

SolarVu™ Installation Guide for Satcon PowerGate Plus Inverters

Introduction

SolarVu™ is an energy portal that enables remote monitoring of renewable energy generation sites over the internet. It requires the installation of a K135 gateway which continuously transfers data from the inverter(s) to the remote SolarVu servers. This guide explains how to connect the K135 gateway to Satcon PowerGate Plus inverters. Several steps are required:

- 1) Connect the K135 gateway to the inverter(s) RS485 terminals
- 2) Connect the K135 gateway to the building LAN for internet access
- 3) Enter the communications settings into each inverter from the front panel
- 4) Access SolarVu from a browser and configure the energy portal

Site Preparation

To access SolarVu from a browser, the inverters communicate using Modbus RTU protocol with a Cachelan K135 gateway connected to the site network as shown in fig 1. Each inverter has an RS485SS communications module with terminals for RS485 serial connection that are connected to the K135 gateway through a 232/485 converter (supplied) as shown in fig 2. The K135 connects to inverters over RS485 using twisted pair wire, typically cat5e, daisy chained for multiple inverters. An RJ45 ethernet jack, connected to the LAN network and a 120VAC outlet for the gateway power dongle are required. The LAN must have high speed internet service to an ISP to provide a gateway to the internet.

K135 Installation

Mount the K135 gateway in an enclosure with conduit to the inverter for the RS485 serial cable or directly on the wall where mechanical protection is not required as shown in fig 2. An indoor location is preferred. The RS485 serial cable can run long distances, over 1000 feet, if necessary.

Power Supply: Plug the K135 and 232/485 isolator power supply dongles into a 120VAC receptacle. Plug the matching dongle DC connectors into the devices. Alternatively, DIN rail mount power supplies can be installed inside an enclosure.

RS485 Serial: As shown in fig 3, connect the terminal block terminals to the first PowerGatePlus RS485SS comms terminals in the inverter. Recommended cable type is Cat5e, 8 wire, #24 solid which uses standard colors as shown in the figure. Ensure wire colors match correctly at both ends as correct polarity is required for successful communications. For multiple inverters, daisy chain the A/B/GND terminals together. No other master device can be connected at the same time as the K135 gateway.

Ethernet: Use a standard ethernet patch cable (not supplied) with RJ45 connectors of the appropriate length to connect from the RJ45 jack on the K135 gateway to the network ethernet at a RJ45 wall jack or the router/switch.

or
Alternatively, run Cat5e cable from the network patch panel and punch it down on an RJ45 modular connector. Observe matching colors at both ends using either T568A or T568B color coding as shown in Fig 3. Connect a short ethernet patch cable from this RJ45 jack to the K135 RJ45 jack.

