

YASKAWA **SOLECTRIA SOLAR**

PVI 14TL **PVI 20TL**

INSTALLATION AND OPERATION MANUAL Revision G

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IMPORTANT REGISTRATION AND WARRANTY INFORMATION

For warranty to become active, this inverter must be registered. To activate warranty and register inverter, please visit the link below.

www.solectria.com/registration

IMPORTANT SAFETY INSTRUCTIONS

In this manual “inverter” or “inverters” refers to the inverter models: PVI 14TL and PVI 20TL, unless one of the specific models is noted.

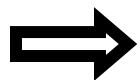
This manual contains important instructions that shall be followed during installation and maintenance of the inverter.

To reduce the risk of electrical shock, and to ensure the safe installation and operation of the inverter, the following safety symbols are used to indicate dangerous conditions and important safety instructions:



WARNING: This indicates a fact or feature very important for the safety of the user and/or which can cause serious hardware damage if not applied appropriately.

Use extreme caution when performing this task.



NOTE: This indicates a feature that is important either for optimal and efficient use or optimal system operation.



EXAMPLE: This indicates an example.

SAVE THESE INSTRUCTIONS

IMPORTANT SAFETY INSTRUCTIONS

- All electrical installations shall be performed in accordance with the local, American or Canadian electrical codes.
- The inverter contains no user serviceable parts. Please contact Solectria Renewables or a Solectria Renewables authorized system installer for maintenance. See Appendix C for Solectria Renewables contact information and authorized system installers.
- Before installing or using the inverter, please read all instructions and caution markings in this manual, on the inverter, as well as on the PV modules.
- Connection of the inverter to the electric utility grid must be completed after receiving prior approval from the utility company and must only be performed by qualified personnel.
- Completely cover the surface of all PV modules with an opaque material before wiring them. PV arrays produce electrical energy when exposed to light and could create a hazardous condition.



DANGER!

Danger to life due to fire or explosion:

Despite careful construction, electrical devices can cause fires.

-Do not mount the inverter on flammable construction materials.

-Do not mount the inverter in areas where highly flammable materials are stored.

-Do not mount the inverters in areas with a risk of explosion

SAVE THESE INSTRUCTIONS

PRESCRIPTIONS DE SECURITE IMPORTANTES

- Tous les travaux d'installation électrique doivent être exécutés en conformité aux normes électriques locales ainsi qu'à la norme nationale américaine et canadienne.
- Le PVI ne contient aucune pièce requérant un entretien effectué par l'utilisateur. Pour toute maintenance, veuillez consulter Solectria Renewables ou un installateur agréé par Solectria Renewables (les coordonnées de Solectria Renewables et des installateurs agréés sont indiquées sur le site web de Solectria Renewables: www.solren.com).
- Avant d'installer ou d'utiliser le PVI veuillez lire toutes instructions et toutes les mises en garde présentes dans ce manuel, sur le SGI et sur les modules PV.
- Le raccordement du PVI au réseau électrique ne doit être effectué qu'après avoir obtenu une entente d'interconnexion auprès de la compagnie locale de distribution électrique et uniquement par du personnel autorisé et qualifié.
- La surface de tous les capteurs PV doivent être recouverte entièrement d'un matériel opaque

- (noir) avant de procéder au câblage. Les capteurs PV exposés a la lumière produisent du courant électrique susceptible de créer une situation de risque.

CONSERVEZ CES INSTRUCTIONS

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1. Introduction

The PVI 14TL and PVI 20TL are commercial, dual MPPT, three-phase grid-tied transformerless PV inverters designed to be interconnected to the electric utility grid. The inverter is listed for use with ungrounded (floating) PV arrays only. By following this manual the inverter can be installed and operated safely. This installation guide is used as a reference for commissioning and as a guideline on how to use the inverter most effectively.

Feeding power back to the grid involves conversion of the DC voltage from the PV array to grid compatible AC voltage by inverting DC to AC. This unit feeds power into a standard, three-phase commercial, industrial, institutional or electrical utility facility's electrical system which is connected to the electrical grid.

If the PV system and inverter are providing the same amount of electrical power that the facility is using, then no power is taken from or fed into the utility grid. If the facility is using more power than the PV system is providing, then the utility grid provides the balance of power. If the facility is using less power than the PV system is generating, then the excess is fed into the utility grid.

Be sure to follow local regulations regarding net metering and interconnection in your local area. Note that some utilities need to change their revenue kWh meter for proper net metering measurement and billing.

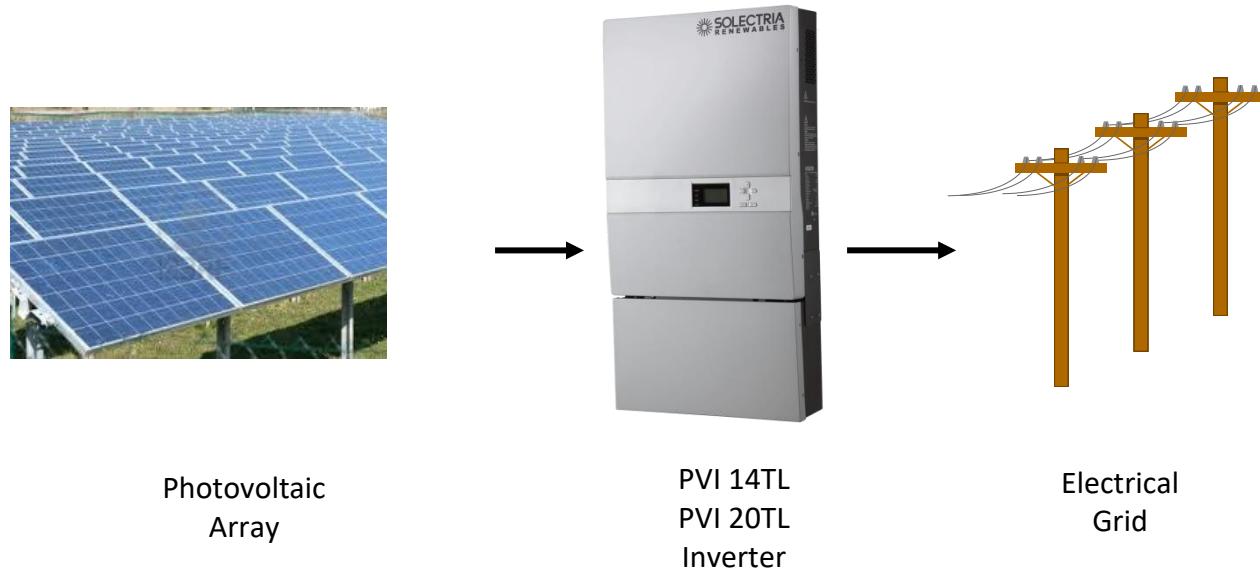
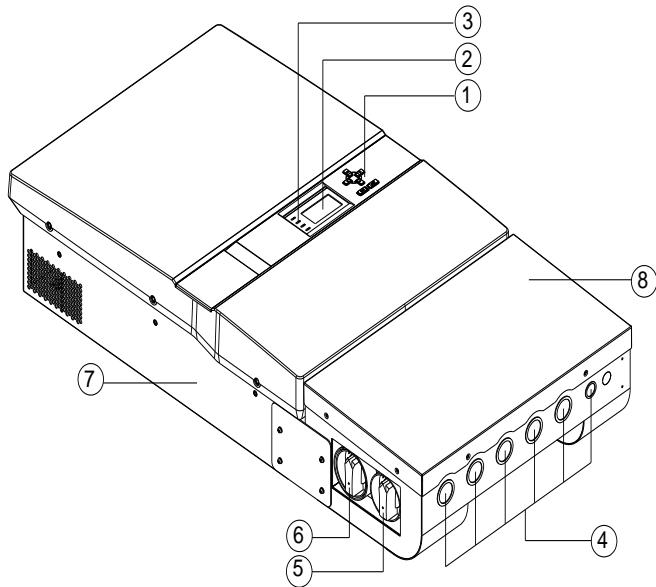


Figure 1.1 – Grid-Tied Inverter Application

PVI 14TL Inverter Enclosure



① Control Keys

There are 6 control keys to switch between display menus and to configure the settings on the LCD.

② LCD

LCD screen displays all measured values and parameters.

③ LED indicators

There are four LED indicators used to signal the operating status of the inverter.

④ Conduit Knockouts

From left to right:
DC inputs and equipment ground (4),
AC output & ground terminals (1)
Signal port (1)
A Spare to be used as needed (1)

⑤ DC disconnect Switch

Built-in, lockable disconnect switch used to disconnect the DC input to the inverter

⑥ AC disconnect Switch

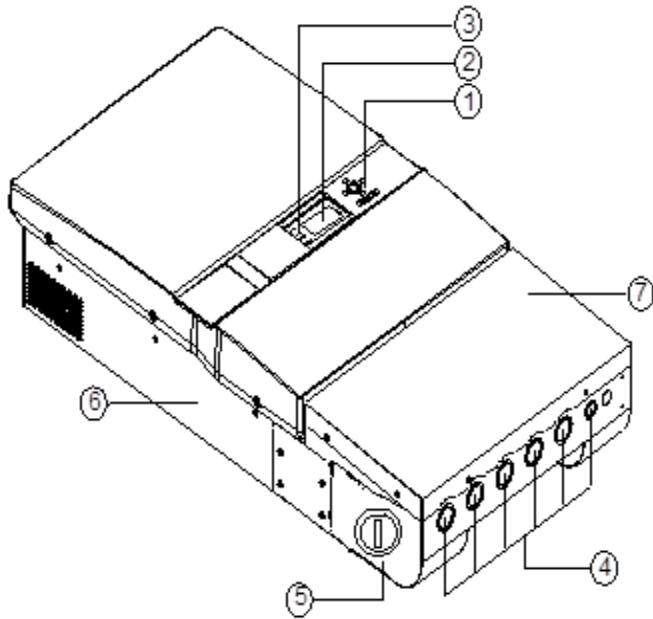
Built-in, lockable disconnect switch used to disconnect the AC output from the PV inverter.

⑦ Main housing (does not contain any serviceable parts, opening this section voids Inverters warranty)

⑧ Wiring Box

Figure 1.2 – PVI 14TL Inverter Interface

PVI 20TL Inverter Enclosure



① Control Keys

There are 6 control keys to switch between display menus and to configure the settings on the LCD.

② LCD

LCD screen displays all measured values and parameters.

③ LED indicators

There are four LED indicators used to signal the operating status of the inverter.

④ Conduit Knockouts

From left to right:
DC inputs and equipment ground (4),
AC output & ground terminals (1)
Signal port (1)
A Spare to be used as needed (1)

⑤ Combined AC and DC disconnect Switch

Built-in, lockable disconnect switch used to disconnect the DC input from the array and the AC output from the grid

⑥ Main housing (does not contain any serviceable parts, opening this section voids Inverters warranty)

⑦ Wiring Box

Figure 1.3 – PVI 20TL Inverter Interface

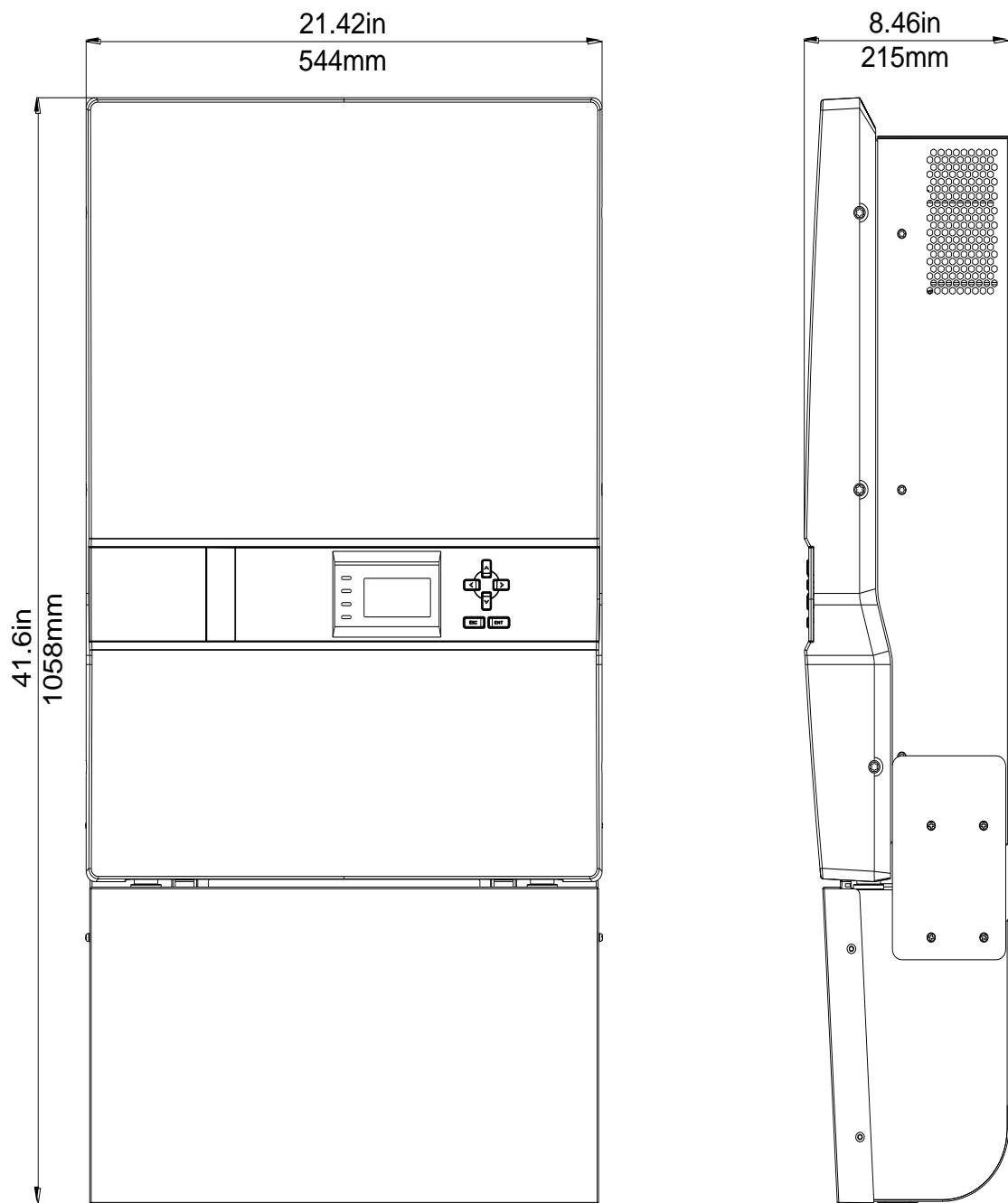


Figure 1.4 – PVI 14TL & PVI 20TL Inverter Dimensions

2. Site Preparation and Inverter Placement

The inverter is comprised of a Type 3R enclosure containing electrical and electronic components and AC and DC integrated disconnects.

