

SolarEdge 10000A-US Inverter SolarVu® Installation Guide

Introduction

SolarVu™ is an energy portal that enables remote monitoring of renewable energy generation sites over the internet. It requires the installation of a gateway which continuously transfers data from the inverters to the remote SolarVu servers. This guide explains how to connect the gateway to SolarEdge SE3000A-US to SE11400A-US inverters using RS485 serial connection with SunSpec protocol. Several steps are required:

- 1) Connect the gateway to the inverters
 - 2) Connect the gateway to the building LAN for internet access
 - 3) Enter the communications settings into each inverter
 - 4) Access SolarVu from a browser and configure the energy portal
- Consult the SolarEdge inverter installation guide and SolarEdge Communications Options application guide for additional details.

Site Preparation

To access SolarVu from a browser, the inverters communicate serially over RS485 with a Cachelan gateway connected to the site network as shown in fig 1. Each inverter comes with a RS485 serial interface as a standard feature. The gateway connects to the inverters over RS485 using twisted pair wire, typically using Cat5e cables, daisy chained for multiple inverters. The LAN must have high speed internet service to an ISP to provide access to the internet. The gateway RJ45 ethernet jack plugs into an RJ45 LAN jack connected to the building router using a standard Cat5e patch cable. Alternatively, SolarVu can be ordered with a 3G cellular modem for wireless internet connection. A source of 120VAC for control power needs to be connected to the SolarVu enclosure.

Gateway Installation

Mount the SolarVu enclosure containing the gateway in a suitable location, typically in the electrical room near the inverters. The NEMA4 enclosure can also be mounted outdoors if preferred. The RS485 serial cable can run long distances, over 1000 feet, if necessary.

Gateway Wiring: Consult the project wiring diagram in the document pouch to determine which type of gateway is being connected to the inverters, SolarVu K135, SolarVu M504 or SolarEdge SE. Then select the appropriate wiring diagram from figures 4, 5, 6 to match the installed gateway.

Power Supply: Source the 120VAC supply from a 15 amp breaker electrical circuit suitable for control power and connect to the labelled Live, Neutral and Ground terminals (fig 3). For some configurations, if wiring directly to the outlet box, refasten the reusable dongle tie wrap after wiring to prevent it becoming loose over time as shown in fig 2.

RS485 Serial: Connect the RS485 serial cat5e cable to the gateway terminals board as shown in fig 3-6 being careful to match the correct wire colours to the terminals. Recommended cable type is Cat5e, 8 wire, UTP, #24 solid. Twisted pair must be used for the RS485 serial data wires. Use a tie wrap to provide strain relief for the cat5e cable. Connect the other end of the serial cable to the first inverter as shown in fig 4-5. Over 1000 feet of wire can be used for reliable serial communications. If the SE gateway is used, connect the SolarVu gateway to the SE gateway RS485-2 port as shown in fig 6.

Ethernet: Use a standard ethernet patch cable with RJ45 plug on each end of the appropriate length to connect from the RJ45 ethernet jack on the gateway to the network ethernet at a RJ45 wall jack or router/switch. The network router must be configured to match the gateway IP settings. This is usually auto IP assignment using DHCP for small sites but a larger commercial organization may require static IP settings specified by the IT system administrator. This should be specified at time of order. Settings as shipped can be verified from the SolarVu configuration sheet included in the enclosure document pouch. Alternatively, SolarVu can be ordered with a 3G cellular modem/router installed for wireless connection. This requires

