SolarVu® for KACO Blueplanet TL1 Inverters
Installation Guide

Site Preparation

SolarVu® is an energy portal that enables remote monitoring of renewable energy generation sites over the web. It requires the installation of a SolarVu gateway which continuously transfers data from the inverter(s). This guide explains how to connect the SolarVu gateway to KACO Blueplanet TL1 3-5kW series of inverters using the RS485 serial interface.

Each inverter has RS485 communication installed as a standard feature. This guide does not cover connection to the inverter ethernet port. To access SolarVu from a browser, the inverters are connected to the internet through a Cachelan gateway as shown in fig 1. The gateway connects to multiple inverters using twisted pair wire, typically cat5e, daisy chained to multiple inverters. The LAN must have high speed internet service to an ISP to provide access to the internet. The SolarVu 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.

SolarVu Gateway Installation

There are 2 versions of gateways that may be received, the single port K135 or the 4 port M504 as shown in fig 2. Mount the SolarVu enclosure containing the SolarVu 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.

Power Supply: Source the 120VAC supply from a 15 amp breaker electrical circuit suitable for control power and connect to the internal junction box as shown in fig 2a (K135). Refasten the reusable dongle tie wrap after wiring to prevent it becoming loose over time. Alternatively for the M504 version, connect to the breaker as shown in fig 2b.

RS485 Serial: Identify the gateway version received in fig 2 and use the matching drawing to connect the RS485 serial cat5e cable to the gateway terminals as shown in fig 2, 3 and 4 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. Over 1000 feet of wire can be used for reliable serial communications. See page 2 and 3 for detailed communication wiring diagram

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 installation of a customer supplied SIM card with an active telco account for service.
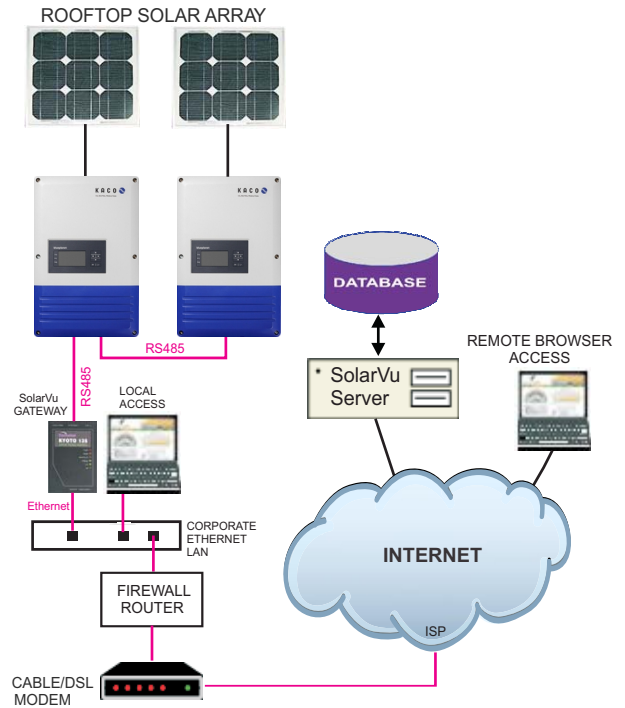
Fig 1 Internet Connection
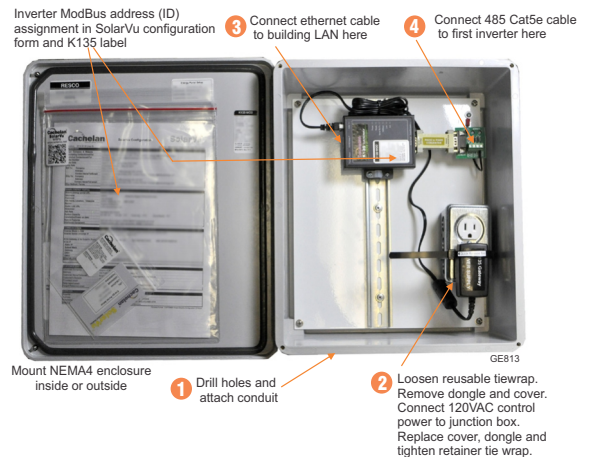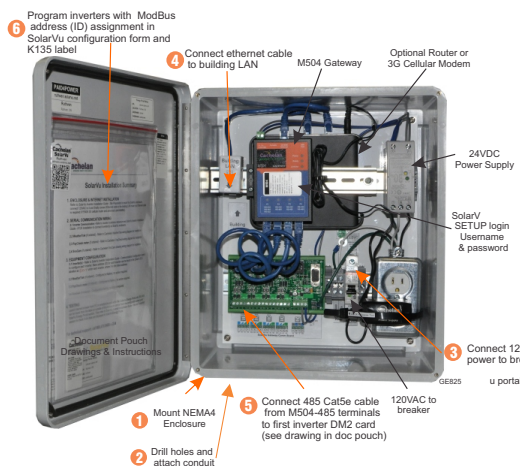