 **NOTE:** If the inverter is mounted outside, ensure that the enclosure remains closed during the installation process in case of rain or snow. Leaving the cover off during installation will void the warranty. Only the wiring box cover should be removed during wiring. The inverter section cover remains on at all times.

 **NOTE:** It is recommended to store the inverter indoors before installation. If the inverter is to be stored outdoors before being installed and commissioned, care must be taken to avoid condensation inside the unit.

2.1 Criteria for device mounting:

- Because the power electronics are within the rainproof enclosure, the inverter can be mounted outdoors.
- The maximum life for the inverter can be achieved by mounting the unit in a clean, dry and cool location.
- For optimal electrical system efficiency, use the shortest possible AC and DC cables and use the maximum allowable cable size.
- Install the inverter in an accessible location following local electric codes for enclosure proximity to other equipment.
- Although the inverter is designed to function at full power continuously up to 50°C ambient temperature, for optimal inverter life and performance, do not mount the inverter in direct sunlight, especially in hot climates. If the unit must be mounted in direct sunlight a sun-shield is recommended but not required. It is recommended that the inverter is mounted on the north side of buildings or on the north side of a ground mount PV array.



CAUTION:

Please follow these guidelines:

Be sure to verify load capacity of wall or mounting area where the inverter would be mounted.

Inverter Model	Weight
PVI 14TL	141 lbs.
PVI 20TL	132 lbs.

Table 2.1 – Inverter Weight

- The ambient temperature must be between -25°C and $+50^{\circ}\text{C}$ for full power and continuous operation. The inverter will automatically reduce power or may shut down to protect itself if ambient air temperature is outside the normal operating range of -25°C to 50°C .
- The National Electrical Code (NEC) requires the inverter to be connected to a dedicated circuit and no other outlets or device may be connected to this circuit. See NEC Articles 690 and 705. The NEC also imposes limitations on the size of the inverter and the manner in which it is connected to the utility grid. See NEC Articles 690 and 705 for guidance within the US.
- The cooling air exhausts are at the left, right and back of the inverter. As the air intake is below the inverter section of the unit, there should be at least 24 inches of clear space at the bottom of the enclosure. Air should be able to flow all around the unit for proper ventilation. It is also recommended to have at least 12 inches of clearance on the left and right sides. Air should be able to flow behind the unit from below it to above it. See figure 3.3 for details.
- A minimum distance of 12 inches must be clear above the inverter for ventilation.
- If you are installing the inverter in a utility vault or electrical closet, the air circulation must be sufficient for heat dissipation. Provide external ventilation to maintain an ambient condition of 50°C or less for full power. The ambient temperature should be kept as low as possible at all times for optimal inverter operation and life.

3. Inverter Mounting



WARNING: Any lifting or moving of the inverter requires at least two people.
Moving of the crate/pallet requires at least three people.

3.1 Checking for Shipping Damage

The inverter is thoroughly checked and tested rigorously before it is shipped. Even though it is packed in a crate and pallet for delivery, the inverter can be damaged during shipping by poor handling, trucking or transfer station activity.

Please inspect the inverter thoroughly after it is delivered. If any damage is seen, immediately notify the shipping company to make a claim. If there is any question about potential shipping damage, contact Solectria Renewables. Photos of the damage will be helpful in documenting potential shipping damage.

- Do not accept the unit if box or pallet is visibly damaged or if you note visible damage when signing shipping company receipt.
- Note damage on shipping papers with the truck driver. Report damage immediately to the shipping company.
- Do not remove the unit from pallet/packaging if damage is evident.
- If it is determined that the unit must be returned, a RMA number must be obtained from Solectria Renewables prior to shipping the unit back.

3.2 Removing the Inverter from the Crate/Pallet and Moving the Inverter into Place

It is recommended to keep the inverter secured in the crate/pallet and move it as close as possible to the final location prior to removing the inverter from the crate/pallet. To remove the crate from pallet, unscrew the #2 Phillips screws from bottom of the crate while holding it on pallet. Then lift the crate in order to remove the inverter.

→ **NOTE:** Failure to follow these lifting guidelines may cause structural damage to the inverter and void the warranty.



WARNING: Do not install the inverter on or over combustible surfaces or materials.



WARNING: Severe injury or death could occur if the inverter mounting fails and falls on a person.

→ **NOTE:** The weight of the inverter will exert an added load to the wall or area where mounted. Be sure to verify proper load capacity of mounting area.

→ **NOTE:** Always use all the (6) mounting plate fasteners.

3.3 Inverter Positioning and Mounting

Correct mounting position for the inverter is vertical. A maximum tilt of 15° in backward direction is allowed (as shown in figure 3.1).

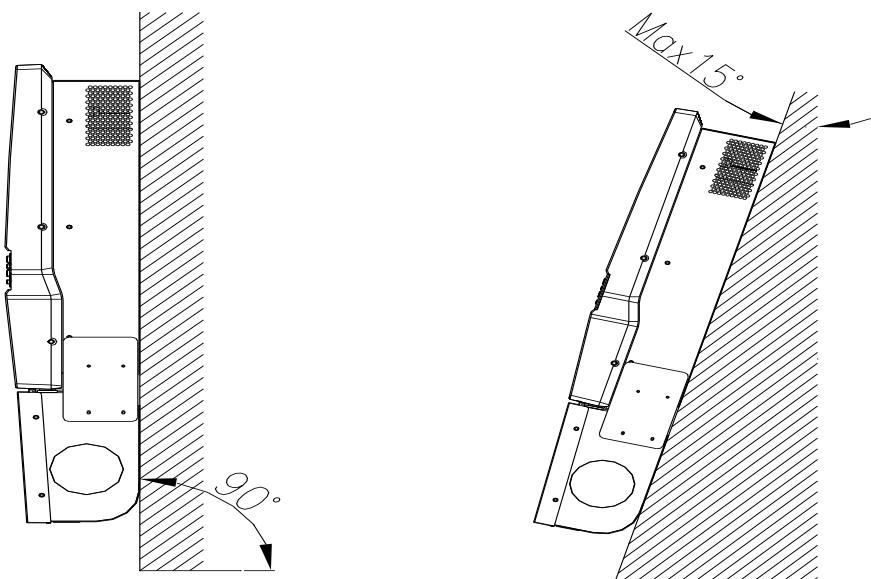


Figure 3.1 Mounting of Inverter - Allowed

Do not install the inverter forward tilted, upside down or laying on its back (figure 3.2).

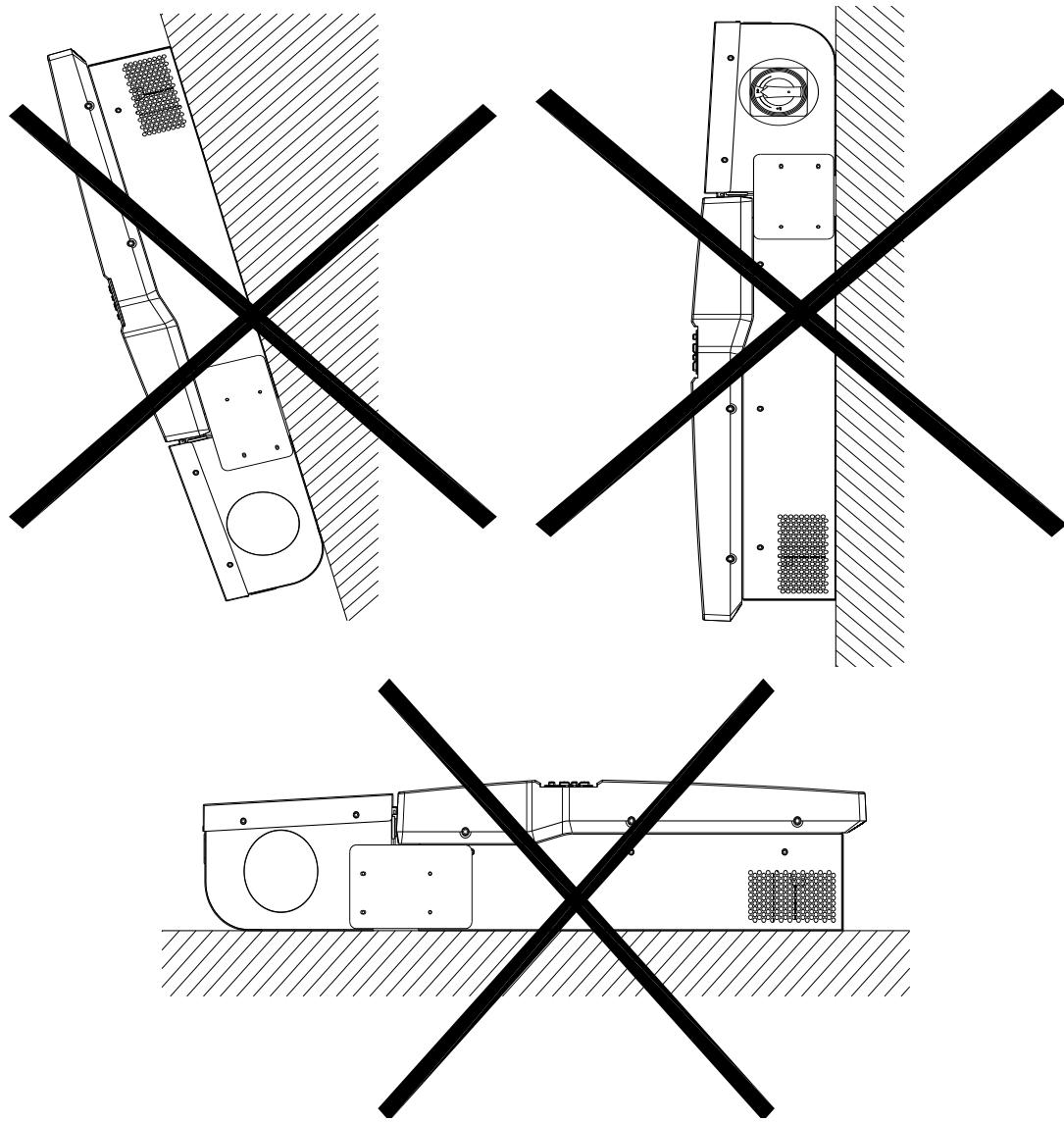


Figure 3.2 Mounting of inverter – Not Allowed

The minimum distances that must be met are shown in Figure 3.3

- There should be a minimum of ≥ 12 inches of space available on both sides. In the case of two or more inverters are installed side by side then there should be minimum of 24 inches available between inverters for adequate access and cooling.
- There should be a minimum of ≥ 24 inches of space available from the bottom of the inverter.