Fig 1 Internet connection

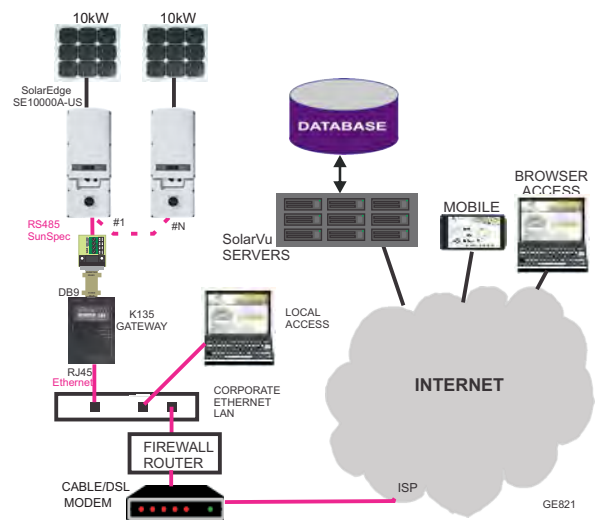


Fig 2 SolarVu enclosure wiring for K135 gateway

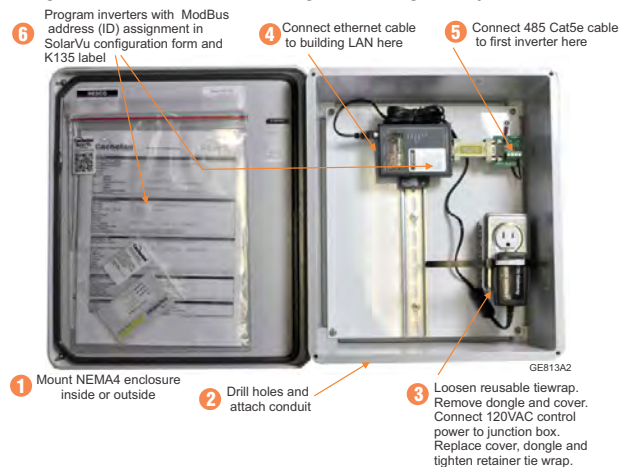
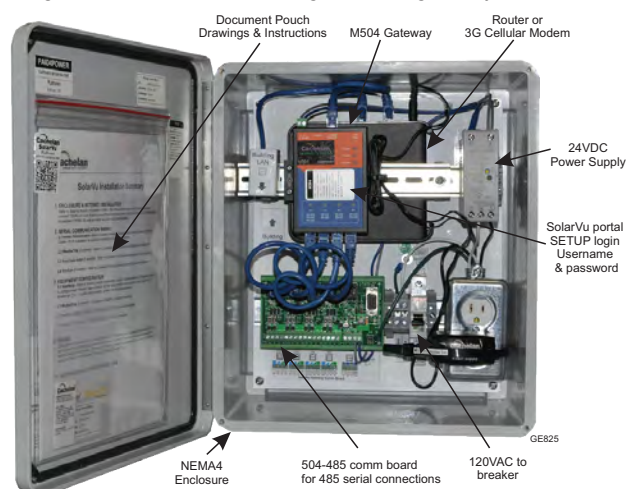


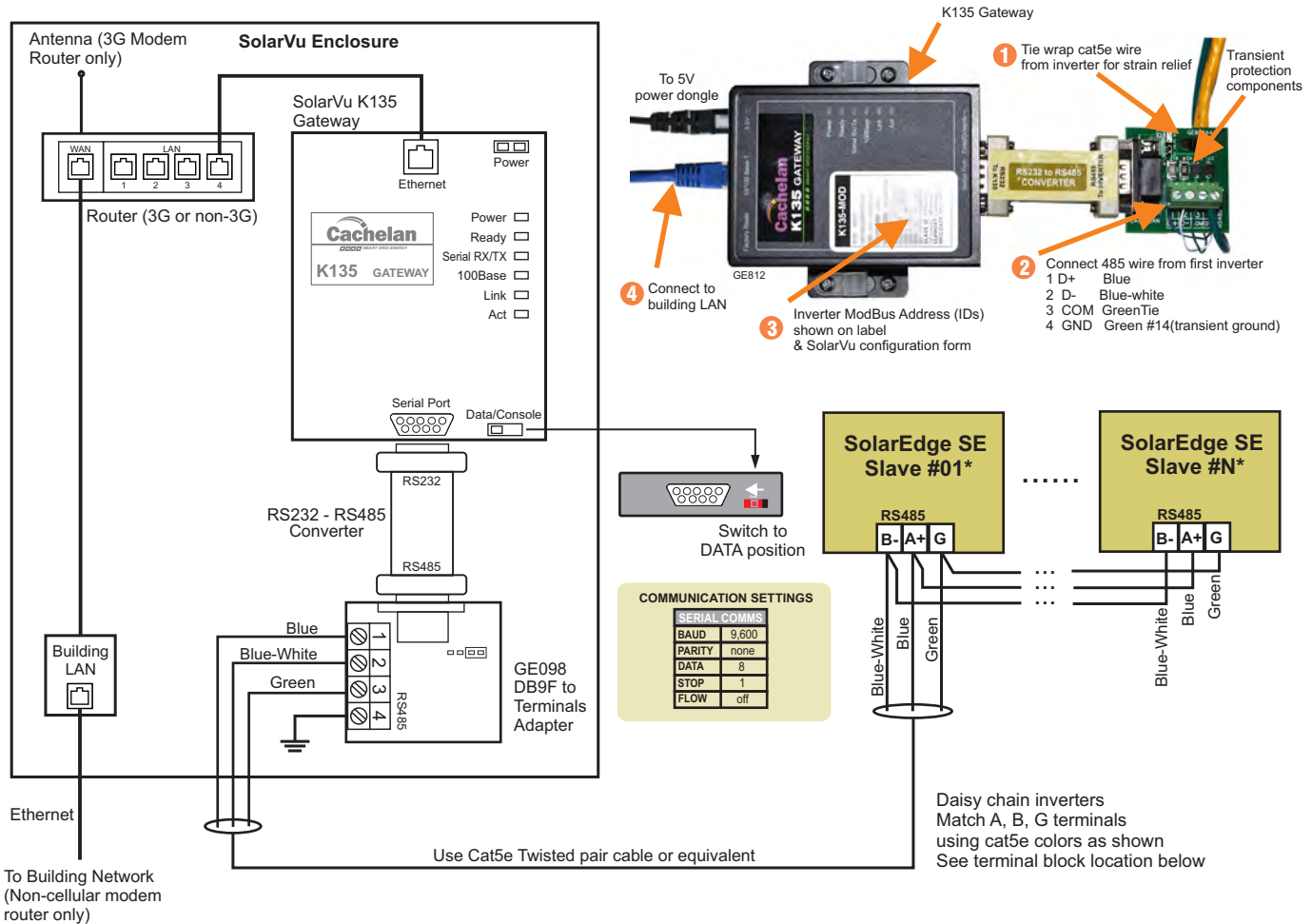
Fig 3 SolarVu enclosure wiring for M504 gateway



