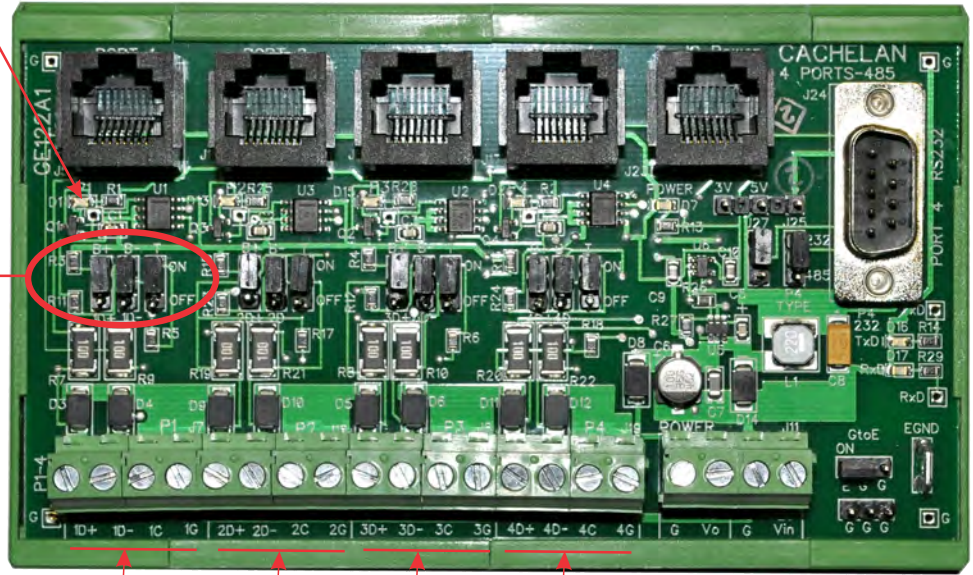Blue data LED flashes when transmitting and receiving data from the inverter.

504-485 Comm Board

JUMPER SETTINGS
Terminator Resistor + Biasing

B+ Bias high = ON
B- Bias low = ON
T 120R termination = ON

B+   **B-**   **T**

ON

OFF

Inverter is normally connected to PORT1.
See SLD drawing in doc pouch for details

PORT1   **PORT2**   **PORT3**   **PORT4**

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485 serial communication ports

Network Setup

On power up, the M504 gateway looks for a DHCP server to provide it a dynamic IP address. If a PC connected to the network can automatically connect to the internet through a browser then the network is already configured to accept the M504.   If a dedicated IP address was programmed instead, subnet mask and DNS server address are required. This needs to be entered into the M504 before shipment. Network configuration is shown on the M504 label and the Configuration Settings page in the doc pouch.   Once the M504 receives its IP address it acts as a client. It will automatically try to connect to the SolarVu server and begin transferring data from the inverter to the server.

Fig 5 M504 indicators

IP & login settings are on the M504 label

M504

SITE
INSTALLER
URL   .solarvu.net
USERNAME
PASSWORD
Network DHCP - Auto
MAC 00-13-48-01-F9-2C
SN A9584-00019
SLAVE ID
p1:1(meter)2(AE),p4:1(Weat herTrak)
MFG DATE Jun 2015

INDICATOR STATUS		
LED	**NORMAL**	**STATUS**
Power	🟢	OFF-no power ON-power OK
Ready	🟢	ON M504 booted up and running
Link/Act	🟢	OFF-no ethernet connection FLASH- data traffic activity
P1	🟠🟢	Serial Port 1 usually inverter Transmit=orange, Receive=green, flashing
P2	🟠🟢	Serial Port 2 usually option Transmit=orange, Receive=green, flashing
P3	🟠🟢	Serial Port 3 usually option Transmit=orange, Receive=green, flashing
P4	🟠🟢	Serial Port 4 usually option Transmit=orange, Receive=green, flashing

TROUBLESHOOTING CHECKLIST	
IP Address	Obtain IP by DHCP or set static IP Network must be configured to same settings
Serial	Check inverter connected to correct port. Polarity of serial twisted pair wires. Serial ID entered correctly in each inverter
Inverter	Powered on. Serial ID has been set to match SLD drawing. Serial wiring correct.
Internet	Internet connection for ISP to LAN working
Support	For Cachelan technical support 905.470.8400 x224 contactus@cachelan.com

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Testing

Ensure the inverter and M504 are powered on, the ethernet cable is plugged into a network jack and the RS485 cable is connected between SolarVu and the inverter. The M504 Power and Ready lights should be on if the power supply is plugged in. The Link/Act LED will periodically flash showing network activity. Assuming the inverter is connected to Port 1, P1 serial data LED will flash on the M504 and the blue Port1 LED will flash on the 504-485 comm board to indicate data activity.