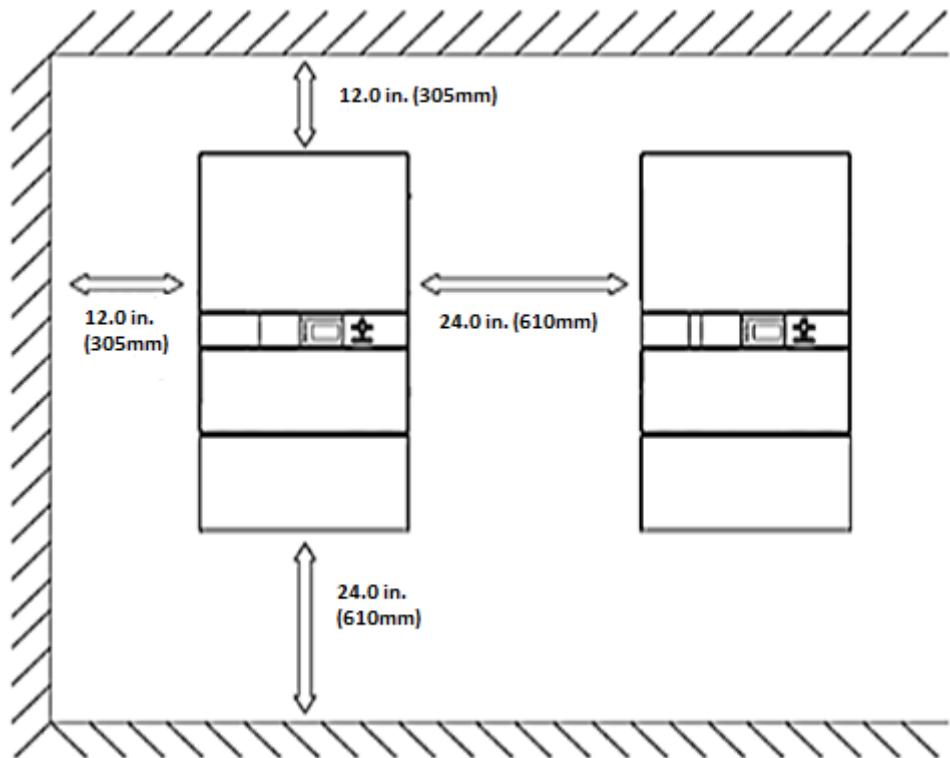
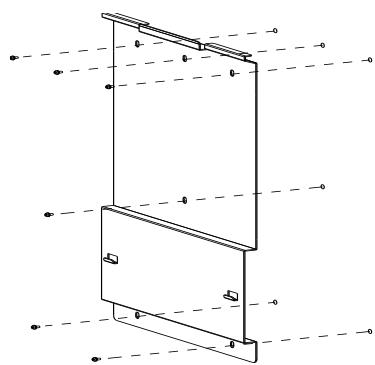


Figure 3.3 Clearance Requirements

Remove the side covers between the wiring box and the inverter section to get access to the handles in order to lift the inverter safely. At least two people are required to lift the inverter. Return side covers when mounting is complete.



Drill 6 holes with a 13/32 inch drill bit and install expansion bolts (available in accessory box). Secure the bracket to the wall using six 5/16" X 25 screws as shown in Figure 3.4.

Figure 3.4 Inverter Wall Bracket Mounting

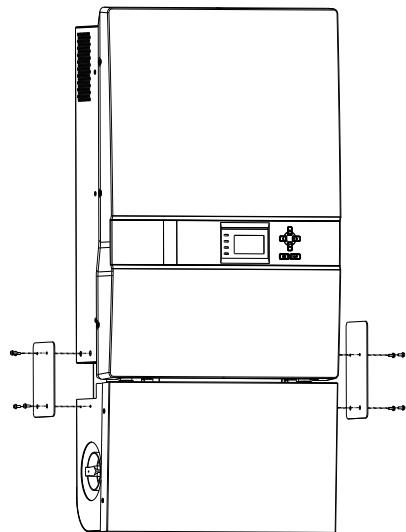


Figure 3.5 Inverter Side Panels

Remove the two side covers prior to inverter installation as shown in Figure 3.5.

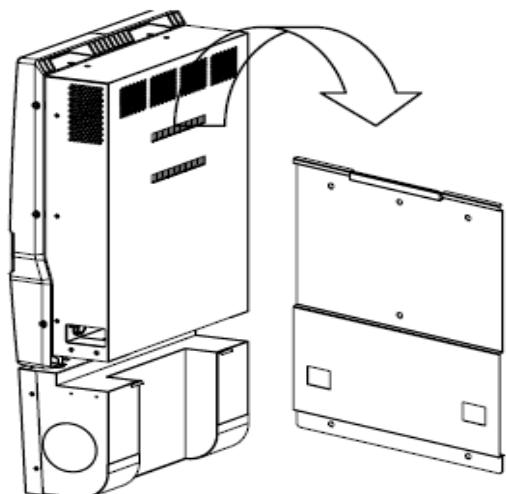


Figure 3.6 Mounting Inverter on Wall Bracket

Install the inverter on the wall bracket and make sure that the top and bottom hooks of the inverter are engaged with the bracket as shown in Figure 3.6.

Reinstall side cover on the inverter using four M4 x 12 screws (Torque: 10 in-lb).

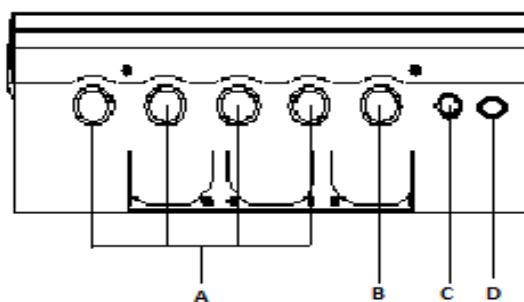
4. Grounding Connections



WARNING: All electrical installations shall be performed in accordance with all local electrical codes by electrically qualified personnel. Only make AC and DC connections directly to the terminals within the wiring box.

4.1 DC and AC Grounds

The inverter must be properly grounded in accordance with local code. The inverter wire terminals for PVI 14TL and PVI 20TL are shown below:



Position	Connection entry
A	Knockout holes for 1" or 1.25" conduit DC input wires and equipment ground
B	Knockout hole for 1" or 1.25" conduit AC output and ground wires
C	Knockout hole for 0.5" or 0.75" conduit communication wires
D	Spare knockout hole that can be used according to the customer's needs

Figure 4.1 DC input & equipment ground

PVI 14TL and PVI 20TL inverters have a ground bar with four terminals used to terminate the equipment ground (Torque 25 in-lb) and one stud that fits M5 nut to terminate the AC ground (Torque for M5 nut is 10 in-lb). Note: lug for stud is located in the accessory box



Warning: Ground per local codes and standard.

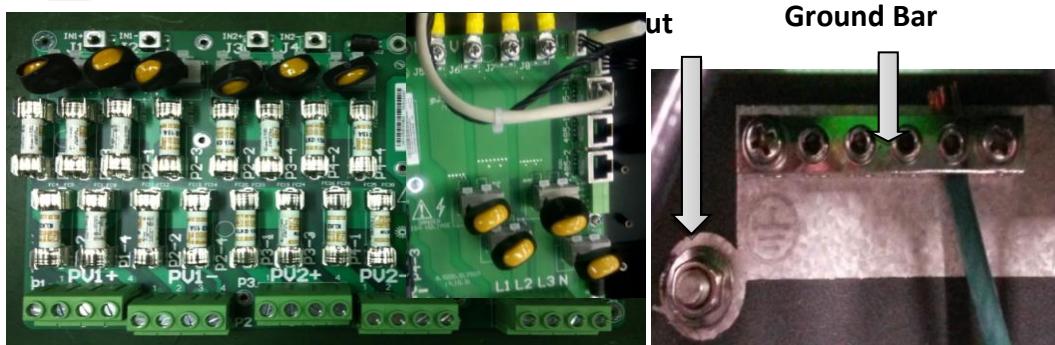


Figure 4.2 Wiring Connection

5. DC Connections from the PV Array



WARNING: All wiring connections at the inverter must be performed with the building AC source circuit panel/breaker off and the PV module strings disconnected. AC and DC disconnect switches at the inverter must also remain off during termination.



WARNING: All electrical wiring must be done by electrically qualified personnel in accordance to local and national electrical code.



WARNING: Before connecting the DC conductors of the PV array to the inverter, verify the polarity of the conductors.



WARNING: Open all fuse holders and remove fuses before wiring. Verify correct polarity and voltage before installing fuses.



WARNING: Before connecting the DC conductors of the PV array to the inverter fuse terminal or bypass them, verify that the DC voltage is less than 600Vdc in all conditions. DC voltages over 600V will damage the inverter. Configure the array such that the open circuit voltage will never exceed 600 Vdc. **Warranty is voided if more than 600Vdc is applied to the DC section of the inverter**



WARNING: Fuses in the inverter's fused combiner must only be replaced with the same type and rating fuses as originally installed.



WARNING: Strings must be balanced for optimum performance and AC output. When DC/AC ratio sizing, perform calculations on the zone level unless you intend to use the inverter in combined MPPT (default) mode. Maximum DC/AC oversizing ratio is 1.35 STC conditions of the modules. Each zone maximum input power is 9.45 kW for the PVI 14TL and 13.5 kW for the PVI 20TL. DC Input current per zone must also be within the following specification: 25A per zone for PVI 14TL and 35A per zone for PVI 20TL. Note for any application that may experience higher than 1000 W per m² on a regular basis, a smaller DC/AC ratio is recommended. Failure to follow these guidelines may result in damage to the inverter and may void your warranty.

A maximum of 16 total DC conductors (8 positive & 8 negative) can be connected and fused at 15A as shown in Figure 5.1 below:

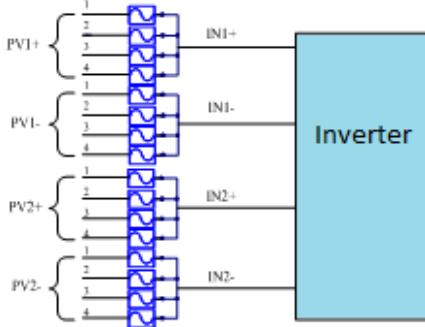
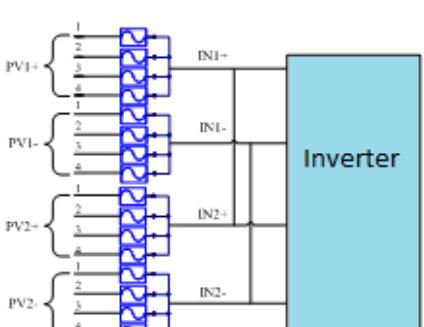
DC input	2 MPPTs working independently	1 MPPT working alone	Wires
8 strings			10AWG

Figure 5.1 String Configurations

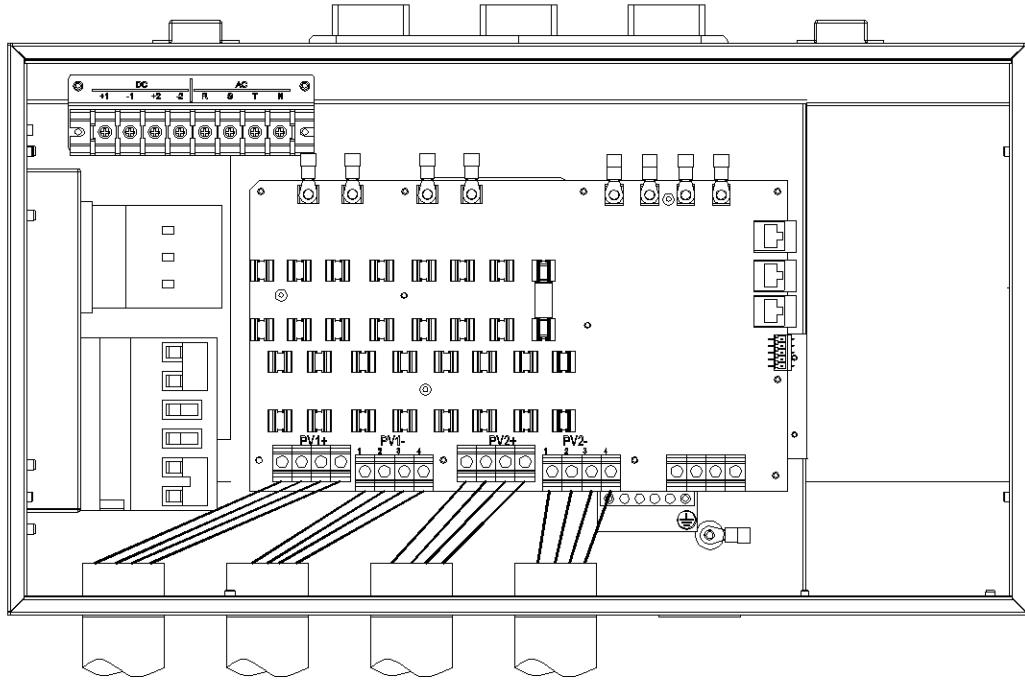


Figure 5.2 Diagram of Wire Connections For Use With Dual MPPT Zone

The standard configuration is “parallel mode: with 1MPPT working alone. Jumper wire between J1 & J3 for positive terminals, jumper second wire between J2 & J4 for negative terminals. If dual MPPT is needed remove the two jumper wires and re-torque the connections to 16 in-lbs. Figure 5.3

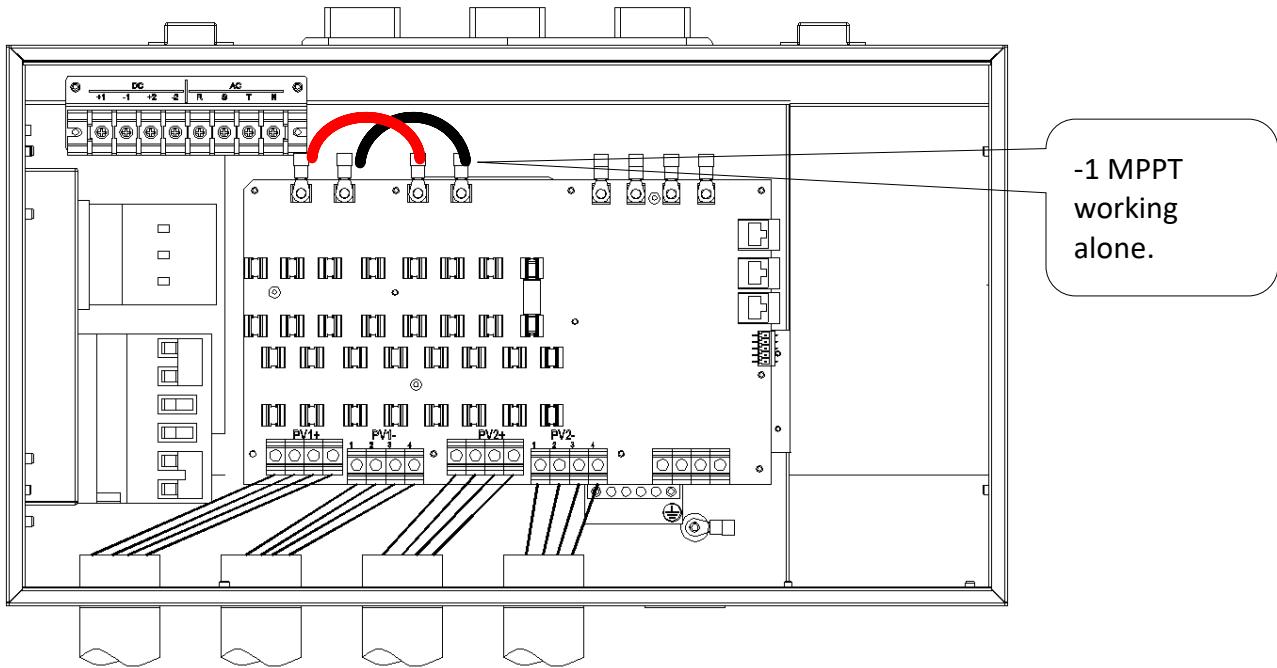


Figure 5.3 Diagram of Wire Connections For Use With One Combined MPPT Zone

90°C copper conductors must be used for wiring. The inverter terminals are listed for 75°C wire; see NEC 310.10 or the Canadian Electrical Code regarding temperature ratings of wire and terminals. The conductor size shall not be smaller than the 75°C wire size based on the ampacities given in table 310.16 of the NEC, ANSI/NFPA 70 and an additional derating factor as indicated by UL1741. Temperature derating factors, voltage drop and other considerations may dictate that larger than minimum wire sizes be used. Verify that any wire size choices meet local codes.