Inverter connection for K135 gateway

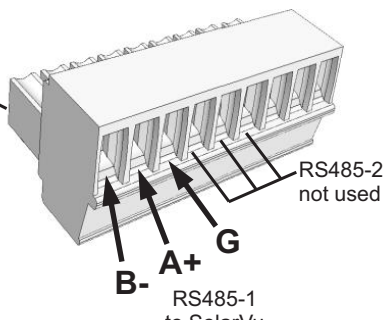
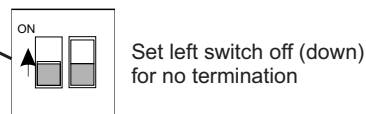
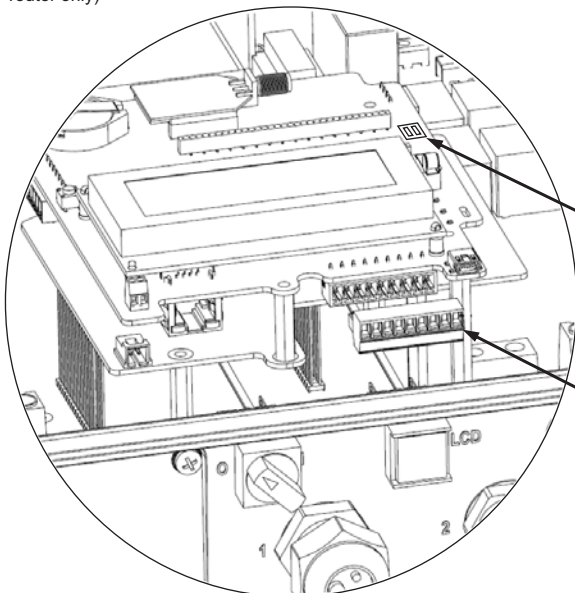
Consult the SolarEdge inverter installation manual for more details on serial communication connection. Ensure AC and DC power to the inverter are off before installing the communication wiring. Route the Cat5e serial communication cable wire through the communication gland in the inverter base. Daisy chain the inverter B- (data-), A+ (data+) and G (ground) together using cat5e cable as shown in fig 4. Carefully match the colours shown at each terminal. Set the termination resistor switch off (left switch down in fig 4) for all inverters except the last one which can optionally be set on. Connect the cable from the first inverter to the K135 gateway being careful to match the wire colours for the SE A+ (K135 D+), SE B- (K135 D-), SE G (K135 GND) terminals. After all inverters are wired together, enter a unique slave address into each inverter starting at 1 to match the SolarVu configuration assignment found in the document pouch configuration form. For 3 inverters the slave addresses would typically be 1,2,3 for example. Follow the menu settings sequence shown in fig 4.