Internet Connection

Power on the M504 and allow at least 2 minutes for communication to be established. From any internet connected computer, open the browser and type in the SolarVu site address found on the M504 label.

Once the SolarVu portal is accessed from a browser, the opening screen is the SITE view shown in fig 6. Click the ANALYZER tab then Inverter Status from the pull down box (fig 7). If there is a internet connection from the site, the Last Communication light will be green. The M504 gateway does not need to be connected to the inverter for this light to be green. If this indicator is red, it indicates no internet connection has been established. In this case, check internet connections at the site by trying to browse the internet at the site with a PC connected to the network.

If the M504 gateway is successfully collecting data from the inverter, the Last Data Updated indicator will be green and inverter data will appear in the Inverter Status screen. If this indicator is red but the Last Communication indicator is green, check the serial connection to the inverter and that the inverter is operating. When both lights are green the gages on the SITE and LIVE screens will display live data and graphs will begin recording site energy output.

Video Tour

For an overview of available features, visit www.cachelan.com and play the What is SolarVu video. Each screen has a HELP button that explains how the features work for that screen. An online help guide is also available for printing under SETUP > Download > Documents > Printed Help shown in fig 9. Login with the username and password on the M504 label or from the configuration settings sheet to access SETUP screens.

Site Screen

For a summary of information about the site, click the SITE menu tab (fig 6). On the upper left, the current charging status of the solar panels, total power being generated now and in the last 30 days is displayed. Underneath, the carbon footprint of energy equivalents is displayed since startup. Links to other websites can be left as defaults or changed in SETUP to personal preferences. The local weather is preset. Email contactus@cachelan.com to have it changed. For viewing on a widescreen TV suitable for display in a public place, click the WIDE PAGE button (fig 10). On the right is a slide show for public viewing. Content can be personalized using uploaded graphics in SETUP.

Fig 7 Check ANALYZER > Inverter Status to see data received from the inverter

Fig 8 Watch the What is SolarVu? video for a tour of SolarVu screens and features

Fig 9 Use the HELP button on each screen for information about that screen or access a Help guide
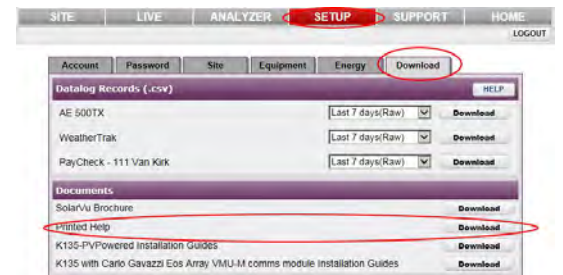

Fig 10 Click the Wide Page button to reformat the SITE screen for an HDTV lobby display

Fig 6 Site screen shows site overview, photos, weather and user programmable links to other webpages

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Live Data

Click the LIVE tab to display current power being generated for the whole site. Actual power and energy generated today are shown on the meter dial shown in fig 11. For a system operating normally, the status indicator should be green with the last update time less than 15 minutes ago. Lifetime energy and revenue are shown digitally. For correct revenue display, the sell price per kWh must be entered in SETUP. If connection to the site is lost, or if an alarm is detected, the status indicator will be red. Click the Listen button with sound on for more information.

Trends are shown for the lifetime of the system using the graphs on the right. Select either an Energy, Revenue or Savings using the button. Click the desired time period above the graph or select any interval with the Range button. Data is stored for the life of the system. Scroll over a bar or data point with your mouse for a popup box with more detailed information about that period. The CO_2 carbon footprint selection gives energy equivalents for the solar power generated over the selected time period.

Analyzer - Troubleshooting

When problems occur with the system or to check inverter operation, click the ANALYZER tab and select Inverter Status in the pull down box. Each inverter connected to the system with a M504 gateway will have its own display panel showing actual values sent. Remotely located technical personnel can assist in interpreting what the values are conveying. If no communication has been received from the device for more than 2 hours a No Data Available message will be shown with a red warning indicator.

For detailed analysis, select the ANALYZER > Equipment Log (fig 13) to see all inverter readings for the last 30 days. Watch the Equipment Log video by clicking the HELP-video icon for more details on how to use this powerful feature. For further analysis download all readings for the time period of interest into a spreadsheet using SETUP > Download.

A reliable internet connection is essential for SolarVu to collect and display data. If the internet is intermittent or not available, a communications warning alarm will be displayed. Use the ANALYZER - Communications screen to study the hourly connection status (fig 14). red squares indicate dropout which may be due to poor 3G cellular connection requiring antenna orientation or a bad land line connection. Contact your service provider for assistance if the condition persists.

Depending on which options are installed, additional tools may be accessible in the ANALYZER pull down box. These include SnoCam, WeatherTrak, PayCheck and SmartStrings. For each option, click the HELP button found on the option screen for more details. Option descriptions and additional instructional videos are available from the cachelan.com website. When returning to the ANALYZER, the screen displayed will be the last one selected on exit.