DC wiring connection point	Configuration	Max DC Wire Size	Conductors Torque (ALL)
DC terminal block 4-8 inputs	Standard use of integrated string combiner box and input fusing	10 AWG, 90°C Cu	10 in-lb
String combiner box bypass terminals, 2 inputs	Two standard inputs that bypass integrated string combiner box and use separate MPPT channels	8 AWG, 90°C Cu (Not recommended, see details below)	10 in-lb
String combiner box bypass terminals, 1 input	Single input that bypasses string combiner using a single MPPT channel	4 AWG, 90°C Cu (Not recommended, see details below)	10 in-lb

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Table 5.1 Wire Sizes Associated with Integrated Fused PV Combiner

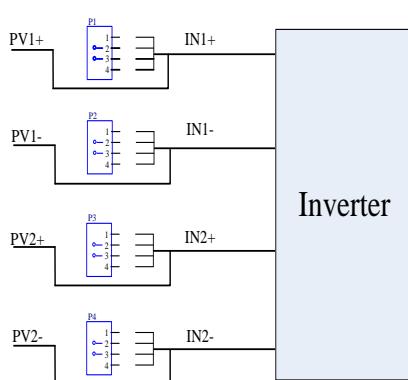
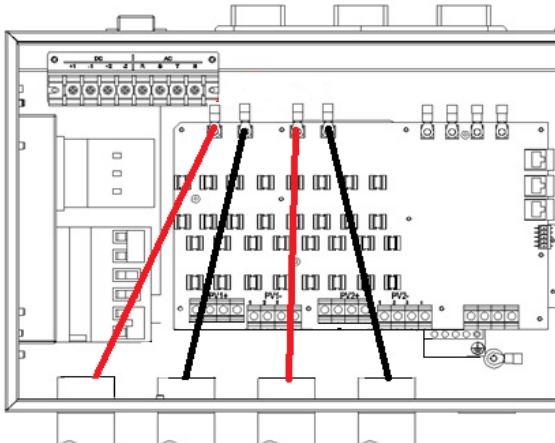
Using only one or two inputs are not recommended for best current sharing results. If needed, DC input wires can be connected to the inverter as showed in table 5.2 below.



Warning: DC fuses must be removed before any of the configurations in table 5.2 are allowed.



Warning: Fusing at the combiner box prior of the connecting to the inverter is required for all of the connections in table 5.2

DC inputs/ MPPT Zones	Configuration Type	Proper Wiring	Wire
2 Inputs -2 MPPT Zones			8 AWG

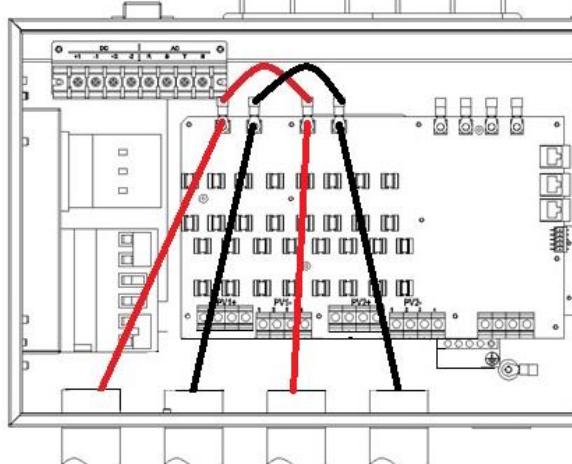
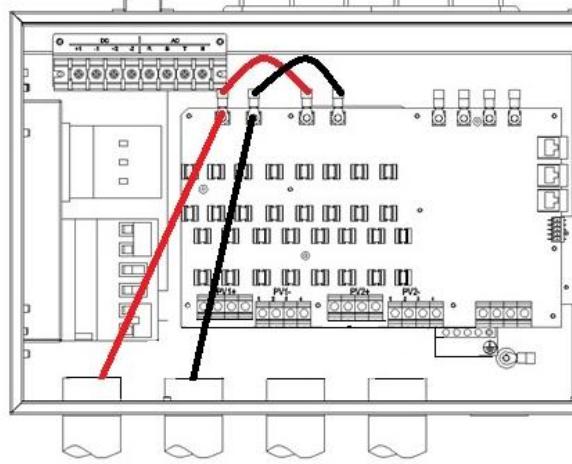
<p>2 Inputs - 1 MPPT Zone</p>	<p>Diagram showing two PV strings (PV1 and PV2) connected to an inverter. Each string has a diode (D1, D2) in series with the positive terminal. The negative terminals are connected to the inverter inputs IN1- and IN2-. The inverter is labeled "Inverter".</p>	 <p>8 AWG</p>
<p>1 Input - 1 MPPT Zone</p>	<p>Diagram showing one PV string (PV1) connected to an inverter. The PV1+ terminal is connected to the inverter input IN1+. The PV1- terminal is connected to the inverter input IN2-. The inverter is labeled "Inverter".</p>	 <p>4 AWG</p>

Table 5.2 Internal String Combiner Bypass Options

6. AC Connections at the Inverter

For the 3-phase AC wiring, for both PVI 14TL and PVI 20TL, five conductors are recommended, one per phase along with a neutral and an AC equipment ground as per local requirements. 90°C rated copper conductors must be used. The integrated disconnect switch terminals are listed for 75°C wire; see NEC 310.10 or Canadian Electrical Code regarding temperature ratings of wire and terminals. . The conductor size shall not be smaller than the 75°C wire size based on the ampacities given in table 310.16 of the NEC, ANSI/NFPA 70 and an additional derating factor as indicated by UL1741. Temperature derating, voltage drop and other considerations may dictate that larger than minimum wire sizes be used. Verify that wire size choices meet local codes and are properly sized to reduce voltage drop.

Inverter Model	AC Voltage	Typical Number of AC Conductors	Minimum AC Wire Size	Maximum AC Wire Size	Torque	Maximum Continuous Output Current	Recommended Min. Interconnection Breaker/Fuse Size
PVI 14TL	208VAC	4 (1 per phase) plus neutral	8 AWG, 90°C Cu	8 AWG, 90°C Cu	10 In-lb	39 A	50 A
PVI 20TL	480VAC	4 (1 per phase) plus neutral	8 AWG, 90°C Cu	8 AWG, 90°C Cu	10 In-lb	25.5 A	35 A

Table 6.1 AC Customer Connections and Interconnection Information

The inverter includes an M5 stud for the connection of an AC Equipment Grounding Conductor (EGC). The stud can accept a single copper conductor ranging from 8 to 10 AWG. AC ECG shall be sized per local code requirements. The AC EGC is connected to the stud via an M5 nut. A crimp lug is available in the accessory box provided. Torque: 10 in-lbs.

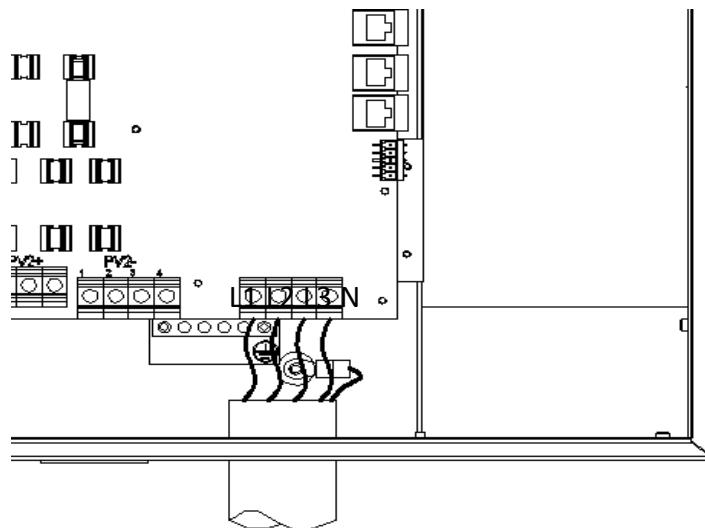


Figure 6.1 AC Wire & Grounding connections

6.1 AC Interconnections to Grid

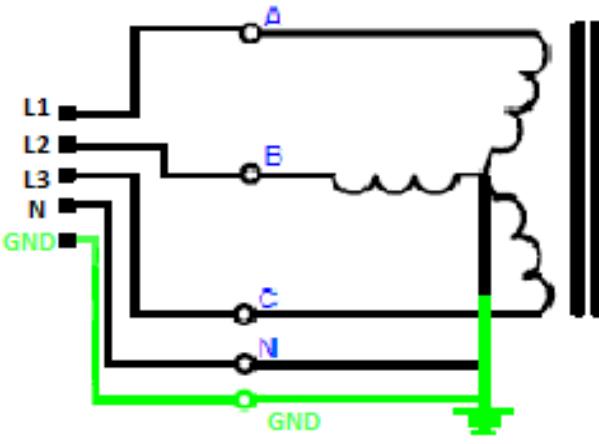
Description	Configuration	Inverter Compatibility
4 Wire WYE (3 phase + Neutral +GND)		Compatible with 14TL Compatible with 20TL
Other Configurations	All other configurations not mentioned in this document, such as Phase Corner Grounded Delta	Not compatible with 14TL Not compatible with 20TL

Table 6.2: Allowable AC interconnections to Grid

7. SolrenView External Monitoring

PVI 14TL and 20TL inverters include an option for a SolrenView gateway integrated with the inverters wiring box. This device can be used for the purpose of monitoring and data logging.

The SolrenView gateway can be factory installed, distributor installed, or field installed.

From the inverter a user can configure and monitor the inverter using a human-machine interface (HMI). This HMI consists of the LCD display and four buttons.

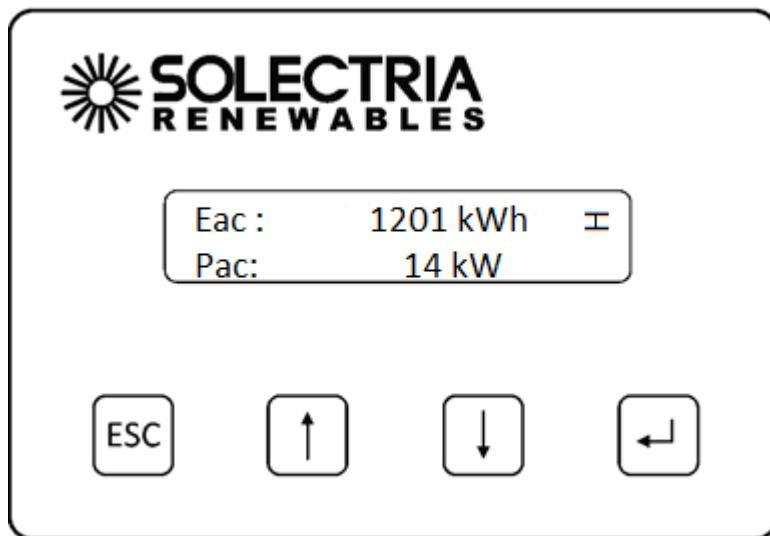


Figure 7.1 – SolrenView Gateway HMI



WARNING: SolrenView gateway connections must be made by qualified personnel only. To reduce the risk of electric shock, you should never attempt to open the inverter, DC, or AC enclosure doors, or perform any service or troubleshooting without prior training. Before attempting to service or troubleshoot the inverter, please read the entire manual.

The back side of SolrenView gateway provides connectivity to the data monitoring system. Solectria Renewables' own SolrenView.com data monitoring system can be interfaced using Ethernet over twisted pair.

