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 K135 gateway which continuously transfers data from the inverter(s). This guide explains how to connect the K135 gateway to AE250 inverters equipped with ModBus 485 serial communications. The AE250 is also available with Modbus over TCP/IP but this connection is covered in a separate document

Each inverter must have a RS485 communication card installed which is normally a standard feature. To access SolarVu from a browser, the inverters are connected to the internet through a Cachelan Kyoto K135 gateway. The K135 connects to multiple inverters using twisted pair wire, typically cat5e, daisy chained to multiple inverters. An RJ45 ethernet jack, connected to the LAN network and 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 as shown in figure 1.

K135 Installation

Mount the SolarVu enclosure with conduit to the inverter for the RS485 serial cable, ethernet cat5e cable and 120VAC control power. Normally this enclosure will be in the same electrical room as the inverter, however, the RS485 serial cable can run long distances, over 1000 feet, if necessary.

Power Supply: Temporarily unplug the K135 power dongle. Wire 120VAC control power from a suitable 15A circuit to the the internal receptacle and replace the cover securing the dongle with the reusable cable tie suppled.

RS485 Serial: Consult theAE installation manual and fig 3 for location, wiring and slave address setting of the RS485 serial communications. Route twisted pair cable through the inverter cable entry holes away from power conductors to the terminals marked D+ D- REF as shown in fig 2. Connect the other end of the twisted pair cable in the SolarVu enclosure to the K135 gateway terminals as shown in fig 2. 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.
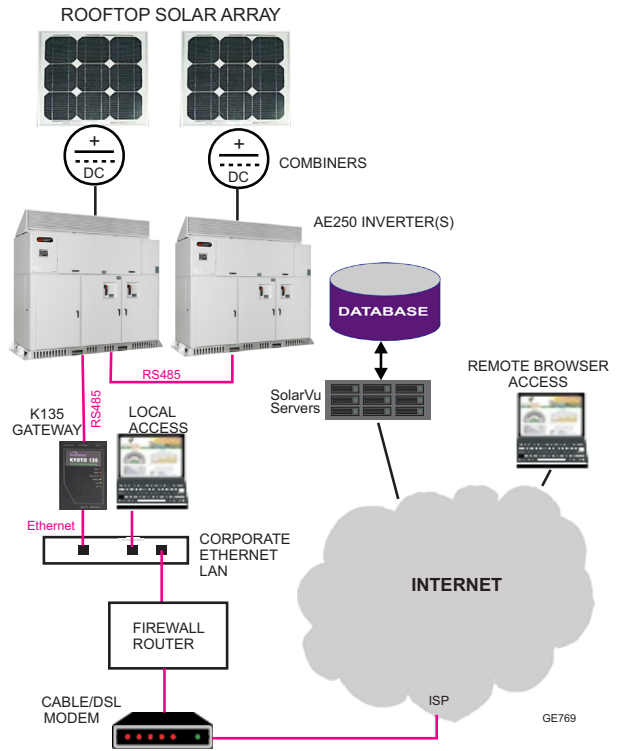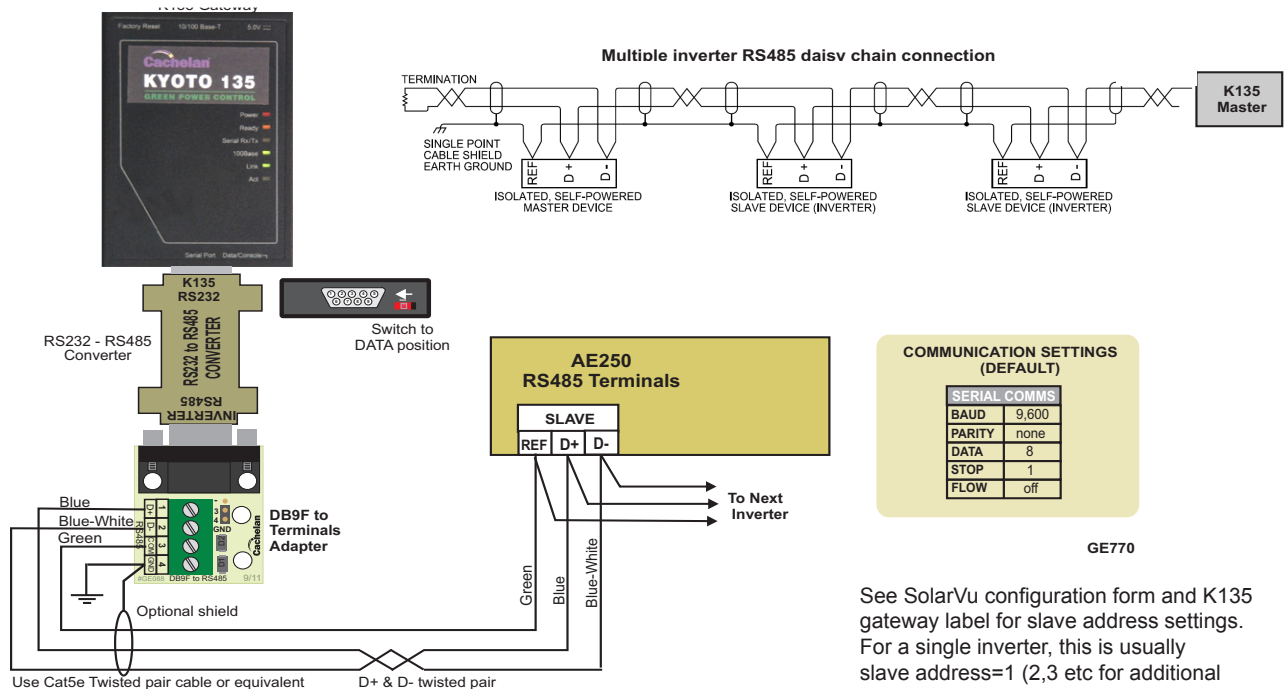
Fig 1 Internet Connection