Analyzer - Performance

Click the ANALYZER tab and select a performance tool from the pull down box. Verify that the system reaches its designed output on sunny days in the Top 10 Days view. The carbon footprint will compute the energy equivalents to the solar energy generated over the selected time period. This helps visitors get a practical feel for the environmental impact. To find the carbon equivalent for an arbitrary energy value, override the actual solar amount by entering a kWh amount and selecting a category, then click the Calculator button. The Payback calculator is useful for determining return on investment.

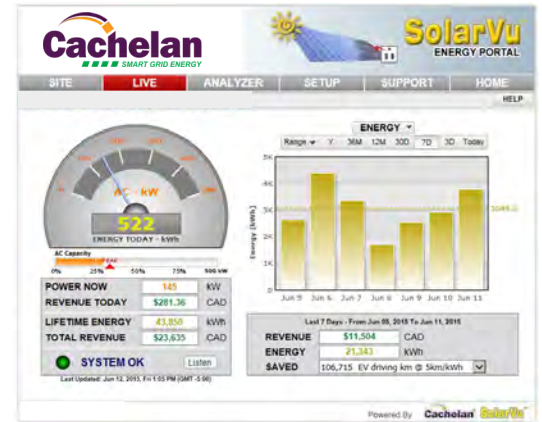Fig 11 View power and energy now or output for any time period on the LIVE screen

Fig 12 Watch the Equipment Log video from the Help video icon to see how to use this powerful

Fig 13 Log shows all inverter readings for last 30 days with record of fault messages for diagnosing problems

Fig 15 Top 10 Days and Carbon Footprint ANALYZER performance screens

Fig 14 Detect intermittent internet connection from weak cellular or down land lines with the 30 day Communication
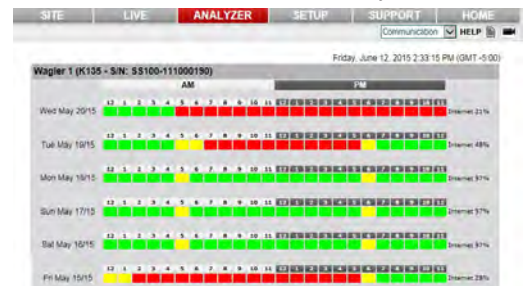
Setup

Each SolarVu portal is pre-configured with factory settings based on information provided at the time of purchase. You can modify preferences, settings, add a slideshow, link to other websites, set email recipients for alarms and reports etc. To configure your site, click the SETUP tab. Enter your unique username and password from the account label found on the M504 gateway and the configuration settings sheet in the SolarVu enclosure doc pouch (fig 16).

For revenue and payback calculators to work properly, correct parameters for energy sell rate, capacity, average insolation etc should be entered. Enter the email address for each individual that wants to receive alarm notifications and a daily output report. This report will include energy and revenues for different time periods and indicate if there are any alarms.

In the Password tab, include an email address to receive the Setup login password from the Forgot your password? link if this is forgotten. The SETUP > Equipment tab is for factory use. For further analysis, individual energy readings for any time period can be downloaded into a spreadsheet from the DOWNLOAD section.

Click the Help button in each section for a description of the effect for each entry. All
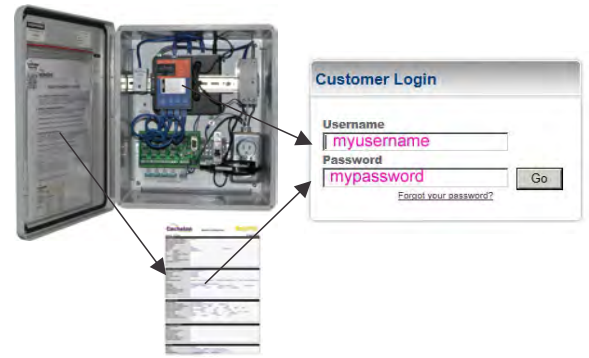

Fig 16 Login to SETUP to change settings

Fig 17 Change system configuraiton parameters and settings by logging in to SETUP

Download data for spreadsheet analysis

Print QR code label for scanning from a smartphone to link to the site

Screens for other setup parameters

Description of equipment for SITE screen "About Site" popup

Enter paramenters like Sell rate, capacity ratings, annual insolation for correct display of revenue and payback

Enter email addresses to receive alarms and output reports

Support

See the What is SolarVu? video at www.solarvu.net for a feature overview. Each screen has a HELP button with details for the items on that view. A printable HELP guide can be downloaded in SETUP > Download.

Before leaving the site after commissioning, if assistance is needed, contact Cachelan technical support at 905.470.8400 x224 in Toronto. Send emails to contactus@cachelan.com.

Cachelan Technical Support
contactus@cachelan.com
905.470.8400 x228

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