7.1 SolrenView Logger Installation (If not pre-ordered from the factory)



WARNING: SolrenView gateway installation must be made by qualified personnel only. To reduce the risk of electric shock, you should never attempt to open the inverter, DC, or AC enclosure doors, or perform any service or troubleshooting without prior training. Before attempting to service or troubleshoot the inverter, please read the entire manual.

1. Locate the location where the SolrenView Gateway to be installed.

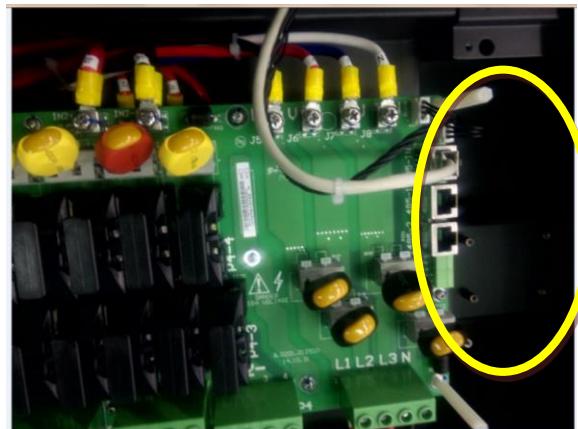


Figure 7.2 SolrenView Gateway Mounting Location in wiring box.



Figure 7.3 Mounting Location in Detail

2. Connect the SolrenView Monitoring Harness (WIH-030031) to the bottom of the SolrenView Gateway by plugging the six pin Molex connection into the bottom of the Gateway. The connector is keyed, so it cannot be installed incorrectly. Connectors are as follows:
3. Connect the green connector end of the SolrenView Monitoring Harness to the 5 pin socket on the Subcombiner PCB board at location P1004.
4. Mount the SolrenView Gateway into the mounting location, orientating the gateway as shown below (Torque to 8 in-lbs).



Figure 7.3 SolrenView Gateway Installed into Subcombiner

7.2 One Gateway (Up to 32 inverters)

For multiple inverters at one location it is possible to use one gateway with up to 32 inverters. Connect inverter's RS 485 together using standard RJ 45 Ethernet patch cords and plugging these into RJ 45 jacks at each inverter on right side of wiring board. Connect an Ethernet cable from the Ethernet jack on the logger installed in either the first or the last inverter to router or switch for connection to the customer's broadband internet service.

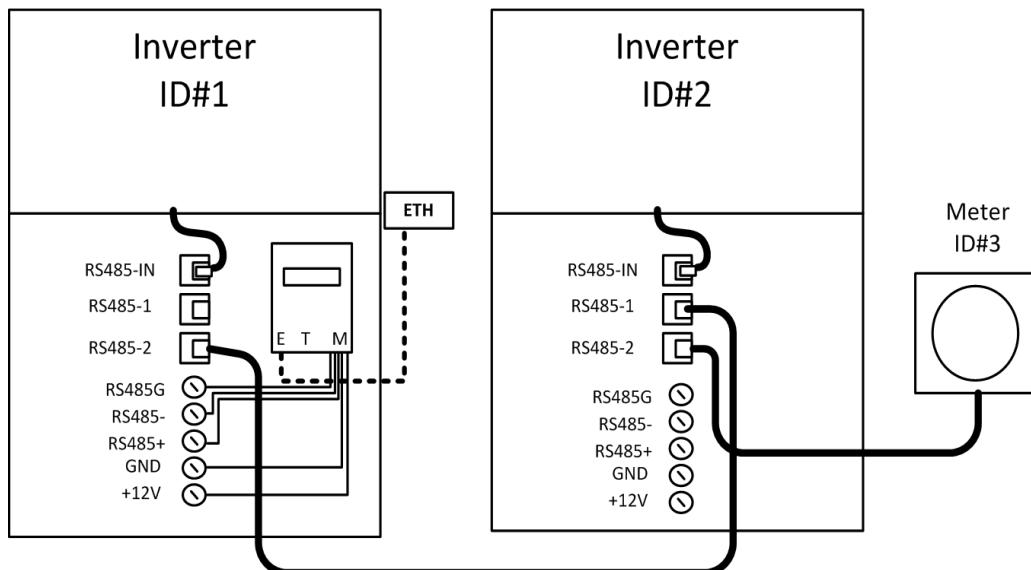


Figure 7.4 Multiple Inverters, Single SolrenView unit

7.3 Communication Connection

There are two RS485 signal ports on the inverter, labeled RS485-1 and RS485-2. The wires are labeled 1 to 8 from left to right, as shown in below:

No.	Color	Function
1	White orange	485+
2	Orange	N.C.
3	White green	485-
4	Blue	N.C.
5	White blue	N.C.
6	Green	N.C.
7	White brown	COM
8	Brown	N.C.

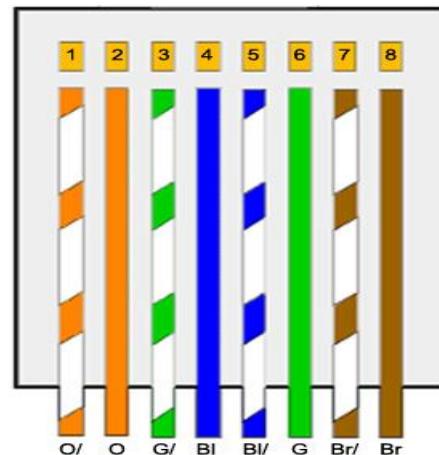


Table 7.1 Wiring required for RS-485 communications

7.4 Button Descriptions

The SolrenView HMI is controlled by four buttons.

These buttons are operated by momentarily pushing the center of the button.

The buttons perform the following functions:

ESCAPE		To move up a level from the current menu. To cancel changing a data value. Hold for two seconds to STOP or START the inverter from the Main Display
UP		To scroll up within the individual menu items. To increase a data value.
DOWN		To scroll down within the individual menu items. To decrease a data value.
ENTER		To enter into the selected menu. To begin to edit a data value. To accept a data value.

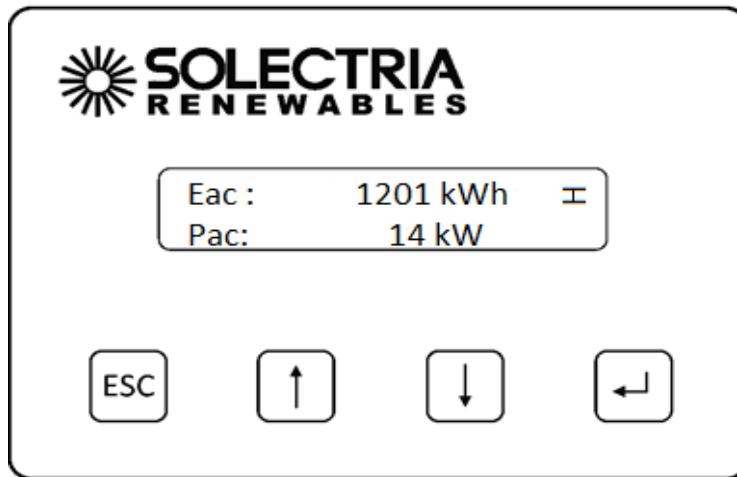


Figure 7.5 Main Display

During normal inverter operation the Main Display shows **AC Energy (Eac)** and **AC Power (Pac)**. The display updates every few seconds with new data from the inverter. Units are dynamically displayed based on the energy and power levels.

7.5 Accessing the Menu

From the **Main Display** press the **ENTER** button to access the menu.

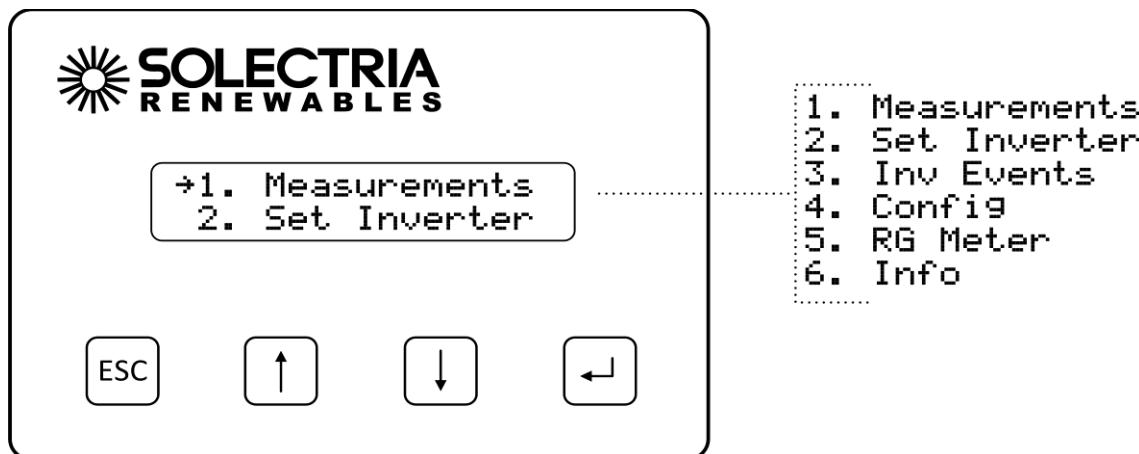


Figure 7.6 Main Menu

The **Main Menu** allows the user to configure and monitor the inverter.

The selected menu option is shown with an arrow on the left. Please note that the display only shows two menu options at a time and will scroll to show the other options.

Press the **DOWN** or **UP** button to change the selected menu option, **as indicated by the arrow**. Press the **ENTER** button to activate the selected function or submenu.

7.6 Establishing Ethernet Connectivity

Before SolrenView web-based monitoring can function the inverter must be networked to the Internet.

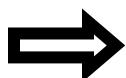
To connect the inverter to the network:

1. Locate the Ethernet port on the bottom of the SolrenView gateway.
2. Install a CAT5, CAT5e, or CAT6 networking cable between the SolrenView gateway and router/switch/firewall. If molded cables cannot be used we suggest using a network cable tester to ensure cable and crimp quality.

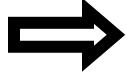
NOTE: *The green link and yellow activity LEDs only light when the SolrenView gateway is powered.*

7.7 Setting up TCP/IP Networking

Connection to the Internet and to the SolrenView web-based monitoring service requires a functioning TCP/IP protocol. This protocol runs over twisted pair Ethernet wiring and requires certain connections to properly operate. By default the SolrenView gateway should automatically configure TCP/IP address from a network router by using the DHCP protocol. In certain cases it may be necessary to override these settings or to manually configure the TCP/IP settings.



NOTE: The network router must be 10T capable.



NOTE: Customers using SolrenView AIR do not need to setup TCP/IP as this is done in the factory prior to shipping the inverter.

Viewing Current TCP/IP settings:

1. Select the **Info** function on the **Main Menu** and the press **ENTER** button.
2. Information on the inverter will be displayed including the IP, gateway, and netmask settings. Press the **ENTER** button to hold the display on the item of interest.

IP (DHCP):
10.0.0.101

Gateway (DHCP):
10.0.0.1

Netmask (DHCP):
255.255.255.0

In the above example, the IP address, gateway and netmask values are being automatically being set through the DHCP service. The exact values displayed will depend on the configuration of the network, but typically are in one of three ranges:

10.0.0.0	– 10.255.255.255
192.168.0.0	– 192.168.255.255
172.16.0.0	– 172.31.255.255

3. If the network is working on the Ethernet protocol level, but the SolrenView is unable to obtain settings through the DHCP service the following will typically be displayed:

IP (Fallback):
192.168.1.1

Gateway:
0.0.0.0

Netmask:
255.255.255.0

4. If the network is not working on the Ethernet protocol level, such as if the twisted pair Ethernet cable is not plugged in, the following will be displayed:

LAN IP:
Unknown

Gateway:
0.0.0.0

Netmask:
255.255.255.0

Manually Configuring Network Settings

To manually configure network settings:

1. Select **Config** from the **Main Menu** then press **ENTER**.
2. Select **LAN** from the **Config Menu** then press **ENTER**.
3. Select the **DHCP** function then press **ENTER** to edit the setting.
4. Press the **DOWN** button to turn **DHCP Mode Off** then press **ENTER** to save this setting.
The **DHCP Mode** setting will now show **OFF**.
5. Press the **DOWN** button to access the **Static IP** setting.
6. Press **ENTER** to modify the **Static IP** value.
7. Specify each of the four octet values (0-255), one at a time. Press the **UP** button to increment the octet. Press the **DOWN** button to decrement the octet. Press the **ENTER** button to accept the octet. Press the **ESCAPE** button to cancel entry at any point. When the fourth octet is entered the entry will be saved.

8. Press the **DOWN** button to access the **Gateway** setting.
Change in the same manner that the **Static IP** was modified.

9. Press the **DOWN** button to access the Netmask setting.
Change in the same manner that the **Static IP** was modified.

Automatically Configuring Network Settings

When shipped from the factory, the SolrenView gateway uses DHCP to configure the TCP/IP settings. If the gateway has been changed to use static IP address the following instructions will explain how to turn on DHCP.

To configure the SolrenView gateway to use DHCP:

1. Select **Config** from the **Main Menu** and press **ENTER**.
2. Select **LAN** from the **Config Menu** and press **ENTER**.
3. Select the **DHCP** function and press **ENTER** to edit this setting.
4. Press the **DOWN** button to turn **DHCP Mode On** and press **ENTER** to save this setting.
The **DHCP Mode** setting will now show **ON**.