Fig 2 K135-AE250 connections

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

COMMUNICATION SETTINGS (DEFAULT)

GE770

See SolarVu configuration form and K135 gateway label for slave address settings. For a single inverter, this is usually slave address=1 (2,3 etc for additional inverters)
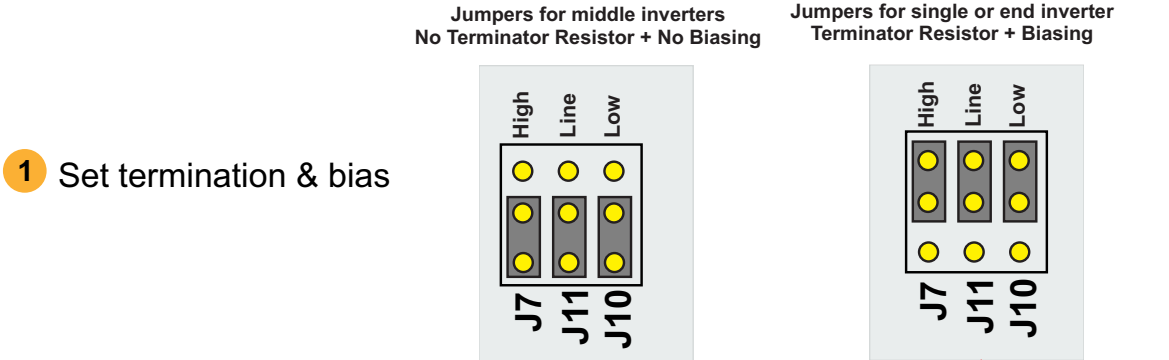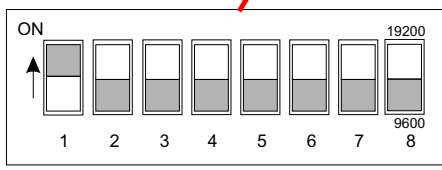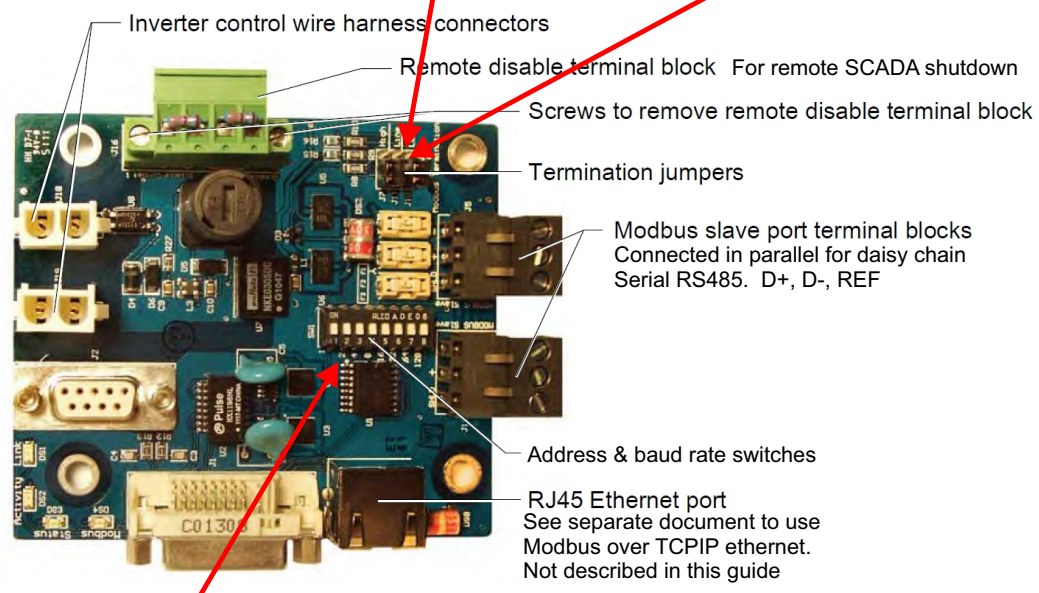
Communications Configuration