ROOFTOP SOLAR ARRAY

Fig 2a SolarVu enclosure - for K135 gateway

Inverter ModBus address (ID) assignment in SolarVu configuration form and K135 label
③ Connect ethernet cable to building LAN here
④ Connect 485 Cat5e cable to first inverter here
Mount NEMA4 enclosure inside or outside
① Drill holes and attach conduit
② Loosen reusable tiewrap. Remove dongle and cover. Connect 120VAC control power to junction box. Replace cover, dongle and tighten retainer tie wrap.

Fig 2b SolarVu enclosure - for M504 gateway

⑥ Program inverters with ModBus address (ID) assignment in SolarVu configuration form and K135 label
④ Connect ethernet cable to building LAN
M504 Gateway
Optional Router or 3G Cellular Modem
24VDC Power Supply
SolarV SETUP login Username & password
③ Connect 120VAC control power to breaker
① Mount NEMA4 Enclosure
② Drill holes and attach conduit
⑤ Connect 485 Cat5e cable from M504-485 terminals to first inverter DM2 card (see drawing in doc pouch)
120VAC to breaker

K135 Gateway Installation

Wall mount the SolarVu® enclosure with conduit to the inverters for serial connection, LAN ethernet and 120VAC control power.

Control Power: A source of 120VAC @ 3W control power is required for the K135 gateway.

Ethernet: Use a standard ethernet patch cable with RJ45 connectors of the appropriate length to connect from the K135 to the network ethernet at a RJ45 wall jack or the router/switch.