Fig 1 Internet Connection

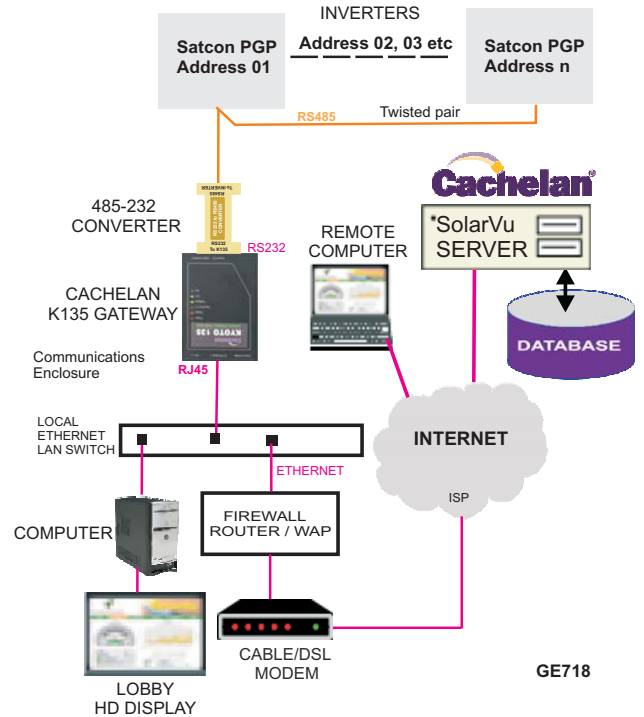


Fig 2 Typical component mounting

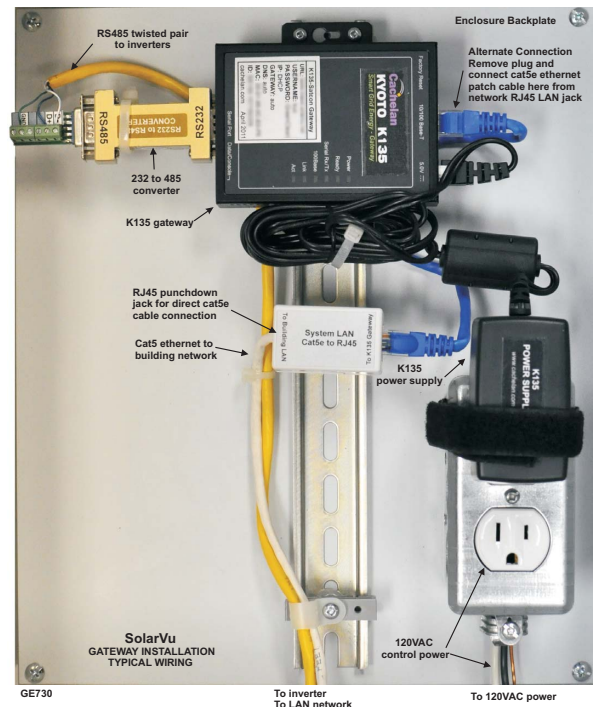


Fig 3 Cat5e LAN wiring

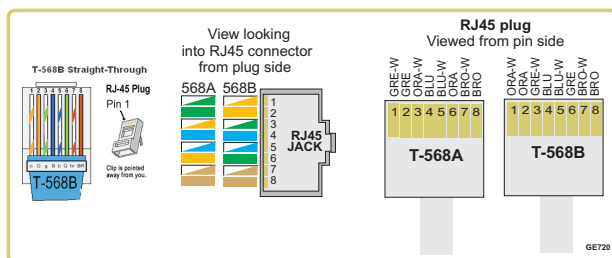


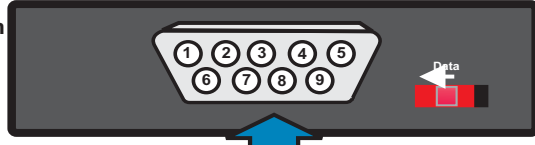
Fig 3 RS485 serial connections

Enclosure

Cachelan K135 Gateway RS485 Master

K135 RS485 Serial Port - DB9M

View from pin side
K135 DB9F



RS485 K135

1	485B-
2	232 Rx
3	232 Tx
4	
5	COM
6	
7	
8	
9	485A+

DB9M

- COMMUNICATION SETTINGS**
- 1) K135 Gateway & PowerGate comms settings must match
 - 2) Each PowerGate to have a unique slave address

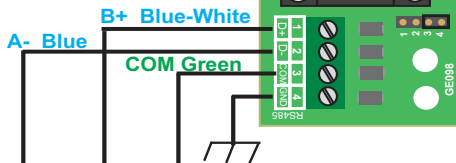
SERIAL COMMS	
BAUD	9,600
PARITY	none
DATA	8
STOP	1
FLOW	off

A- > B+ = 1 / MARK / OFF
B+ > A- = 0 / SPACE / ON

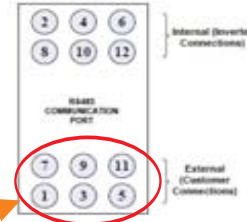
232/485 CONVERTER

RS232 To K135
CONVERTER
RS232 to RS485
CONVERTER
RS485
To INVERTER

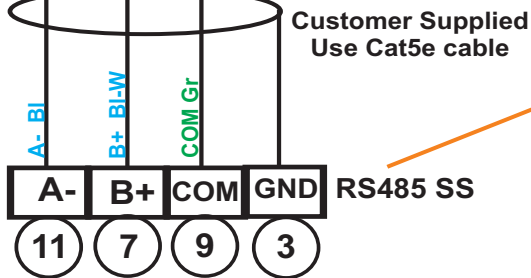
Adapters may vary
Match terminals
A- to D- B+ to D+