Setting Fallback IP Address

When the SolrenView gateway is set to use DHCP, but is unable to acquire an IP address lease, it will “fallback” to using a specified IP address after a few seconds.

To specify a fallback IP

1. Select **Config** on the **Main Menu** and press **ENTER**.
2. Select **LAN** from the **Config Menu** and press **ENTER**.
3. Confirm that the **DHCP Mode** setting shows **ON**.
The Fallback IP is only available when DHCP is turned on.
4. Press the **Down** button to show the Fallback IP setting.
5. To change the Fallback IP, press the **ENTER** button.
6. Specify each of the four octet values (0-255), one at a time. Press the **UP** button to increment the octet. Press the **DOWN** button to decrement the octet. Press the **ENTER** button to accept

the octet. Press the **ESCAPE** button to cancel entry at any point. When the fourth octet is entered the entry will be saved.

7. Press the **DOWN** button to show the Gateway IP setting.

8. To change the Gateway, press the **ENTER** button.

9. When DHCP is on, the Gateway can either be auto detected or manually specified.

10. To configure the SolrenView gateway to auto detect the gateway from the DHCP server, select the “**Autodetect**” option in using the HMI. **Autodetect** is the special gateway value of 0.0.0.0.

11. To configure the SolrenView gateway to use a manual gateway, specify each of the four octet values (0-255), one at a time. Press the **UP** button to increment the octet. Press the **DOWN** button to decrement the octet. Press the **ENTER** button to accept the octet. Press the **ESCAPE** button to cancel entry at any point. When the fourth octet is entered the entry will be saved.

12. Press the DOWN button to access the **Netmask** setting.

Change in the same manner that the Fallback IP was modified.

Set Network ID and Baud Rate:

The inverter (see section 9.2) and SolrenView must have the same **Baud Rate** (9600) and **Address (Inverter ID)** for proper communication. However, each inverter requires it's unique Network ID.

1. Select **Set Inverter** on the **Main Menu** and press **ENTER**.

2. Select **Inverter ID** from the **Set Inverter Menu** and press **ENTER**.

3. Give the inverter a unique setting and press **ENTER**.

4. Select **Baud Rate** from the **Set Inverter Menu** and press **ENTER**.

5. Set the Baud Rate to **9600** and press **ENTER**.

7.8 Enabling SolrenView Web-based Monitoring

Before SolrenView web-based monitoring can function the inverter must be networked to the Internet, see sections 6.12 through 6.15 for more details.

As explained in section 6, data logging is one of the main functions of the SolrenView gateway. This option is turned on with the **SRV Mode** setting. Once enabled, the SolrenView gateway will periodically update various operational values and send this data to the SolrenView web-based monitoring service.

If **SRV Mode** is turned on and the gateway is unable to transfer data to the monitoring service then data will accumulate in a queue on the SolrenView gateway. This queue is stored in non-volatile flash memory. After a few weeks the data queue will become full and the oldest data will be lost, so it is important to establish Internet connectivity soon after the inverters are commissioned.



NOTE: If a third party monitoring service is installed, SRV mode should be set to off.

NOTE: Enabling SRV Mode when the SolrenView.com data monitoring service has not been purchased will result in unnecessary wear and tear on the SolrenView gateway.

To enable SolrenView.com data monitoring

1. Select **Config** on the **Main Menu** then press **ENTER**.
2. Select **SRV Mode** function on the **Config** Menu then press **ENTER**.
3. The SRV Monitoring function will be displayed. Press **ENTER** to modify the setting.
4. Press the **DOWN** button to change the setting to **ON**.
5. Press the **ENTER** button to accept the setting change.

7.9 Viewing and setting the Date/Time

When the SolrenView web-based monitoring service is purchased and functioning, it is normally not necessary to set or maintain the time on the inverter. The time will automatically be set and adjusted based on the inverter's time-zone.



*NOTE: The date is only editable if **SRV Mode** is off.*

To view the date and time:

1. First select **Config** on the Main Menu then press **ENTER**.
2. Select the **Date/Time** option on the **Config** Menu then press **ENTER**.
3. The current date will be displayed.



Note: The date is only editable if SRV Mode is off. When SRV Mode is on, the date and time is automatically set.

4. Press the **ENTER** button to begin changing the date. The month will flash, indicating that this portion of the date can be changed with the buttons. Press the **UP** button to increment the month and the **DOWN** button to decrement the month. Press the **ENTER** button to accept the month. Press the **ESCAPE** button to cancel and return to the menu. Days and years can be set in a similar manner.
5. Press the **ENTER** button to begin changing the time. The format is HH:MM:SS and hours are shown in 24 hour format. The hour will flash, indicating that this portion of the time can be changed with the buttons. Press the **UP** button to increment the hour and the **DOWN** button to decrement the hour. Press the **ENTER** button to accept the hour value. Press the **ESCAPE** button to cancel and return to the menu. Minutes and Seconds can be set in a similar manner.

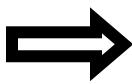
7.10 Rebooting the SolrenView Gateway

If the SolrenView Gateway cannot communicate over the Internet or is not updating inverter data it may need to be rebooted. To reboot SolrenView gateway:

1. First select **Config** on the **Main Menu** then press **ENTER**.
2. Select the **Reboot** option from the menu and press **ENTER**.
3. The Reboot monitor prompt will be shown. Press the **ENTER** button to reboot the SolrenView gateway.

7.11 Resetting the SolrenView Gateway to Factory Defaults

It may be necessary to reset the SolrenView gateway to factory defaults. This does not reset the inverter core, nor shutdown the inverter for any period of time.



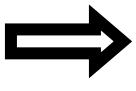
NOTE: Resetting the SolrenView gateway will also clear events, revenue-grade KYZ counters and SolrenView.com data queue. Caution should be used with this function to avoid data loss.

To reset the SolrenView gateway:

1. First select **Config** on the **Main Menu** then press **ENTER**.
2. Select the **Reset All** option from the menu then press **ENTER**.
3. A message warning that the SolrenView gateway is about to be set to factory defaults will be shown. Press the **ESCAPE** button to cancel the reset.
4. Select the Yes option under Clear settings to reset the SolrenView gateway to factory defaults. The Reset Storage screen will appear for a moment.

8. Commissioning the Inverter PV System

Before commissioning, ensure that the inverter is mounted, all connections are made and the inverter is ready to power up.

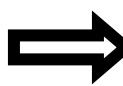
 **NOTE:** Make sure all tools, parts, etc. are removed from the vicinity of the inverter before turning on.



WARNING: Make a final check of all AC and DC wiring to the inverter and in the system before turning on.



WARNING: Connecting the inverter to the electric utility grid must only be completed after receiving prior approval from the utility company. Installation must be performed only by qualified personnel/licensed electrician(s).

 **NOTE:** With the PV modules connected and inverter disconnect switches still off, perform a final check of the PV voltage and polarity once more using a digital voltmeter and probing the positive (+) and negative (-) PV connections.

Turning on the Inverter

- Turn on the dedicated three-phase circuit breaker or disconnect switch at the building service.
- For PVI-14TL, turn on AC disconnect first followed by the DC disconnect.
- For PVI-20TL, turn on the inverter's integrated disconnect.

Operation

The inverter will connect to the electric grid when the DC voltage first exceeds 300VDC (strike voltage) and 200W of power is available. The inverter will shut down when the DC voltage falls below 180VDC.

Turning off the Inverter

- For PVI-14TL, turn off the DC disconnect followed by the AC disconnect.
- For PVI-20TL, turn off the inverter's integrated disconnect switch.

9. LCD and LED Indicators

The inverter operates automatically without the need for user interaction. The LCD display and LED indicators on the front of the inverter provide valuable operating information.

9.1 LCD

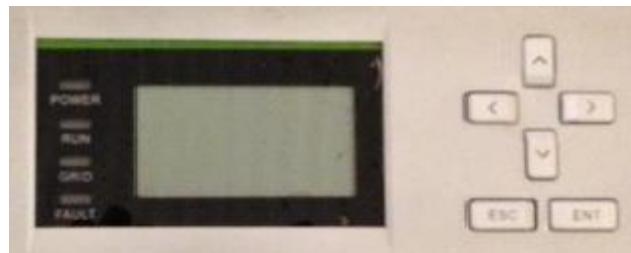
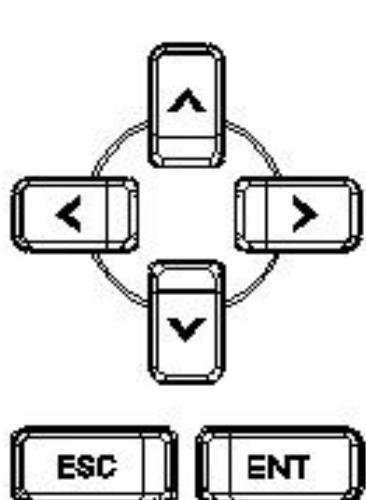


Figure 9.1 – LCD



Key	Description	Definition of function
	Escape key	Back/end/mute
	Enter key	Confirm entering the menu/confirm set point
	Up	Page up in selection menu
	Down	Page down in selection menu
	Left	-1 when setting parameters
	Right	+1 when setting parameters

Figure 9.2 Key Descriptions

9.2 Screen Descriptions

Main Screen (Default)

Press appropriate keys to move from the main/default screen into the start menu.

Start Menu

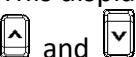
1. Measurements
2. Alarm
3. History
4. Settings
5. Power/PF

Measurements Menu

This menu displays the data stored in the inverter memory. Use the  buttons to scroll up and down through the list. Pressing  will take the screen back to the start menu.

AC Energy (ETOT)	Cumulative AC Energy (kWh)
Installed AC Power (Pac)	AC Power (kW)
AC Power output (Pac)	AC Power Output (kW)
Run Time (RunT)	Hours
AC1 Voltage (Vab)	AC Voltage, (V)
AC2 Voltage (Vbc)	AC Voltage, (V)
AC3 Voltage (Vca)	AC Voltage, (V)
AC Freq (Freq).	AC Frequency (Hz)
AC1 Current (Ia)	AC Current, (A)
AC2 Current (Ib)	AC Current, (A)
AC3 Current (Ic)	AC Current, (A)
Heatsink Temperature (T_int)	°C
Ambient Temperature (T_ambient)	°C
DC Voltage (Vpv1)	DC Voltage (V)
DC Current (Ipv1)	DC Current (A)
DC Voltage (Vpv2)	DC Voltage (V)
DC Current (Ipv2)	DC Current (A)

Alarm Menu

This displays inverter alarm and faults, some of which may be modified with the keypad. Use the  buttons to scroll up and down through the list. Pressing  will take the screen back to the start menu. Any fault message will be indicated in the “Alarm” menu.

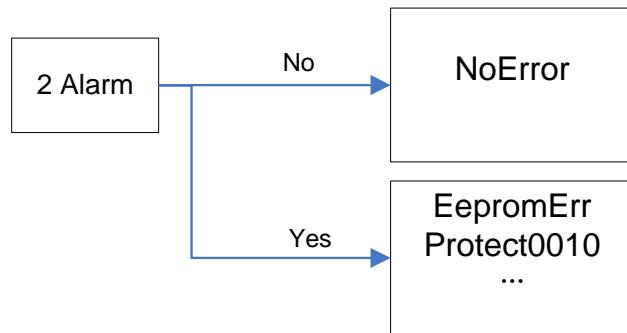


Figure 9.3 Present fault information

History Menu

This menu displays inverter data history, some of which may be modified with the keypad. Use the and buttons to scroll up and down through the list. Pressing will take the screen back to the start menu. The following information can be found in the menu:

1. Up to 100 entries of most recent fault messages are recorded and retrieved
2. The latest 21 days operation history data is available
3. Product software/hardware and serial number information
4. Cumulative generated power information

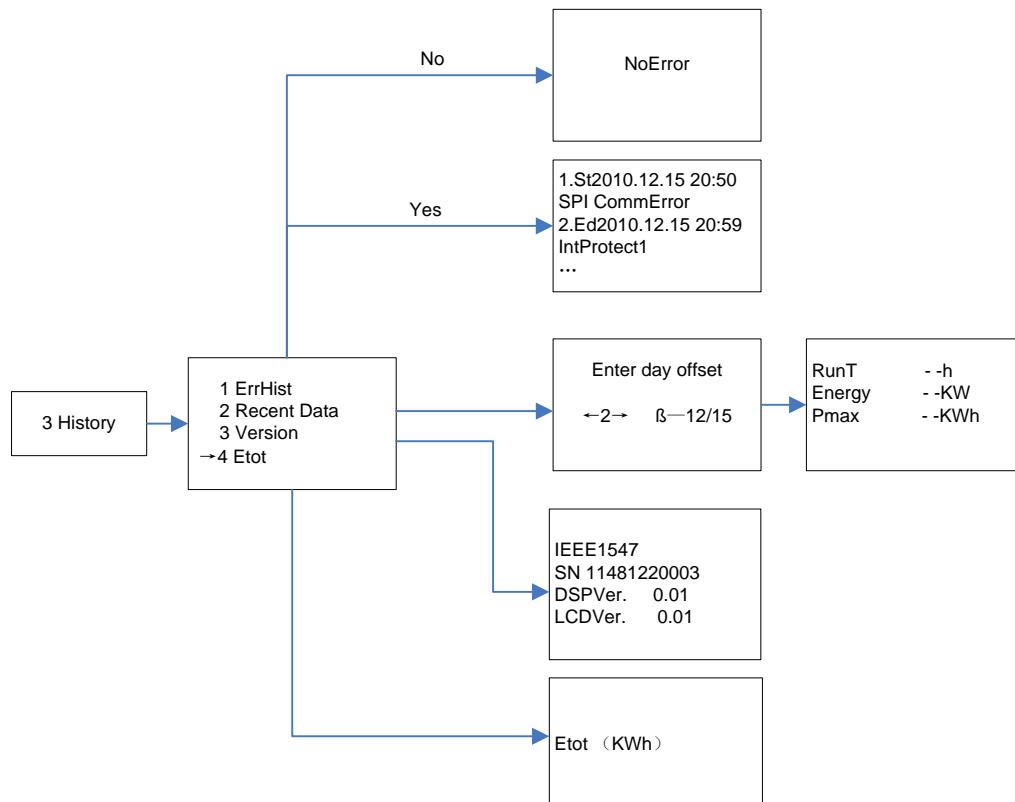


Figure 9.4.1 History Menu and Submenu (14TL)