RS485 Serial: Use twisted pair wire or two pairs in a cat5e #24AWG solid twisted pair wire cable cutting off the unused additional wires. Daisy chain from the K135 gateway to the RS485 A B in and out terminals to each inverter as shown in fig 3 according to the inverter version installed. See the Kaco TL3 manual for using the front panel keys and display to program the unique slave address in each inverter slave typically 1,2,3 etc with the slave IDs noted on the SolarVu configuration sheet. Baud rate settings are fixed at 9600. The terminating resistor if used, should only be set on for the last inverter in the daisy chain.
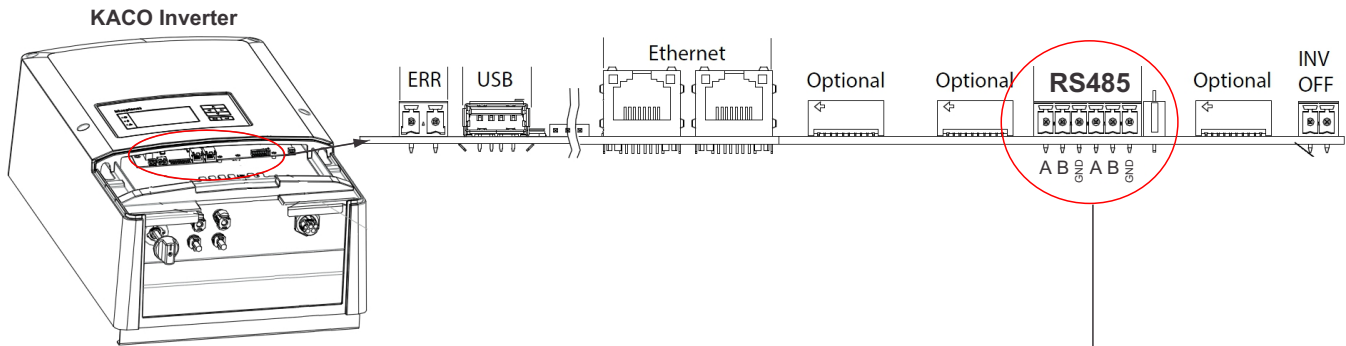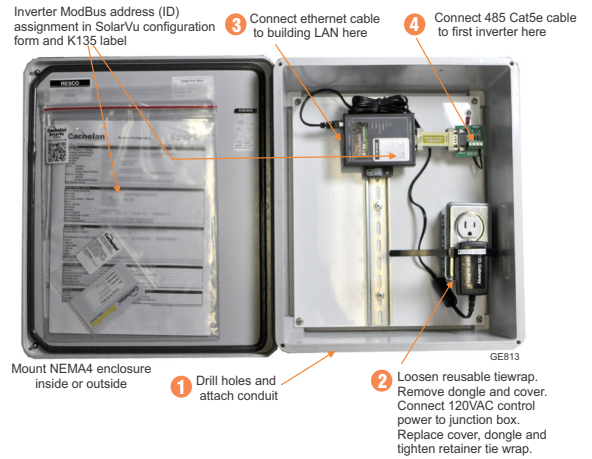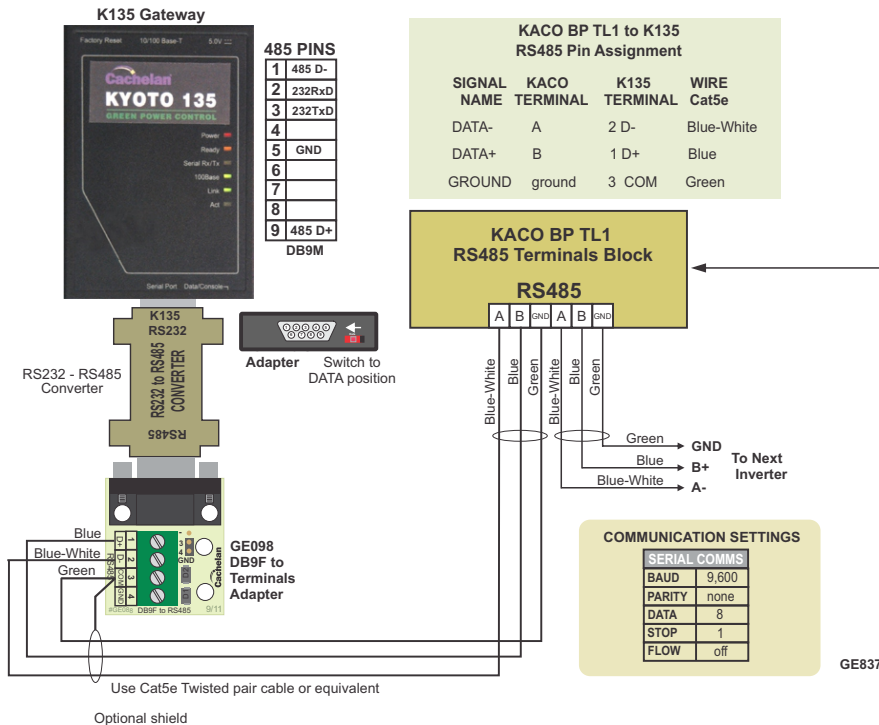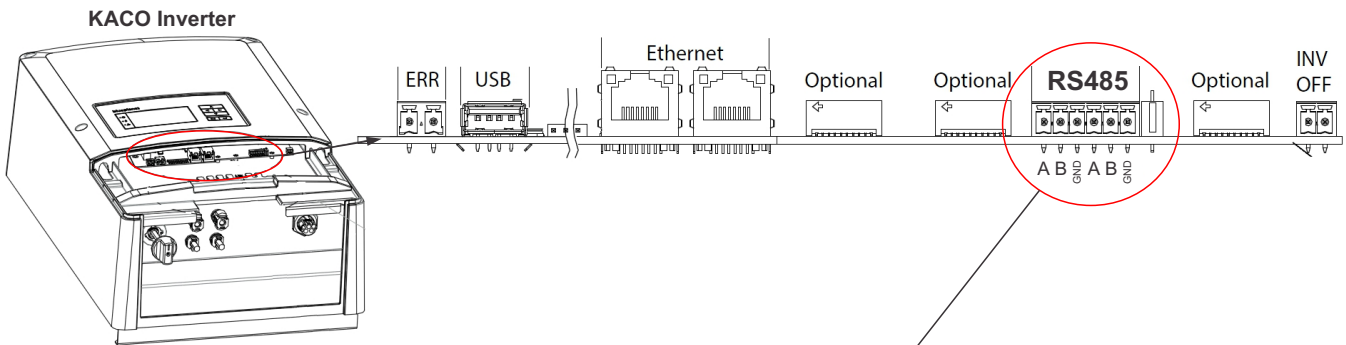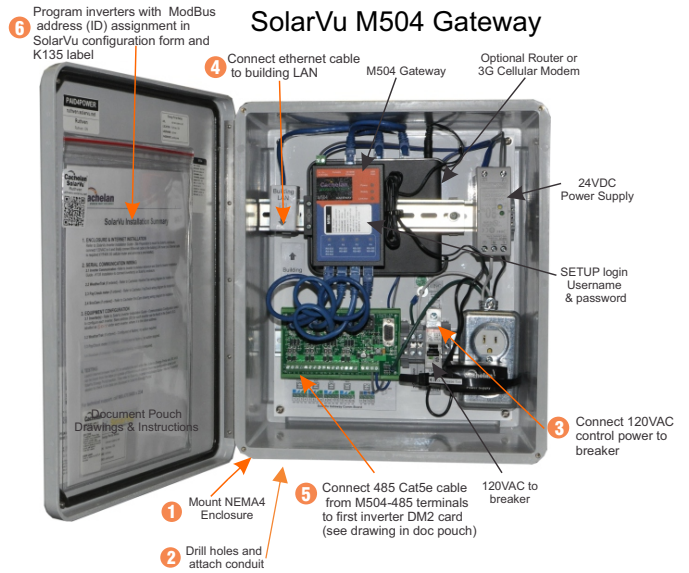