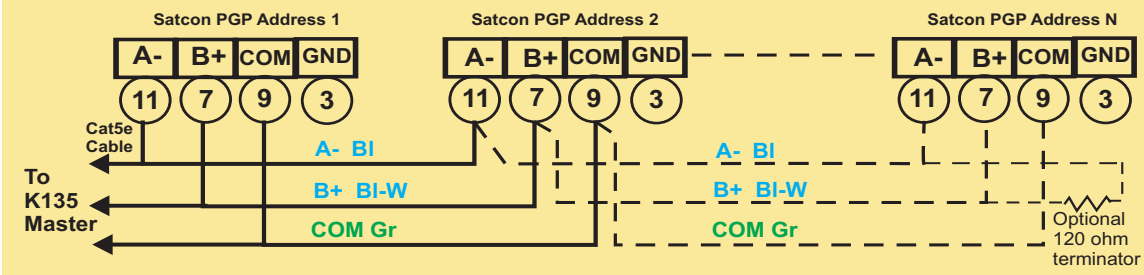
Satcon PowerGate Plus
RS485SS Isolator Terminals



SIGNAL	SATCON	Cat5e WIRE
A-	S11	A- BI
B+	S7	B+ BI-W
GND	S9	COM Gr
SHIELD	S3	not used



RS485 DAISY CHAIN CONNECTION OF MULTIPLE SATCON INVERTERS



GE719-3

Fig 4 PowerGatePlus menus for communications settings

Communication settings for each inverter must be programmed from the PowerGatePlus front panel to match the K135 gateway settings. The required settings are:

Protocol: Modbus RTU

Baud Rate: 9600

Parity: None

Data Bits: 8

Stop Bits: 1

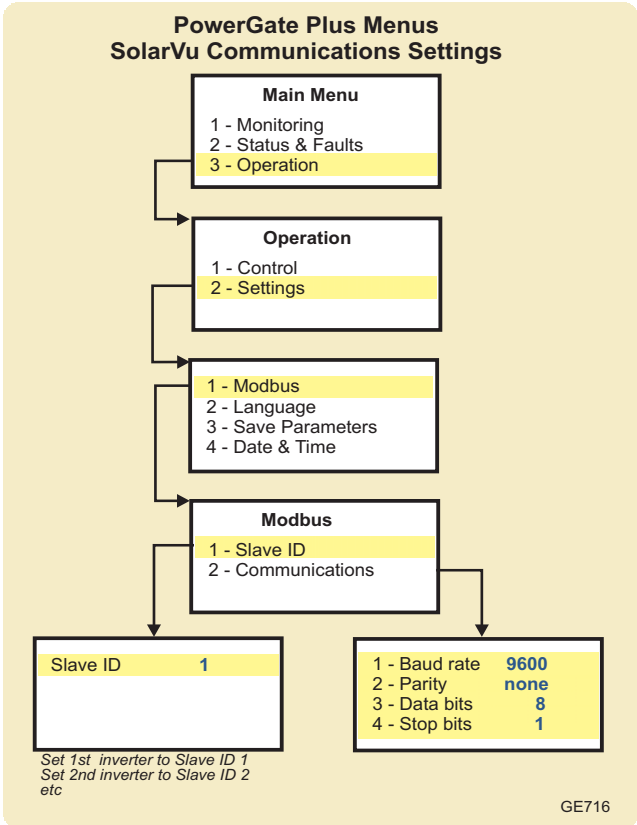
Slave ID: 1st inverter - 1. For additional inverters, each must have a unique slave ID (also called a slave address) consecutively numbered. For example, 5 inverters would be assigned slave IDs of 1,2,3,4,5. Enter these settings using the front panel keys navigating the menus as shown in fig 4.

For multiple inverters, for easy identification, record which address was assigned to its physical array such as

ID 1 = north roof

ID 2 = south roof

When viewing inverter values in SolarVu this will make it easier to identify which part of the system is being displayed as shown in the Analyzer > Inverter Status screen fig 5.