Fig 4 SolarEdge SE inverter communication connection and settings



Inverter Configuration

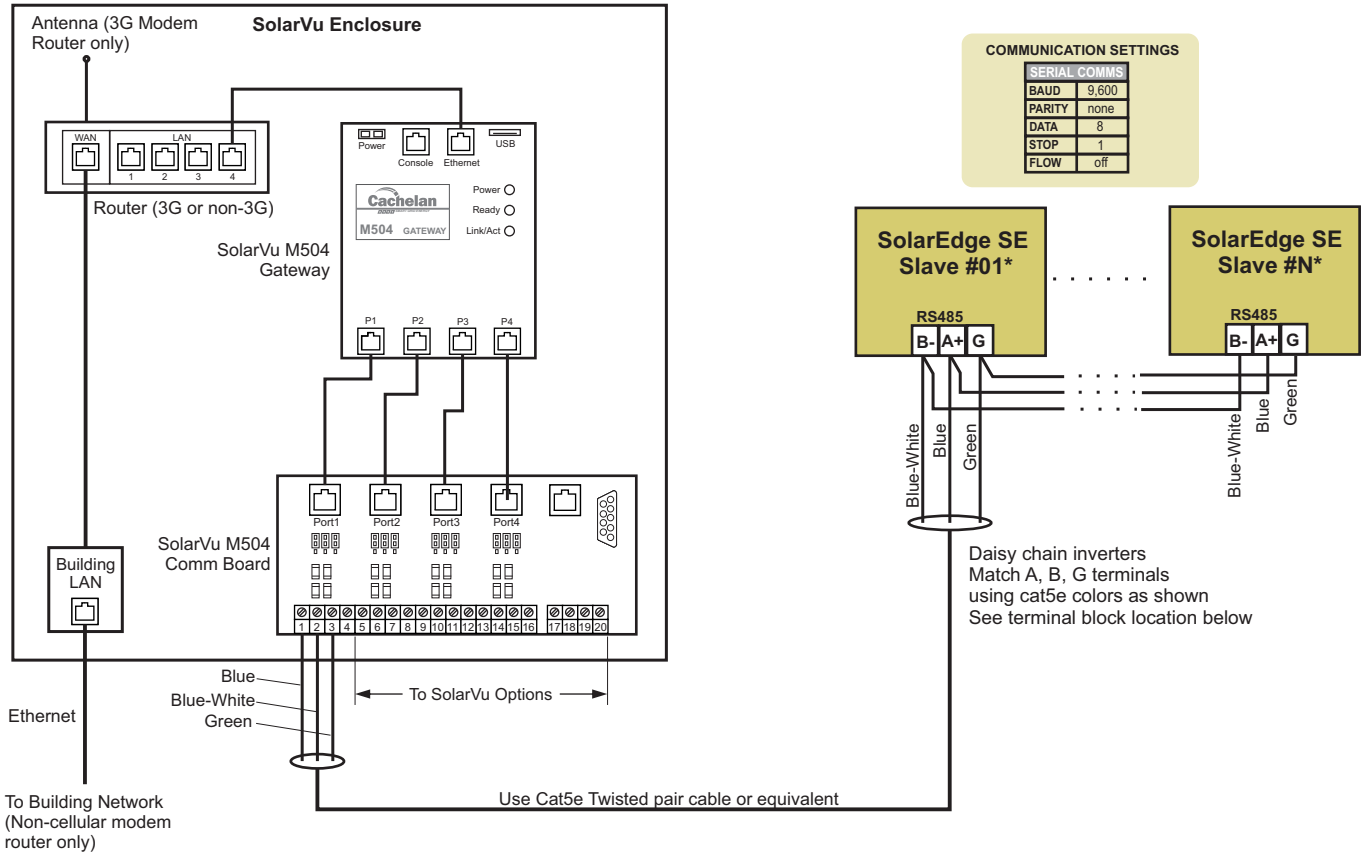
In the LCD menu, for each inverter program serial settings:
 Communication > RS485-1 Conf > Device Type > Select Non-SE Logger
 Communication > RS485-1 Conf > Protocol > Select SunSpec
 Communication > RS485-1 Conf > Device ID > Assign unique address to match the inverter #