Each inverter must have a unique slave address and baud rate to match the K135 gateway master settings shown on the SolarVu configuration form. It is important that these are set correctly or there will be no communication between the K135 gateway and the inverters. For a single inverter this is normally set to slave address=1, baud rate=9600. Additional inverters would be set to slave addresses 2,3 etc. For a single inverter, 485 biasing and termination should be set on. For more than one inverter, the biasing and termination are set off for all but the last inverter in the daisy chain. As shown in fig 3 biasing and termination is set with shorting jumpers. The slave address is set with DIP switches 1-7 as shown in the table. DIP switch 8 sets the baud rate which should be set off for 9600 baud.

Fig 3 RS485 Communication card settings

Jumpers for middle inverters
No Terminator Resistor + No Biasing

Jumpers for single or end inverter
Terminator Resistor + Biasing

① Set termination & bias

High Line Low

J7 J11 J10

High Line Low

J7 J11 J10

AE250 Comms Board

Inverter control wire harness connectors

Remote disable terminal block   For remote SCADA shutdown

Screws to remove remote disable terminal block

Termination jumpers

Modbus slave port terminal blocks
Connected in parallel for daisy chain
Serial RS485. D+, D-, REF

Address & baud rate switches

RJ45 Ethernet port
See separate document to use
Modbus over TCPIP ethernet.
Not described in this guide

ON   19200

1   2   3   4   5   6   7   8   9600

Unique slave address must be set to match K135 master
Switches shown for single inverter slave address 1, 9600 baud

② Set slave address & baud rate

Address	SWITCH NUMBER						
	1	2	3	4	5	6	7
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

GE792

Cachelan SMART GRID ENERGY

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 SolarVu™ server and begin transferring data from the inverter to the server.

K135 indicators and connections

Connect to RJ45 LAN (see IP settings)
RJ45 ETHERNET

Connect to 120VAC power supply
5Vdc POWER

Factory Reset   10/100 Base-T   5.0V

Cachelan®
KYOTO 135
GREEN POWER CONTROL

Power
Ready
Serial Rx/Tx
100Base
Link
Act

Serial Port   Data/Console

RS232 SERIAL PORT
Connect to inverter

COMMUNICATION MODE SWITCH
← Data mode - left

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.

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.