Testing the System

At this point the installation should be complete ready for testing. It is helpful to have access to a PC that is connected to the internet for viewing SolarVu screens using the URL supplied for the system. The K135 is preconfigured to automatically send inverter data to the SolarVu servers. To do this it must first establish an internet connection. Then it will collect data from the PowerGatePlus inverters and periodically transmit them.

Verifying correct operation is described in the sections that follow. Indicator lights and actual values accessible from the SolarVu Analyzer > Inverter Status screen are useful for determining the status of the system.

Fig 6 Use the ANALYZER > Inverter Status screen to check system status

Fig 5 Use the Slave ID number to identify each inverter

To access the inverter status screen, enter the SolarVu URL in your browser
Click ANALYZER
Inverter Status

Time of last update received from the K135 gateway → Tuesday, October 12, 2010 2:09:58 PM (GMT -5:00)

Satcon PowerGate Plus #1 (Slave Address : 1)

Input Power 0 W Output Power 0 W Lifetime Energy 0 Whr

Energy Production

Lifetime Energy Today 0 Whr Yesterday 0 Whr 7 Days 0 Whr 30 Days 0 Whr 7 Days Avg. 0 Whr 30 Days Avg. 0 Whr

System Status Click button to display values of interest or All for full status screens

DC Input Voltage 0 V DC Link Voltage 0 V DC Link Current 0 A DC Ground 0.0 A

Line Voltage A 0 V Line Voltage B 0 V Line Voltage C 0 V Avg. Line Voltage 0 V

Line Current A 0 V Line Current B 0 V Line Current C 0 V Avg. Line Current 0 V

Input Power 0 W Line Neutral Current 0.0 A Line Voltage Unbalance 0 % Line Current Unbalance 0 %

Output Power 0 W Reactive Power 0.0 kVAR Apparent Power 0.0 kVA Power Factor 0.000

Operating State Power Up Vdc In Timer 0.00 Min Vac Line Timer 0 Sec Number Faults 0

System Informations

Temperature Sensors

DC & AC Protection Settings Light is green if K135 is reading valid data from the inverter over RS485. K135 must be connected to the internet.

Zones Status - Current & kWh

Last Data Updated: Oct 8, 2010, Fri 5:20 PM (GMT -5:00)

No Communication Since: Oct 8, 2010, Fri 5:20 PM (GMT -5:00)

Light goes green if K135 is connected to the internet

Time of last communication. K135 sends an update every 15 minutes

Satcon PowerGate Plus #1 (Slave Address : 1)

Satcon PowerGate Plus #2 (Slave Address : 2)

Satcon PowerGate Plus #3 (Slave Address : 3)

Network Setup

If automatic IP assignment is used, on power up, the K135 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 K135. Otherwise consult the IT systems administrator for assistance. If a dedicated IP address, subnet mask and DNS server address are required, this needs to be entered into the K135 before shipment. Once the K135 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.

K135 indicators and connections



Testing

Ensure the inverters and K135 are powered on, the ethernet cable is plugged into a network jack and the RS485 cable is connected between the K135 and the inverter(s). The Power and Ready lights should be on if the power supply is plugged in. The Link and Ready lights should be on if the power supply is plugged in. The Link light indicates the ethernet connection is working. 100Base will only be on for high speed connections; for 10Base it is off. The Act light will periodically flash showing network activity. The Serial Rx/Tx flashes when the inverter is polled by the K135 but most of the time the light is off.

Internet Connection

Power on the K135 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 assigned for your account. This will be found on the account label shipped with the K135 and on the front panel of the K135. It is in the format *www.mysitename.solarvu.net*

Once the SolarVu energy portal is reached, the opening screen is the SITE view. Click ANALYZER > INVERTER STATUS. If there is a connection from the site, the Last Communication light will be green. The K135 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. Check internet connections at the site by trying to browse the internet at the site with a PC connected to the network.

On a new system, the K135 gateway will search for the address of each connected inverter. When found, the Last Data Updated indicator will be green and inverter data will appear. If this indicator is red but the Last Communication indicator is green, check the RS485 serial connection to the inverter and that unique slave IDs have been entered. When both lights are green the gages on the SITE screen will display live data and graphs will begin recording site energy output. Contact Cachelan Technical Support for assistance if you cannot get a connection.