Inverter connection for M504 gateway

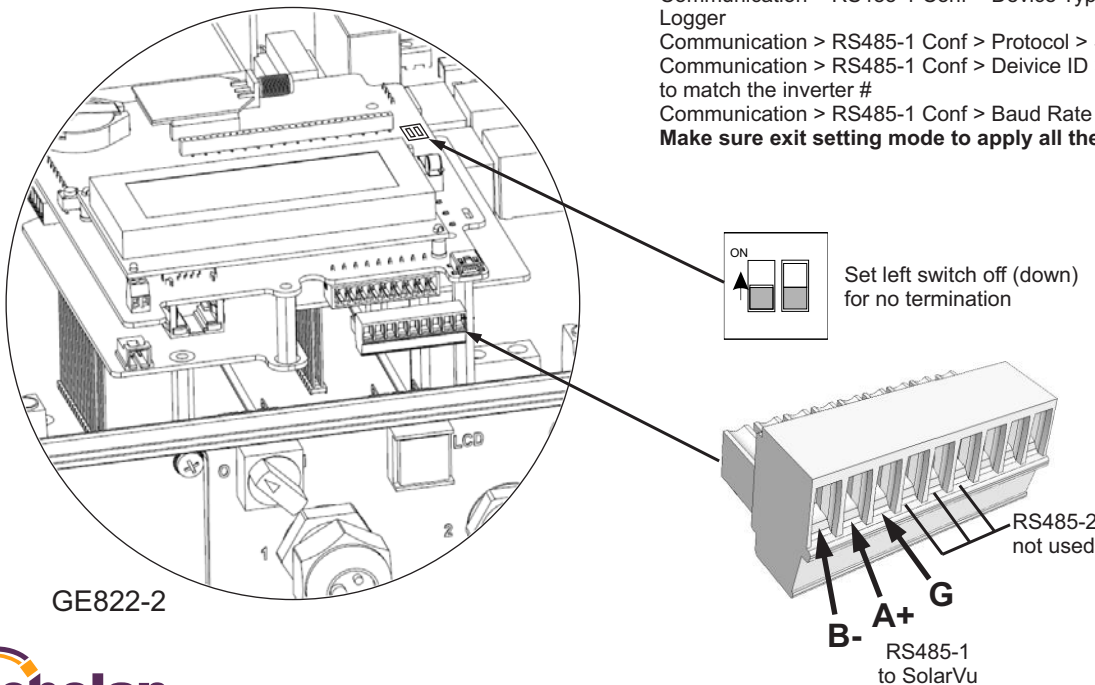
Consult the SolarEdge inverter installation manual for more details on serial communication connection. Ensure AC and DC power to the inverter are off before installing the communication wiring. Route the Cat5e serial communication cable wire through the communication gland in the inverter base. Daisy chain the inverter B- (data D-), A+ (data D+) and G (ground) together using cat5e cable as shown in fig 5. Carefully match the colours shown at each terminal. Set the termination resistor switch off (left switch down in fig 5) for all inverters except the last one which can optionally be set on. Check the project drawing in the doc pouch and connect the cable from the first inverter to the correct M504-485 port, usually this is port 1. After all inverters are wired together, enter a unique slave address into each inverter starting at 1 to match the SolarVu configuration assignment in the document pouch configuration form. For 3 inverters the slave addresses would typically be 1,2,3 for example. Follow the menu settings sequence shown in fig 5.

Fig 5 SolarEdge SE inverter communication connection and settings



Inverter Configuration

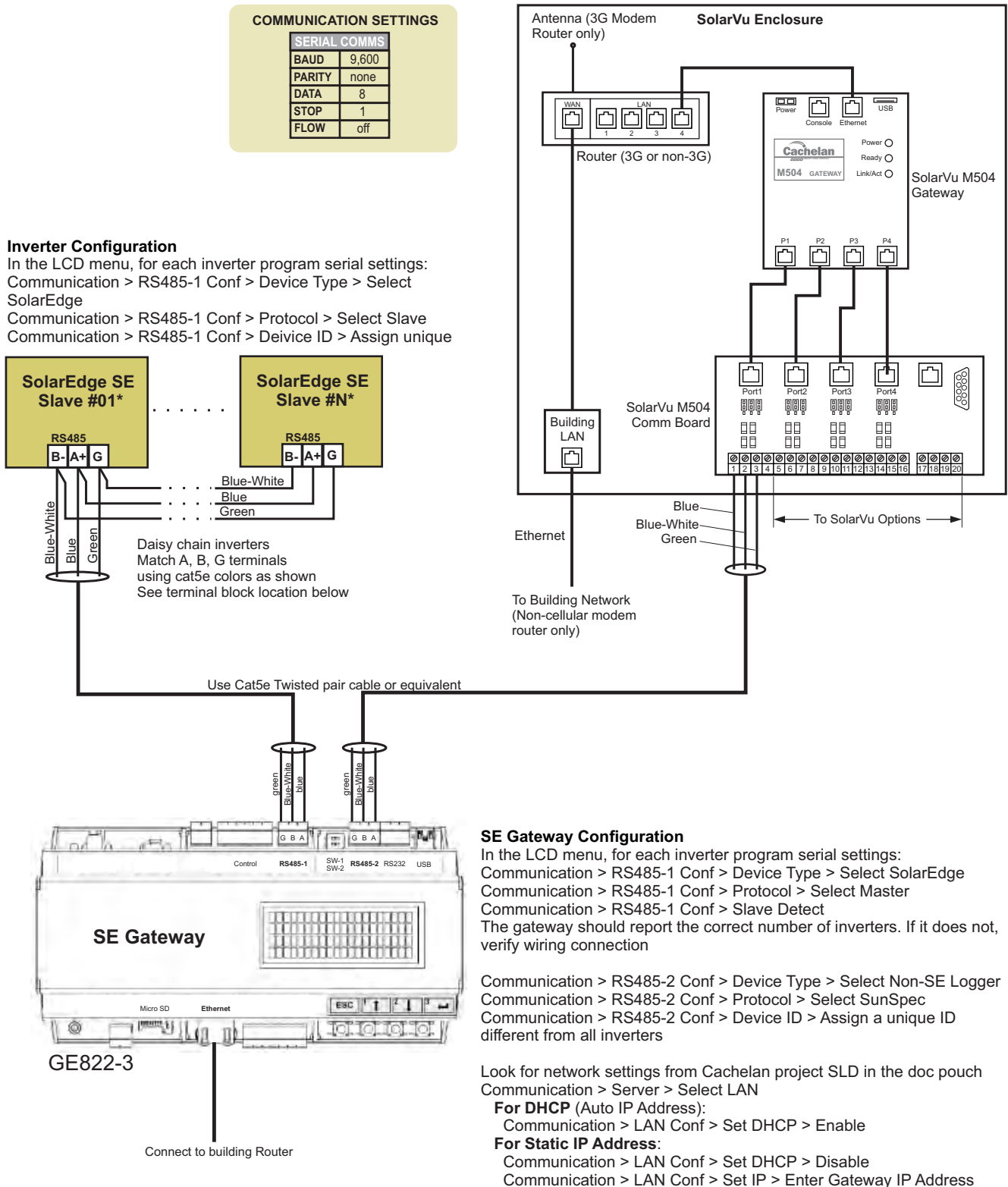
In the LCD menu, for each inverter program serial settings:
 Communication > RS485-1 Conf > Device Type > Select Non-SE Logger
 Communication > RS485-1 Conf > Protocol > Select SunSpec
 Communication > RS485-1 Conf > Device ID > Assign unique address to match the inverter #
 Communication > RS485-1 Conf > Baud Rate > Select 9600
Make sure exit setting mode to apply all the settings