Inverter ModBus address (ID) assignment in SolarVu configuration form and K135 label

③ Connect ethernet cable to building LAN here

④ Connect 485 Cat5e cable to first inverter here

GE813

Mount NEMA4 enclosure inside or outside

① Drill holes and attach conduit

② Loosen reusable tiewrap. Remove dongle and cover. Connect 120VAC control power to junction box. Replace cover, dongle and tighten retainer tie wrap.

Fig 3 K135-KACO Blueplanet TL1

KACO BP TL1 to K135 RS485 Pin Assignment

SIGNAL NAME	KACO TERMINAL	K135 TERMINAL	WIRE Cat5e
DATA-	A	2 D-	Blue-White
DATA+	B	1 D+	Blue
GROUND	ground	3 COM	Green

COMMUNICATION SETTINGS

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

GE837

Inverter Communications Settings

Each inverter must be configured with a unique address (ID) and the correct communication protocol using the front panels keys and display. Required inverter ID settings are found in the SolarVu enclosure document pouch on the door and are normally assigned as 1,2, 3... Follow the sequence below to set each inverter an unique ID.

From inverter display -> "settings" menu -> Interface -> Assign a unique Address

Note that the baud rate on each inverter are left as default at 9600

M504 Gateway Installation

Wall mount the SolarVu® enclosure with conduit to the inverters for serial connection, LAN ethernet and 120VAC control power.

Control Power: A source of 120VAC @ 3W control power is required for the K135 gateway.

Ethernet: Use a standard ethernet patch cable with RJ45 connectors of the appropriate length to connect from the M504 to the network ethernet at a RJ45 wall jack or the router/switch.

RS485 Serial: Use twisted pair wire or two pairs in a cat5e #24AWG solid twisted pair wire cable cutting off the unused additional wires. Daisy chain from the M504 gateway to the RS485 A B and Ground terminals to each inverter as shown in fig 4. See the Kaco Blueplanet TL1 manual for using the front panel keys and display to program the unique slave address in each inverter slave typically 1,2,3 etc with the slave IDs noted on the SolarVu configuration sheet. Baud rate settings are fixed at 9600. The terminating resistor if used, should only be set on for the last inverter in the daisy chain.
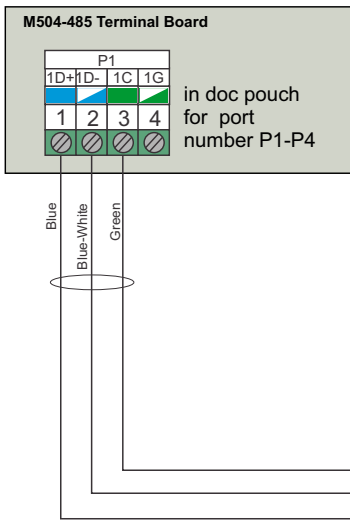

SolarVu M504 Gateway

- ⑥ Program inverters with ModBus address (ID) assignment in SolarVu configuration form and K135 label
- ④ Connect ethernet cable to building LAN
- M504 Gateway
- Optional Router or 3G Cellular Modem
- 24VDC Power Supply
- SETUP login Username & password
- ③ Connect 120VAC control power to breaker
- 120VAC to breaker
- ⑤ Connect 485 Cat5e cable from M504-485 terminals to first inverter DM2 card (see drawing in doc pouch)
- ① Mount NEMA4 Enclosure
- ② Drill holes and attach conduit
- Document Pouch Drawings & Instructions

KACO Inverter

ERR | USB | Ethernet | Optional | Optional | **RS485** | Optional | INV OFF

A B GND A B GND

Fig 4 M504-KACO Blueplanet TL1

M504-485 Terminal Board

P1			
1D+	1D-	1C	1G
1	2	3	4

in doc pouch for port number P1-P4

Blue | Blue-White | Green

KACO BP TL1 RS485 Terminals Block

RS485

A | B | GND | A | B | GND

Blue-White | Blue | Green | Blue-White | Blue | Green

Green → GND
Blue → B+
Blue-White → A-

To Next Inverter

KACO TL3 to M504 RS485 Pin Assignment

SINGAL NAME	KACO TERMINAL	K135 TERMINAL	WIRE Cat5e
DATA-	A	2	Blue-White
DATA+	B	1	Blue
GROUND	GND	3	Green

COMMUNICATION SETTINGS

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

Inverter Communications Settings

Each inverter must be configured with a unique address (ID) and the correct communication protocol using the front panels keys and display. Required inverter ID settings are found in the SolarVu enclosure document pouch on the door and are normally assigned as 1,2, 3... Follow the sequence below to set each inverter an unique ID.

From inverter display -> "settings" menu -> Interface -> Assign a unique Address

Note that the baud rate on each inverter are left as default at 9600

Network Setup

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 SolarVuTM server and begin transferring data from the inverter to the server.