K135 Status Indicator Interpretation

INDICATOR STATUS		
LED	NORMAL	STATUS
POWER	ON	OFF- no power ON-power OK
READY	ON	OFF No DHCP or static IP address. Check IP settings, ethernet connection
SERIAL	FLASHING	OFF Check RS232 to inverter connection. Inverter may be off.
100Base	ON	ON- 100Base, OFF- 10Base or no ethernet connection
Link	ON	OFF No ethernet connection
Activity	FLASHING	FLASH - data traffic activity

TROUBLESHOOTING CHECKLIST

IP	Obtain IP by DHCP or set static IP. Network configured to recognize K135
Serial	RS232 serial cable connected between inverter and K135
Inverter	Inverter is powered on
Internet	Internet connection from ISP to LAN is operating normally
K135	K135 in data mode (red switch set to left viewed from top)
Support	Technical support: contactus@cachelan.com

K135 front panel label with web address and login

K135 GATEWAY

URL: mysite.solarvu.net
 USER: myusername
 PASSWORD: mypassword
 IP: DHCP
 MAC: 00-01-95-06-E8-33
 ID: SS100 070300075 v1.4.1
 TYPE:

Check ANALYSER > INVERTER STATUS for communication. Screen shots may vary by inverter type

LIVE - for valid data, green status light and time received

Video Tour

For an overview of available features, visit www.solarvu.net and play the What is SolarVu video. Each screen has a HELP button that explains how all the features work. An online help guide is available for printing under SETUP > DOWNLOADS > PRINTED HELP.

Visit www.solarvu.net for a features video



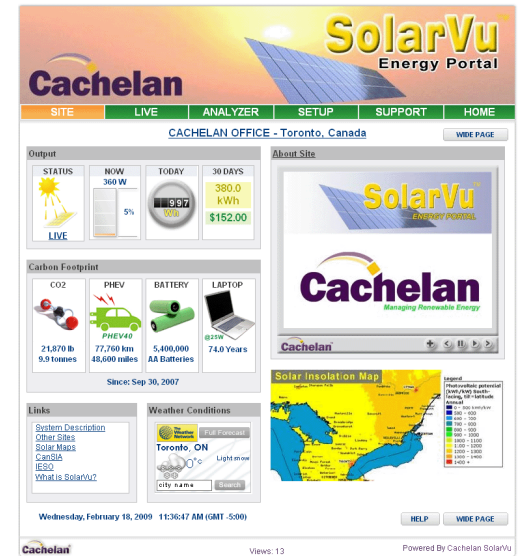
Help guide



Site Screen

For a summary of information about the site, click the SITE menu button. 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. On the right is a slideshow for public viewing. Content can be personalized using uploaded graphics in SETUP.

Site Summary Screen



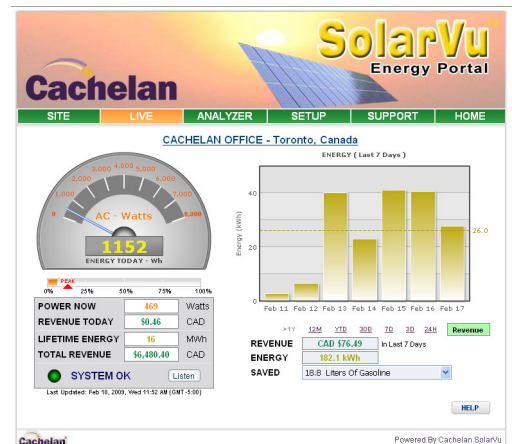
Select wide screen view for public display on an HDTV



Live Data

Click the LIVE menu button to display current power being generated in the array. Actual power and energy generated today are shown on the meter dial. For a normally operating system, 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.