Inverter connection for SolarEdge SE gateway

Consult the SolarEdge inverter installation manual for more details on serial communication connection. Ensure AC and DC power to the inverter are off before installing the communication wiring. Route the Cat5e serial communication cable wire through the communication gland in the inverter base. Daisy chain the inverter B- (data D-), A+ (data D+) and G (ground) together using cat5e cable as shown in fig 6. Carefully match the colours shown at each terminal. Set the termination resistor switch off (left switch down in fig 6) for all inverters except the last one which can optionally be set on. Connect the cable from the first inverter to the SE gateway port RS485-1 being careful to match the B, A, G terminal colours to the corresponding inverter terminals. After all inverters are wired together, enter a unique slave address into each inverter starting at 1 to match the SolarVu configuration assignment in the document pouch configuration form. For 3 inverters the slave addresses would typically be 1,2,3 for example. Follow the menu settings sequence shown in fig 6.

Fig 6 SolarEdge SE inverter communication connection and settings



Network Setup

Ensure the SolarVu enclosure is connected to the building LAN as shown in fig 4-6 (unless 3G cellular was ordered). 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 inverters and options to the server.

Fig 7 Serial connection to the M504-485 comm board with biasing and termination set on for port 1.

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

JUMPER SETTINGS
Terminator Resistor + Biasing

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

B+	B-	T	ON
●	●	●	ON
○	○	○	OFF

Inverters are normally daisy chained to PORT1. See SLD drawing in doc pouch for details.