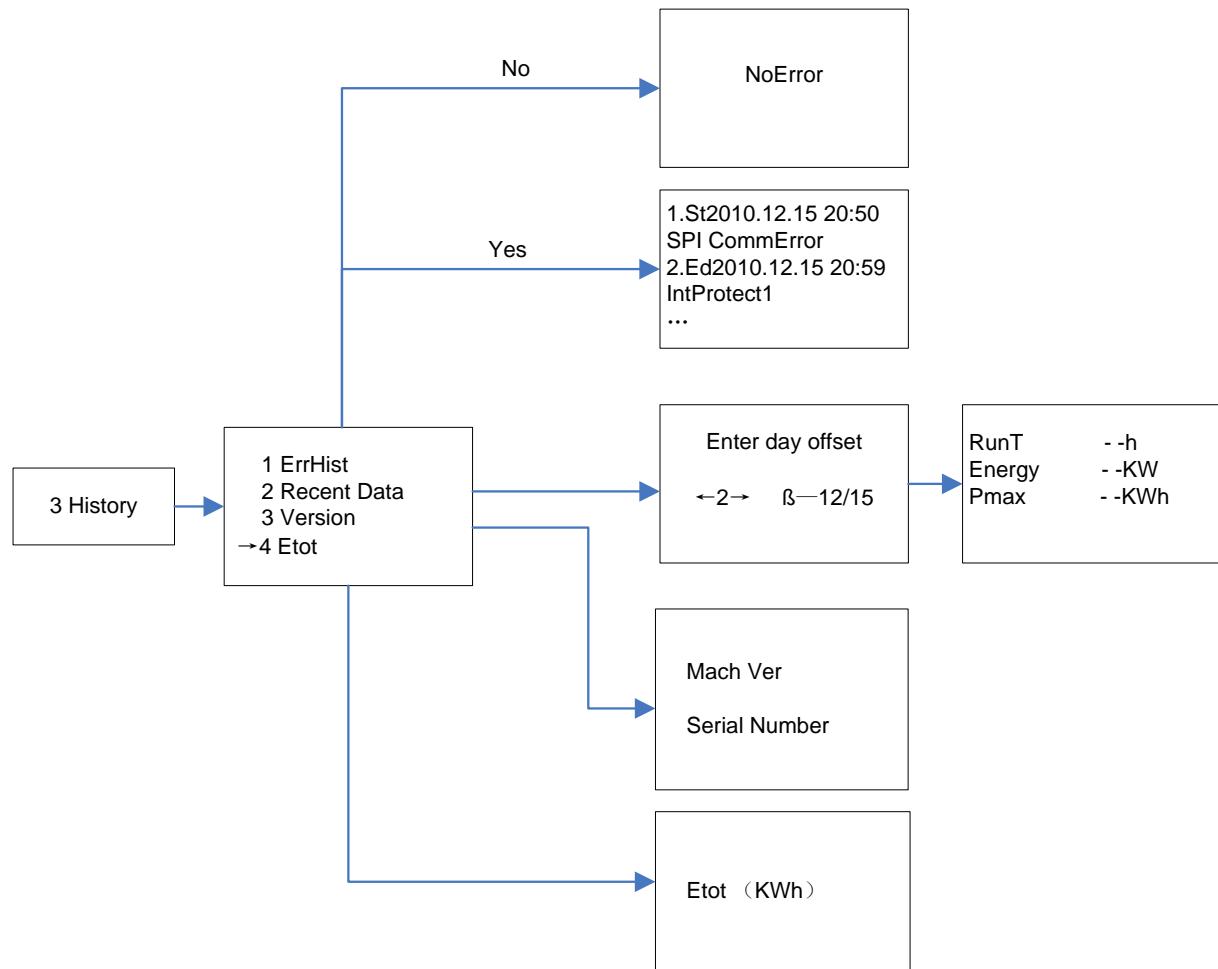


Figure 9.4.1 History Menu and Submenu (20TL)

Settings Menu

The inverter parameters can be adjusted by using commands in the settings menu as shown in the figure 9.5 below:

Options such as Power On/off, Language, Sounds, System time, Communication, Mppt and Arc Fault protection can simply be change/ Set from the setting menu.

Note: When prompt for a password, enter the following: **UP, Right, Down, Left**

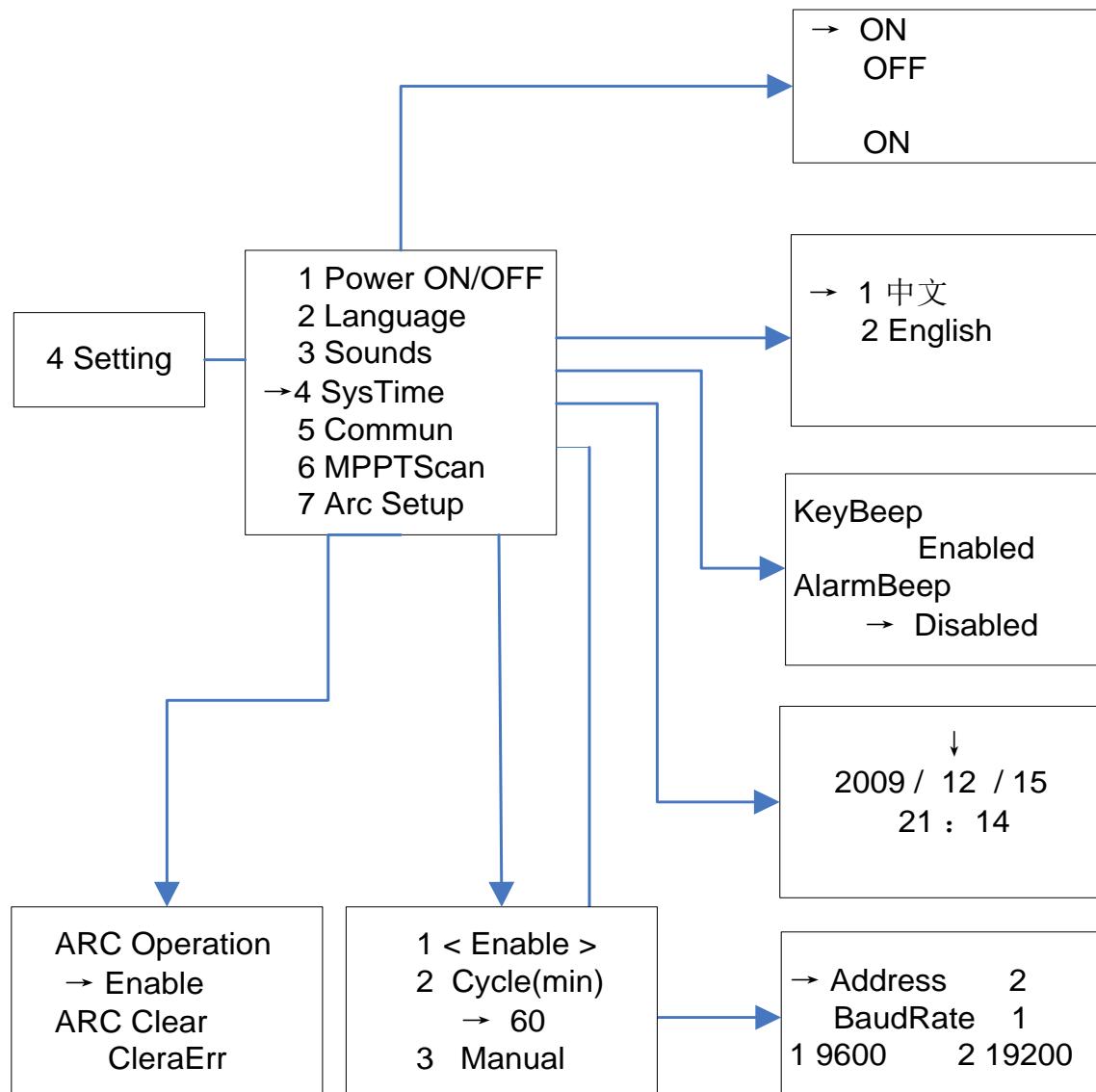


Figure 9.5.1 System setup menu and submenu (14TL)

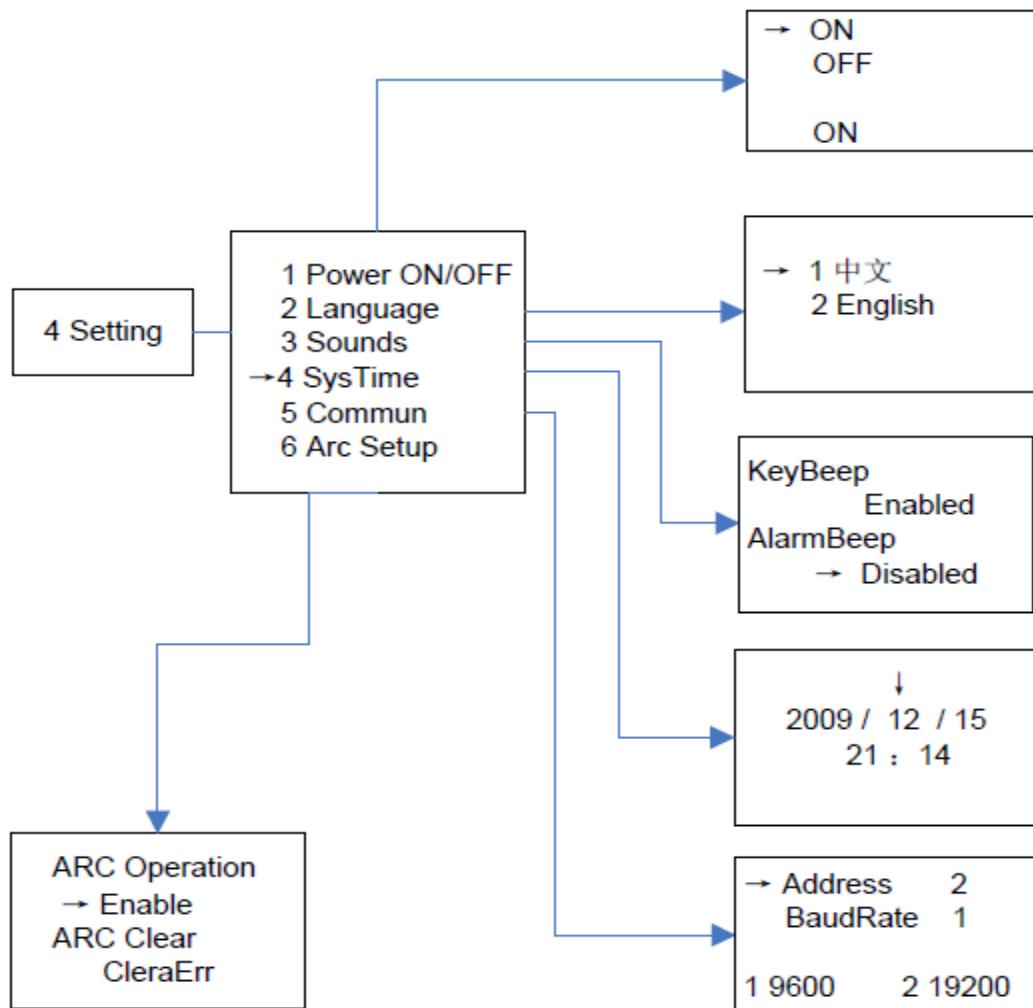


Figure 9.5.2 System setup menu and submenu (20TL)

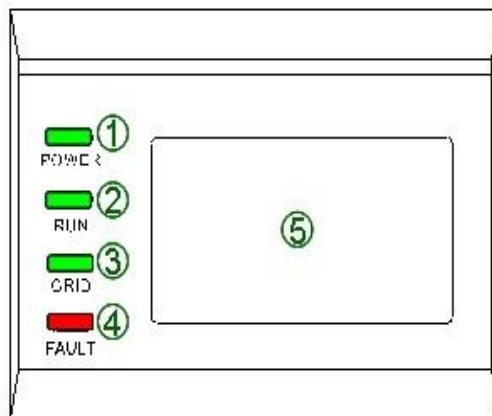
Note: The inverter and SolrenView (see section 7.7) must have the same **Baud Rate** (9600) and **Address (Inverter ID)** for proper communication.

Power /PF

“Active Power” and “PowerFactor” parameters can be set up through the LCD keys as well as remotely. **Note: Only adjustable with permission of the local utility**

9.3 LED Indicators

The LED indicators on the front of the inverters enclosure are used as indicators of the inverters operational status.