K135 indicators and connections
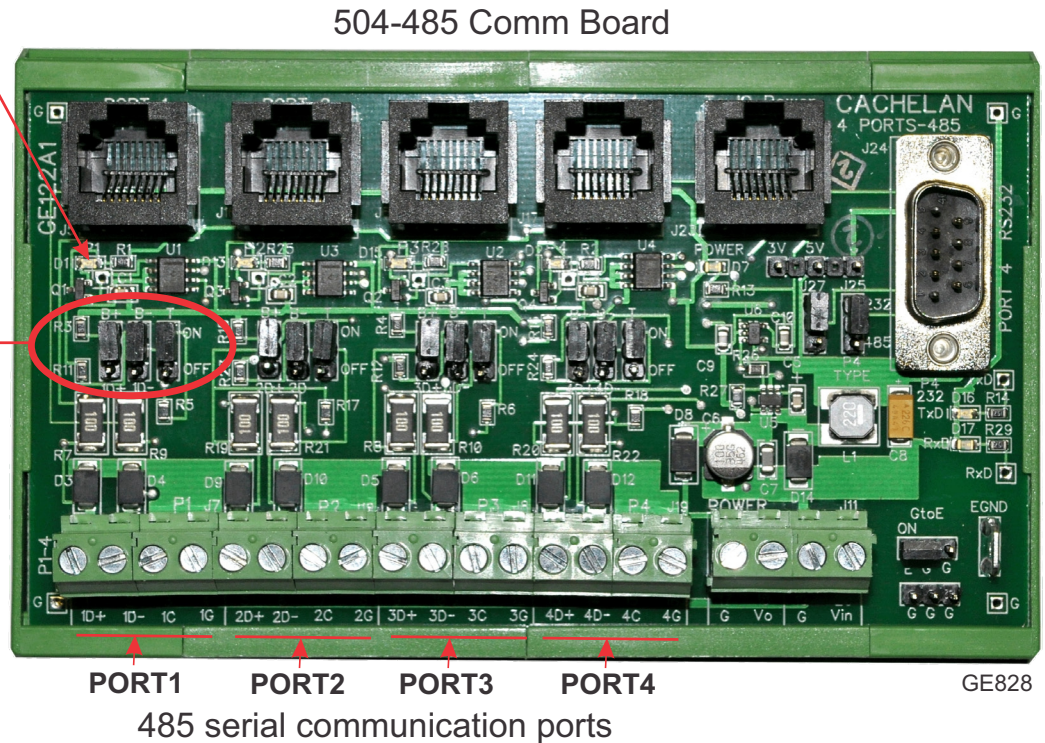

K135 Status Indicator Interpretation

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

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. The Power and Ready lights should be on if the power supply is plugged in. The Link light on 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.

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	Xantrex GT
TYPE:	

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

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 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 after the URL. Once the website 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.

If the K135 gateway is successfully collecting data from the inverter, 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 serial connection to the inverter and that it is operating. When both lights are green the gages on the SITE screen will display live data and graphs will begin recording site energy output.

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

Network Setup - M504 Gateway

On power up, the 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 gateway. If a dedicated IP address was programmed instead, subnet mask and DNS server address are required. This needs to be entered into the gateway before shipment. Network configuration is shown on the gateway label and the Configuration Settings page in the doc pouch. Once the gateway 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 7 M504 Gateway Indicators

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

OFF

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

504-485 Comm Board

PORT1   PORT2   PORT3   PORT4

485 serial communication ports

GE828

LED	NORMAL	STATUS
	INDICATOR 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