LIVE view shows current conditions

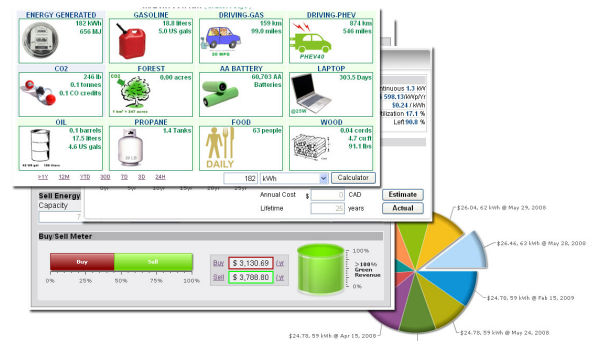


Trends are shown for the lifetime of the system using the graphs on the right. Select either an Energy or Revenue view using the button. Click the desired time period under the graph. Scroll over a data point with the mouse for more detailed information about that day. The carbon footprint pulldown gives energy equivalents for the solar power generated for the selected time period.

Analyzer - Performance

Click the ANALYZER menu button and select a category in the pulldown menu and a time period under the graph. 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 benefits available. To find the carbon equivalent for an arbitrary value, override the actual solar amount by entering a kWh value and selecting a category, then click the Calculator button. Other views including buy/sell energy use, performance and payback can be selected with in the pulldown menu. The screen will return to the last value selected on return.

ANALYSER - select performance views from pulldown



Analyzer - Troubleshooting

When problems occur with the system or to check inverter operation, click ANALYZER > INVERTER STATUS. Each inverter connected to the system with a K135 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.

For detailed analysis, it may be helpful to download all readings for the time period of interest into a spreadsheet for further analysis using SETUP > DOWNLOAD.

Download printable HELP guide or actual readings for any time period

Setup

For entering settings to configure your site, click the SETUP menu button. Enter your unique username and password from the account label. The setup screen appears showing communication status and current preference settings. Check the last communication time ❶. It should show a time within the last 15 minutes if communication between the site and SolarVu™ server is working normally.

For the payback and revenue calculators to work properly, correct parameters for energy sell rate, capacity, average insolation etc should be entered. Account > Equipment Setup is for factory use. All changes take immediate effect. The Site Setup tab is used to customize the banner, links, slideshow and system description. Click the Help ❷ button for each section for a description of the effect for each entry. For further analysis, individual energy readings for any time period can be downloaded into a spreadsheet from the DOWNLOAD section.

Enter the email address ❸ for each individual that wants a regular status report sent to them and select the frequency. 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 if this is forgotten.

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.

For additional technical support, send an email to contactus@cachelan.com or dial our support line in Toronto, Canada at 905.470.8400

Click ANALYZER > INVERTER STATUS for troubleshooting

Lifetime Energy 1,800 Whr	AC Output	Power	0 W	Vrms (L1-L2)	217 V	Current	0.0 A
		Vrms (L1-N)	125 V	Vrms (L2-N)	132 V	Frequency	60.0 Hz
AC Output Power 0 W	DC Input	Power	33 W	Volts	349 V	Current	0.1 A
	Performance	Power Efficiency	0 %	Heatsink Temp.	29 °C		
PV Input Power 33 W	Lifetime	Today On-Grid	2.2 Hrs	Lifetime	13.5 Hrs	Relay Cycle	36
	Inverter	DC Input	2,700 Whr	AC Output	1,800 Whr	Efficiency	67 %
	Status	Model	PVI 5000	S/N	10010063	RS485 Address	15
		Hardware Ver.	65	DSP1 Ver.	1.40	DSP2 Ver.	1.18
		Fault mode Vach - The AC voltage of mains utility is over the upper limit Vact - The AC voltage of mains utility is under the lower limit COM - External communication failed warning message Vact2 N - The voltage between L2 and neutral is exceeding the upper limit					
		Set Points					
		Listen	Last Data Updated:		Apr 19, 2010, Mon 11:54 AM (GMT -5:00)		
		Listen	No Communication Since:		Apr 16, 2010, Fri 3:54 PM (GMT -5:00)		

See K135 label for SETUP login

K135 GATEWAY	
URL:	mysite.solarvu.net
USER:	myusername
PASSWORD:	mypassword
IP:	DHCP
MAC:	00-01-95-06-E8-33
ID:	SS100 070300075 v1.4.1
TYPE:	
DATE:	Feb 2009
SUPPORT:	cachelan.com

Configure site settings in SETUP

Cachelan Technical Support

contactus@cachelan.com

905.470.8400 x228