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: Xantrex GT

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

Xantrex GT (North Array)

DC INPUT	POWER	1,013.0 W	Volts	295.3 V	Amps	3.43 A
AC OUTPUT	POWER	898.0 W	Volts	212.4 V	Amps	4.37 A
PERFORMANCE	Efficiency	88.6 %	Frequency	60.0 Hz	Heat Sink	36 C
TODAY	Energy	5,325 Whr	Max Power	3.35 kW	Online	06h 27m
LIFETIME	Energy	8,150 kWh	Revenue	$ 3,423.00	Run Time	607 Days

Inverter AC Watts
898

Listen ● Last Data Updated: Feb 26, 2009, Thu 1:42 PM (GMT -5:00)
Listen ● Last Communication: Feb 26, 2009, Thu 1:42 PM (GMT -5:00)

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

PEAK
0%   25%   50%   75%   100%

POWER NOW	0	Watts
REVENUE TODAY	$1.01	CAD
LIFETIME ENERGY	16	MWh
TOTAL REVENUE	$6,480.80	CAD

● SYSTEM OK   Listen

Last Updated: Feb 18, 2009, Wed 4:42 PM (GMT -5:00)

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
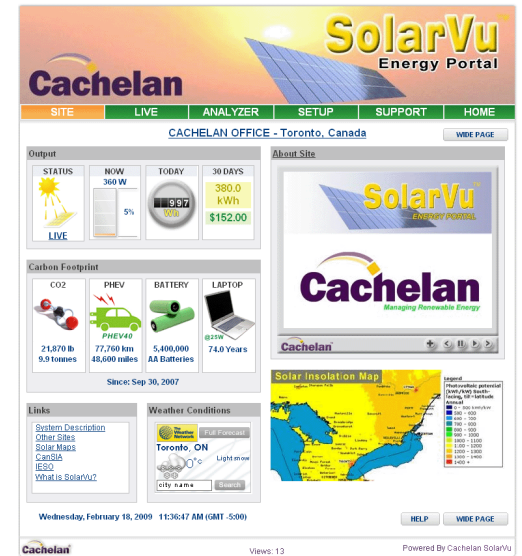
Select wide screen view for public display on an HDTV

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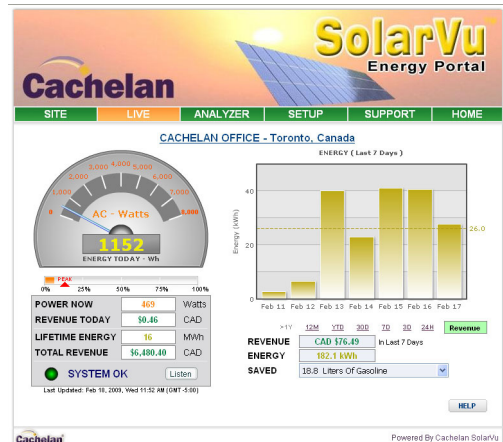
Trends are shown for the lifetime of the system using the graphs on the right. Select either an Energy or Revenue view using the button. Click the desired time period under the graph. Scroll over a data point with the mouse for more detailed information about that day. The carbon footprint pulldown gives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

SolarVu® Installation Guide for AE250 Inverter
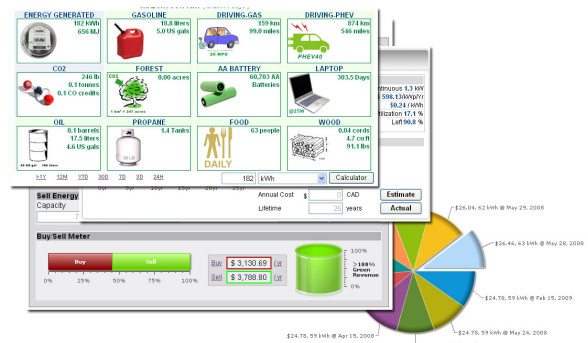
Analyzer - Troubleshooting

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

Click ANALYZER > INVERTER STATUS for troubleshooting

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.

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: Outback Mate
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

SolarVu® Installation Guide for AE250 Inverter