LED indicator	Description	State	Meaning
POWER	Indicates the states of the DC source.	LED on	There is enough DC power to turn on the inverters internal circuitry.
		LED off	Not enough DC power to turn on the inverters internal circuitry (Example: No sun condition).
RUN	Indicates the operating state of the inverter	LED on	Inverter is generating power.
		Blinking	Derated running state (LED on 0.5s, LED off 1.5s).
		LED off	Inverter is not generating power.
GRID	Indicates the state of the electric grid	LED on	AC Grid is within limits.
		Blinking	AC Grid not within limits (LED on 0.5s, LED off 1.5s).
		LED off	Either AC or DC is not available at the inverter.
FAULT	Indicates the inverters in a fault condition	LED on	A fault has occurred.
		Slow blinking	An Alarm has been triggered (LED on 0.5s, LED off 2s).
		Fast blinking	Inverter has shutdown to protect itself (stays on for 0.5s, stays off 0.5s)
		LED out	No fault.

Table 9.1 LED messages

10. Troubleshooting and Inverter Messages

Although the inverter is designed for many years of power production there may be instances where error messages are displayed on the LCD screen. This table can be used to help identify the error and resolve it.

Type	Name	Definition	Possible causes	Recommended solutions	
Alarm	1- TempSensorErr	Abnormal temperature reading	1- Internal temperature sensor is making poor contact	1- Verify temperature reading off of the display 2- Switch off the inverters internal disconnects	
			2-Temperature sensor is damaged	3- Switch the Inverter back on 4- If error does not clear, contact Solecatria Customer Service	
	2- SPICommErr	Inverters internal communication failure	1-Poor connection of the inverters internal communication connector	1- Observe for 5 minutes and see whether the alarm is cleared automatically	
				2- Switch off the inverters internal disconnects	
				3-Switch the Inverter back on	
				4-If error does not clear, contact Solecatria Customer Service.	
Alarm	3- IntFanErr	Inverters internal fan (can't be seen externally) is not operating properly	1-Fan service life has expired	1- Observe for 5 minutes and see whether the alarm is cleared automatically	
				2- Switch off the inverters internal disconnects	
	3- IntFanErr		2-Fan connector is making a poor connection	3-Switch the Inverter back on	
				4-If error does not clear, contact Solecatria Customer Service.	

Alarm	4-ExtFanErr	One of the three external fans is not operating properly	1- Fan is blocked	1- Observe for 5 minutes and see whether the alarm is cleared automatically
				2- Switch off the inverters internal disconnects
			2- Fan service life has ended	3- Check the fan blades for debris
			3- Fan socket connector is making a poor connection	4- Switch the Inverter back on
				5- If error does not clear, contact Solectria Customer Service
Alarm	5-EepromErr	Incorrect memory reading	1- A problem with the inverters internal memory	1- Observe for 5 minutes and see whether the alarm is cleared automatically
				2- If error does not clear, contact Solectria Customer Service
Alarm	6- Arc Board Error	Internal Arc board self-check error	1-Possible communication error between Arc board and Inverter	1-Observe for 5 minutes and see whether the alarm is cleared automatically
			2- Abnormal reading within the Arc board	2- If error does not clear, contact Solectria Customer Service

Protection	1- OverTemp	Ambient temperature or temperature inside inverter is too high	1- Ambient temperature outside the inverter is too high	1- Confirm that external ambient temperature is within the specified range of operating temperature
				2- Verify air inlet and outlet are not blocked
			2- Fan is blocked	3- Verify fan is not blocked
				4- Verify proper spacing was followed during installation
			3- Poor cooling due to improper installation	5- Observe for 30 minutes and see whether the alarm is cleared automatically
				6- If error does not clear, contact Solectria Customer Service
Protection	2- GridV.OutLim	Grid voltage exceeds the specified range	1- Grid voltage is abnormal	1- Observe for 10 minutes and see whether the alarm is cleared automatically
			2- No AC voltage at the inverter	2- Verify Grid Voltage is within range
			3- Improper AC wiring. (see section 6.1)	3- Verify proper AC wiring
			4- Loose AC connections	4- If error does not clear, contact Solectria Customer Service

Protection	3- GridF.OutLim	Grid voltage frequency is abnormal	1- Grid frequency is out of range	1- Observe for 10 minutes and see whether the alarm is cleared automatically
				2- Verify grid frequency is within range
				3- Verify proper AC wiring
			2- Loose AC connections.	4- If error does not clear, Contact Solecetria Customer Service
Protection	4- PV1 (2) VoltOver	DC input voltage exceeds the specified value	1-DC over-voltage	1- Observe for 30 minutes and see whether the alarm is cleared automatically
				2- Verify DC open circuit input voltage is within specified range
				3- Switch off the inverters internal disconnects
				4- Switch the Inverter back on
				5- If error does not clear, contact Solecetria Customer Service
Protection	5- PV1 (2) Reverse	DC inputs connected with incorrect polarities	1- PV positive pole and negative pole are connected in reverse	1- Verify DC voltage polarity is correct on all inputs
				2- If error does not clear, contact Solecetria Customer Service

Protection	6- GFCI.Err	DC leakage current is above recommend value	1- Excessive parasitic capacitance on PV module due to insulation failure	1- Observe for 10 minutes and see whether the alarm is cleared automatically
			2- Abnormal grounding conditions	2- Contact System installer to check installation for possible Ground Fault
				3- If error does not clear, contact Solectria Customer Service
Protection	7- IntProtectA~Z	Internal problem within the inverter	1- One of the inverters internal protection features was triggered causing the inverter to shut down	1- Observe for 10 minutes and see whether the alarm is cleared automatically
				2- If error does not clear, contact Solectria Customer Service
Protection	8-Arc Protect	Inverter shuts down due to a possible Arc fault concern	1- An internal Arc fault occurred on the DC side	1-Have Electrical qualified personnel inspect wiring section of Inverter
			2-Fault with the Arc board	2- If no issues are found, contact Solectria Customer Service
Fault	1- IntFaultA~O	Internal noncritical fault within the inverter	1 -A fault occurred internally within the inverter	1- The inverter will restart once the fault is cleared.
				2- If error does not clear, contact Solectria Customer Service

Table 10.1 Troubleshooting

11. Product Warranty and RMA Policy

The current warranty and RMA statement for the product is available online at <http://www.solectria.com/support/documentation/warranty-information/grid-tied-inverter-warranty-letter/>. If you do not have access to the internet or to request a copy to be mailed to you, please contact our Technical Service department 978-683-9700 x 2.

12. Technical Data

12.1 Output AC Specifications

The inverters are designed to feed power into a standard 60Hz, three-phase AC utility service provided within a facility with a rating of not less than the rating of the inverter(s) connected to it.

The inverter is designed to work with the range of AC voltages for a three-phase service defined by IEEE 1547-2003 and ANSI C84.1.

	PVI 14TL	PVI 20TL	Unit
Nominal Output Voltage	208	480	VAC
Operating AC Voltage range	88 – 110%		VAC
Operating frequency	59.3-60.5		Hz
Power Factor	Unity, >0.99		
Total Harmonic Distortion(THD)	< 3%		
Continuous Output Power	14	20	kW
Continuous Output Current	39	25.5	Amps

Table 12.1 – AC Output Specifications

	PVI 14TL	PVI 20TL
Peak Efficiency	96.7%	97.40%
CEC Weighted Efficiency	96%	97%

Table 12.2 –Efficiency of Inverters

12.2 Other Specifications

Integrated String Combiner Option	8 Fused Position, 15A (4 per MPPT)
Operational Ambient Temperature	-13° to 140°F (-25° to 60°C) Derating may occur over 50°C
Storage Temperature	-22° to 158 °F (-30° to 70°C)
Inverter Enclosure	Type 3R

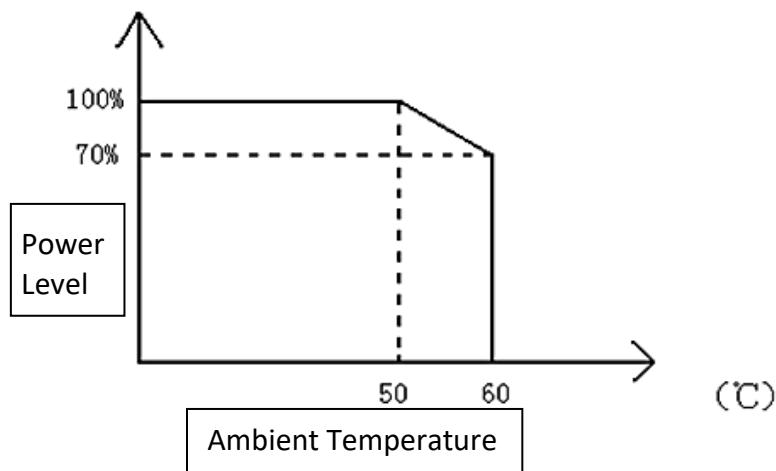
Table 12.3 – Other Specifications

12.3 Input DC (PV) Specifications

	PVI14TL	PVI 20TL	Units
Absolute Maximum Input Voltage	600	VDC	
Operating Input Voltage	180-580	260-580	VDC
MPPT Input Voltage Range	300-540	300-550	VDC
MPPT Trackers	2 with 4-Fused Inputs per Zone		
Maximum Operating Input Current per Zone	25	35	Amps

Table 12.4 – DC Input Specifications

12.4 Temperature Derating Curve



12.5 Internal Circuit Diagram

The basic power flow within the PVI 14TL-20TL series of inverters is below. Note that the GFDI circuit is not depicted.

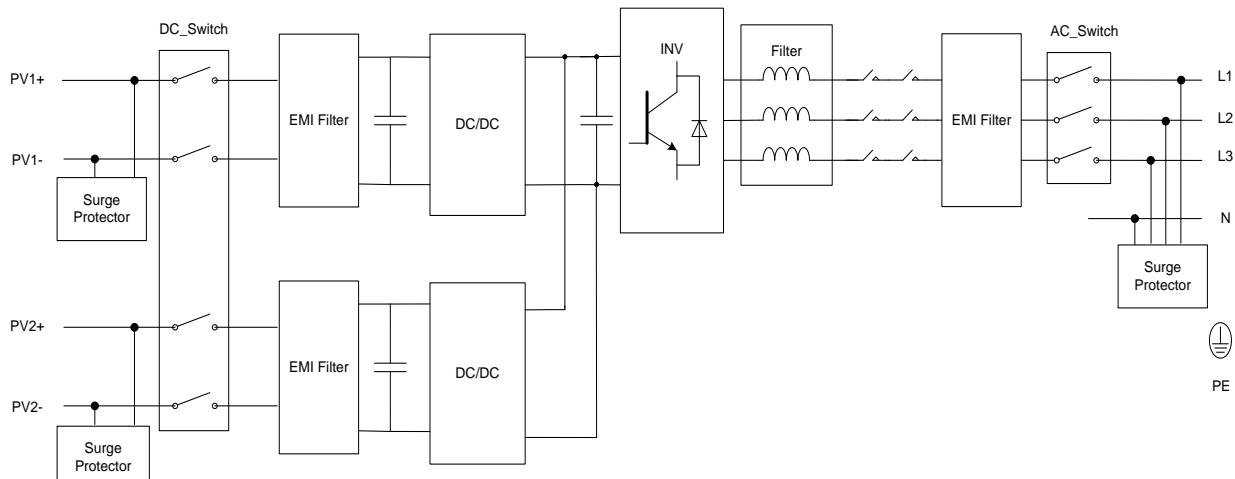


Figure 12.1 – Simplified Internal Circuit Diagram for PVI 14TL-20TL Series Inverters

13. Appendices

Appendix A – PVI 14TL, 20TL datasheet

<https://solectria.com/support/documentation/inverter-datasheets/pvi-14tl-pvi-20tl-transformerless-3-ph-string-inverters-datasheet/>

Appendix B – String Sizing Tool

<http://www.solren.com/stringSizing.html>

Appendix C – Contact Information

Yaskawa – Solectria Solar
360 Merrimack Street
Building 9, Floor 2
Lawrence, Massachusetts 01843
USA

Tel: 978-683-9700
Fax: 978-683-9702
Sales/ General Info: inverters@solectria.com
Technical Support & Service: 978-683-9700 x2
Website: www.solren.com

Appendix D – Authorized Distributors

<https://solectria.com/pv-inverters/how-to-buy/>

Appendix E – UL1741 / IEEE 1547 / CSA22.2#107.1 Authorization to Mark



165 Main Street
Cortland, NY 13045

Telephone: 888-347-5478
Facsimile: 607-758-9808
www.intertek-ellsemko.com

Listing Certificate

The following Company/product(s) is listed for use with the ETL/cETL Listed Mark(s).

Standard(s): Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources- UL 1741. Standard for General Use Power Supplies, CSA C22.2 No. 107.1-01, Reaffirmed 2006 with Interim Certification Requirements for Utility-Interconnected Inverters- Technical Information Letter (T.I.L.) No. I-43.

Company: Solectria Renewables, LLC.- Lawrence, MA USA

Product(s): Grid-Tie PV Inverter

Model(s). PVI 14TL-208
PVI 20TL-480



If you have any further questions, please feel free to call me at 1-847-718-6326

Sincerely,
Melissa Mueller

ETL Directory Coordinator
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545 E. Algonquin Road
Arlington Heights, IL