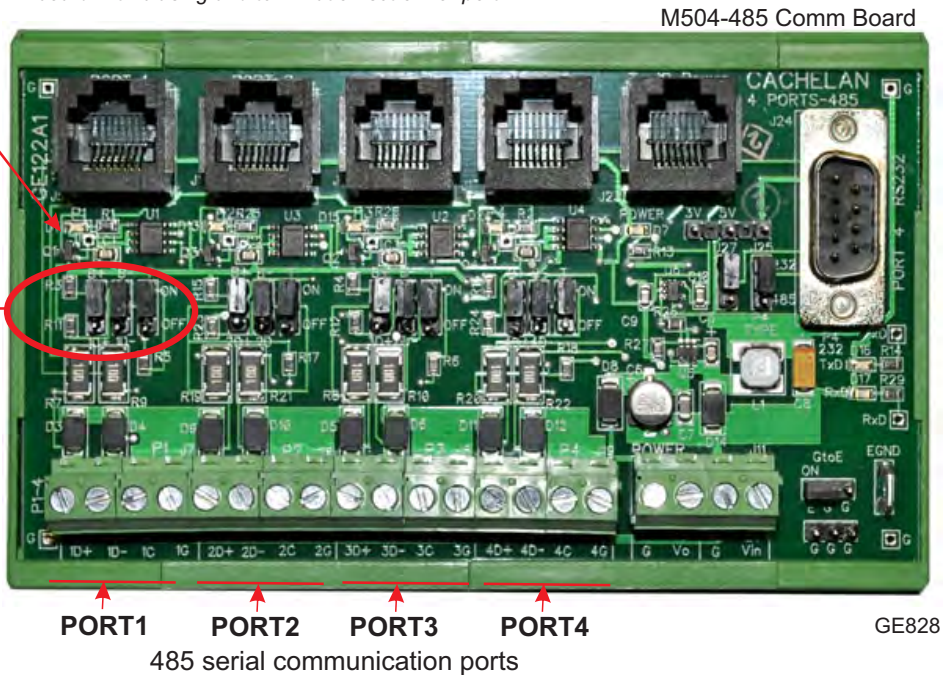


Fig 8 M504 indicators



IP & login settings are on the M504 label



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

Testing

Ensure the inverter and SolarVu gateway are powered on, the ethernet cable is plugged into a network jack and the ethernet cable is connected between SolarVu and the first inverter with the others daisy chained as shown in fig 4-6. For the M504 version the Power and Ready lights should be on if the power supply is plugged in. The Link/Act LED will periodically flash showing network activity. Ports 2-4 are serial RS485 used for communicating with SolarVu accessories. The inverters typically communicate over ports 1 which can be confirmed from the project drawing.

Internet Connection

Power on the gateway 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 gateway label.

Once the SolarVu portal is accessed from a browser, the opening screen is the SITE view shown in fig 9. Click the ANALYZER tab then Inverter Status from the pull down box (fig 10). If there is a internet connection from the site, the Last Communication light will be green. The 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 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

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 12. 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 9). 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 13). On the right is a slide show for public viewing. Content can be personalized using uploaded graphics in SETUP.

Fig 9 Site screen shows site overview, photos, weather and user programmable links to other webpages

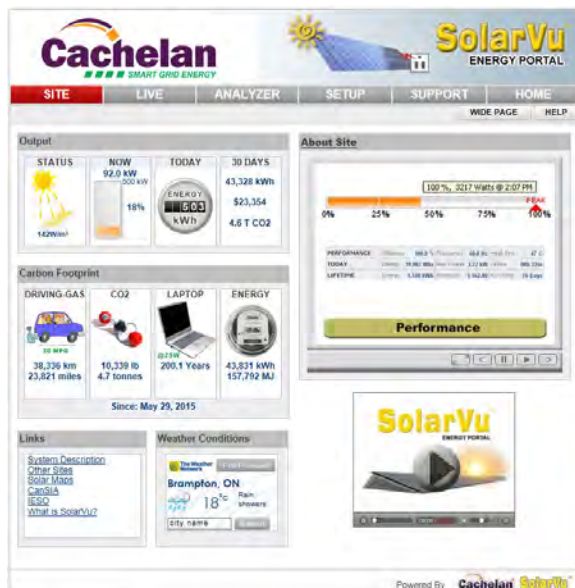


Fig 10 Check ANALYZER > Inverter Status to see data received from the inverter



Fig 11 Watch the SolarVu video for a tour of SolarVu screens and features.

www.cachelan.com/link-solarvutour

Other videos are available at cachelan.com



Fig 12 Use the HELP button on each screen for information about that screen or access a Help guide

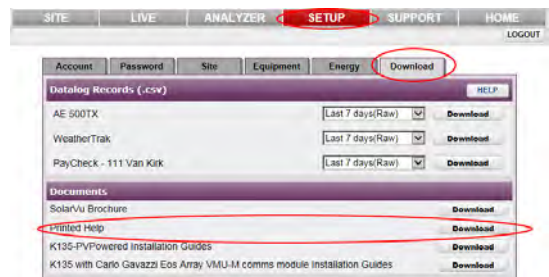


Fig 13 Click the Wide Page button to reformat the SITE screen for an HDTV lobby display



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 14. 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 CO₂ 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 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 16) 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 17). 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 (fig 18). 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 18 Top 10 Days and Carbon Footprint ANALYZER performance screens

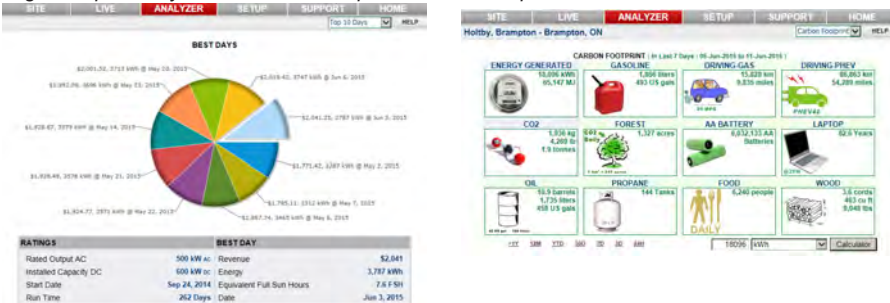


Fig 14 View power and energy now or output for any time period on the LIVE screen.