GE829

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 .
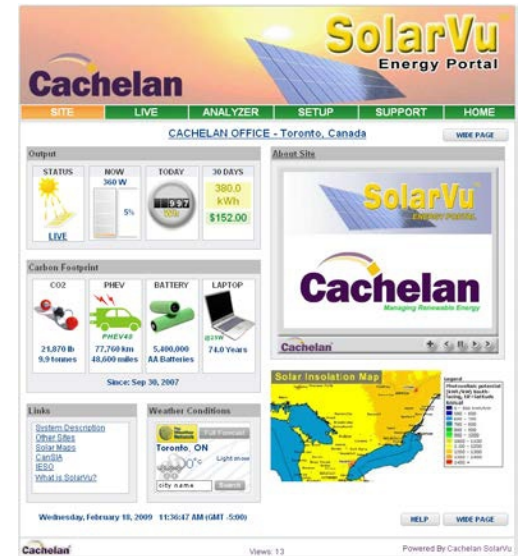
Help guide

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.
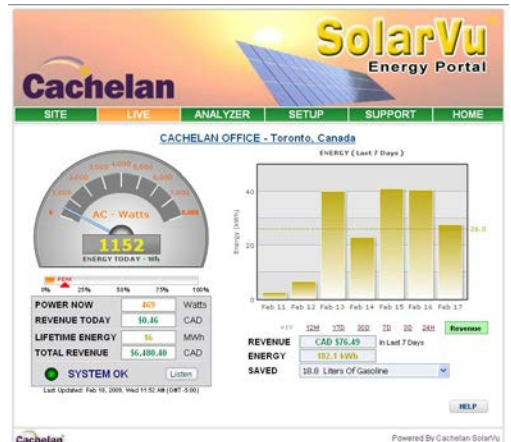
Site Summary Screen

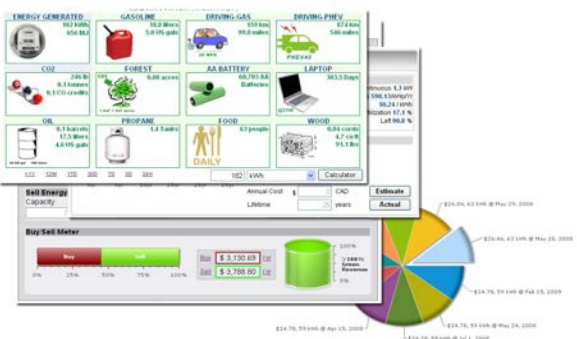*Select wide screen view for public display on an HDTV*

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.

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.

LIVE view shows current conditions

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

Xantrex GT (North Array)							
	DC INPUT	POWER	903.0 W	Volts	294.1 V	Amps	3.07 A
	AC OUTPUT	POWER	793.0 W	Volts	212.4 V	Amps	3.90 A
Inverter AC Watts	PERFORMANCE	Efficiency	87.8 %	Frequency	60.0 Hz	Heat Sink	37 C
793	TODAY	Energy	7,132 Whr	Max Power	3.35 kW	Online	08h 20m
	LIFETIME	Energy	8,151 kWh	Revenue	$ 3,423.42	Run Time	607 Days
	Listen ⬤ Last Data Updated:			Feb 26, 2009, Thu 3:42 PM (GMT -5:00)			
	Listen ⬤ Last Communication:			Feb 26, 2009, Thu 3:42 PM (GMT -5:00)			

Xantrex GT (South Array)							
	DC INPUT	POWER	727.0 W	Volts	300.4 V	Amps	2.42 A
	AC OUTPUT	POWER	640.0 W	Volts	211.8 V	Amps	3.13 A
Inverter AC Watts	PERFORMANCE	Efficiency	88.0 %	Frequency	60.0 Hz	Heat Sink	36 C
640	TODAY	Energy	5,609 Whr	Max Power	2.36 kW	Online	08h 18m
	LIFETIME	Energy	8,175 kWh	Revenue	$ 3,433.50	Run Time	607 Days
	Listen ⬤ Last Data Updated:			Feb 26, 2009, Thu 3:42 PM (GMT -5:00)			
	Listen ⬤ Last Communication:			Feb 26, 2009, Thu 3:42 PM (GMT -5:00)			

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.

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

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

Cachelan Technical Support
contactus@cachelan.com
905.470.8400 x228