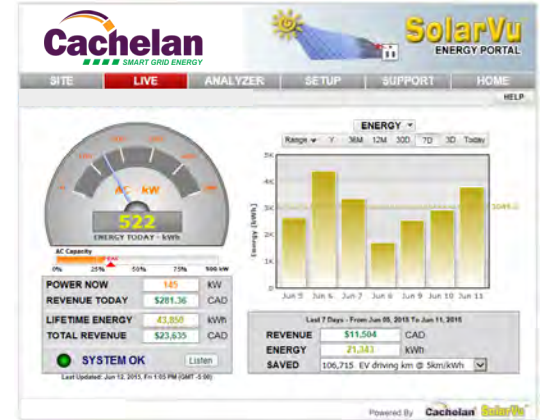


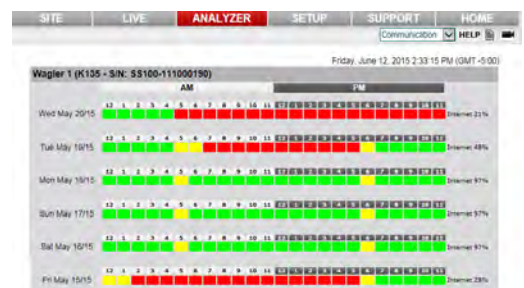
Fig 15 Watch the Equipment Log video from the Help video icon to see how to use this powerful troubleshooting tool. <http://www.cachelan.com/link-equipmentlog>



Fig 16 Log shows all inverter readings for last 30 days with record of fault messages for diagnosing problems



Fig 17 Detect intermittent internet connection from weak cellular or down land lines with the 30 day Communication log



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 gateway and the configuration settings sheet in the SolarVu enclosure doc pouch (fig 19).

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 changes take immediate effect.

Fig 20 Change system configuration parameters and settings by logging in to SETUP

The screenshot shows the 'SETUP' tab selected in the top navigation bar. Below it are sub-tabs: Account, Password, Site, Equipment, Energy, and Download. The 'System Parameters' section includes fields for Default Web Address, Alias Web Address, Site Name, Location, Description, Installation Date (Mar 28th 2014), AC Output Capacity (240 kW ac), DC Input Rating (366 kW dc), Startup kWh Offset (7573 kWh), Lifetime (25 Years), Insolation (1097 kWh/kWp/Yr), Time Zone (GMT) (-5.0), Currency (CAD), System Cost (2,378,181 CAD), Annual Cost (24994 CAD), Sell Rate (0.713 /kWh), and Buy Rate (0.110 /kWh). The 'Email Setup' section shows a table of email addresses and frequencies.

Annotations include:

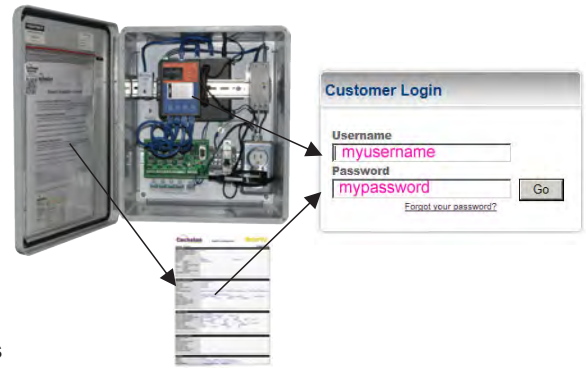
- Download data for spreadsheet analysis (pointing to the Download tab)
- Print QR code label for scanning from a smartphone to link to the site (pointing to the QR Code button)
- Screens for other setup parameters (pointing to the Site, Equipment, Energy, and Download tabs)
- Description of equipment for SITE screen "About Site" popup (pointing to the Description field)
- Enter parameters like Sell rate, capacity ratings, annual insolation for correct display of revenue and payback (pointing to the AC Output Capacity, DC Input Rating, and Startup kWh Offset fields)
- Enter email addresses to receive alarms and output reports (pointing to the Email Setup table)

Support

See the What is SolarVu? video at www.cachelan.com 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.

Fig 19 Login to SETUP to change settings



Cachelan Technical Support
contactus@cachelan.com
905.470.8400 x224