# PVI 23TL
# PVI 28TL

## INSTALLATION AND OPERATION MANUAL

Revision B
[Generation I (SN Prefixes 1159 and 1160)]

# 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

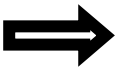
In this manual, “inverter” or “inverters” refers to the inverter models: PVI 23TL and PVI 28TL, unless one of the specific models is noted.

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 symbol, along with the word “**WARNING**”, indicates a fact or feature 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 system operation.

**EXAMPLE:** This indicates an example.

# SAVE THESE INSTRUCTIONS

# IMPORTANT SAFETY INSTRUCTIONS

- All electrical installations shall be performed in accordance with all applicable 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 Appendix D for information regarding authorized system installers.

- Before installing or using the inverter, please read all instructions and caution markings in this manual as well as those on the inverter and 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 arrays with an opaque material before wiring them. PV arrays produce electrical energy when exposed to light and could create a hazardous condition.

# 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 entretient effectué par l'utilisateur. Pour toute maintenance, veuillez consulter Solectria Renewables ou un installateur agrée par Solectria Renewables (les coordonnées de Solectria Renewables et des installateurs agrées 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 effectuée 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

# Table of Contents

# 1.0 Introduction

The PVI 23TL and 28TL are commercial, dual MPPT, three-phase utility-interactive, transformerless PV inverters designed to be interconnected to the electric utility grid. The inverter is listed for use with ungrounded 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.

This inverter is a transformerless type without galvanic isolation. Therefore, the inverter may only be operated with ungrounded PV arrays. Furthermore, the PV array must be installed in accordance with NEC 690.35 (Ungrounded Photovoltaic Power Systems) and local regulations for ungrounded PV arrays. Additionally, the PV array (PV modules and cabling) must have protective insulation and the PV modules used must be suitable for use with this inverter.

The PVI 23-28TL includes key product protection functions, such as:

- Anti-Islanding Protection
- DC Arc-fault Circuit Interruption
- Protection Against Reverse Polarity
- Short Circuit Protection
- Monitoring DC Input Insulation Against Ground
- Monitoring AC Output Voltage and Frequency
- Monitoring Leakage Current Against Ground (GFCI)
- Monitoring DC Injection from AC Output
- DC Input and AC Output Over-voltage Protection
- DC Input Over-current Protection
- Monitoring Ambient Temperature
- Monitoring IGBT Module Temperature
- Wide-range Frequency and Voltage Support

The inverter is suitable for use indoors and outdoors. It meets the requirements of ANSI/NFPA 70, NEC690.5, UL 1741, IEEE 1547, and IEEE 1547.1 for the parallel operation of power generation plants on low-voltage networks of regional electrical utility companies.

The function of the Anti-Islanding protection complies with UL 1741/IEEE 1547 specifications. The Anti-Islanding function guarantees secure disconnection in the case of circuit isolation or interruptions in power supply while also protecting against isolated operation.

A DC arc-fault circuit interruption is integrated into the PVI 23-28TL inverter and complies with the requirement of a Type 1 device in the UL 1699B standard.

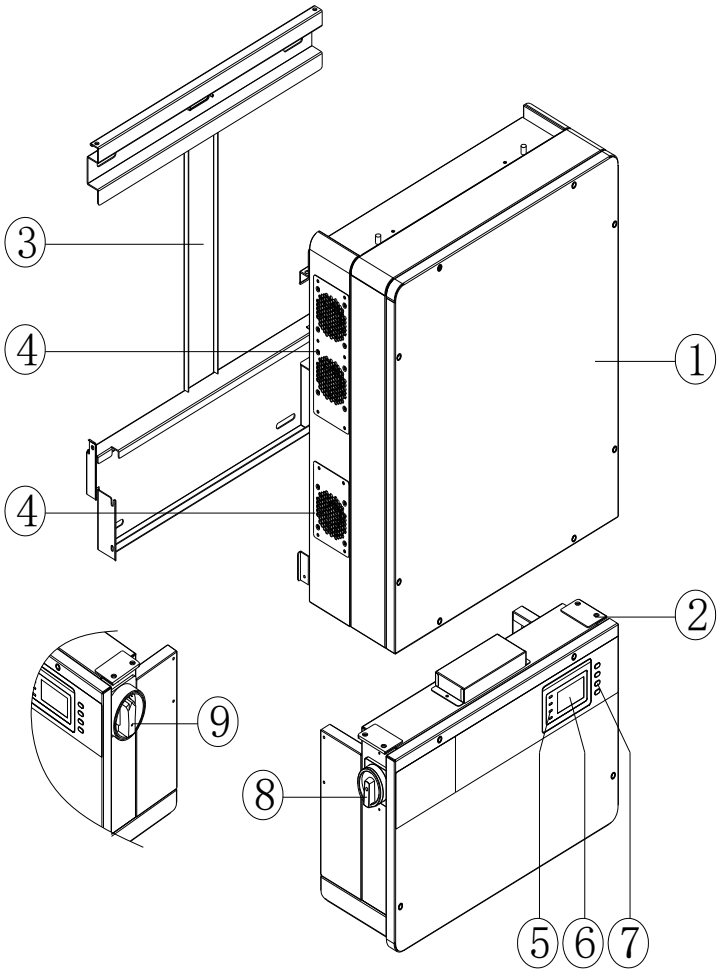
Feeding power back to the grid involves the conversion of DC voltage from the PV array to grid compatible AC voltage by inverting DC to AC. This unit feeds power into a standard, three-phase commercial, industrial, institutional, or electrical utility facility's electrical system which is connected to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


**Figure 1.1 – Grid-Tied Inverter Application**

## 1.1 PVI 23-28TL Inverter Enclosure




**① Inverter Main Housing**
Does not contain any serviceable parts; opening this section voids the inverter warranty.

**② Wiring Box**
For customer's AC and DC wire connections.

**③ Mounting Bracket**

**④ Cooling Fans**

**⑤ LED Indicators**
There are four LED indicators used to signal the operating status of the inverter.

**⑥ LCD**
The LCD displays all measured values and parameters.

**⑦ Control Keys**
There are 4 control keys, to switch between display menus and to configure the settings of the inverter.

**⑧ DC Disconnect Switch**
Built-in, lockable disconnect switch used to disconnect the DC input to the inverter.

**⑨ AC Disconnect Switch**
Built-in, lockable disconnect switch used to disconnect the AC output from the PV inverter.

**Figure 1.2 – PVI 23TL Inverter Interface**

# 2.0 Site Preparation and Inverter Placement

The inverter is comprised of a NEMA 4 enclosure, containing electrical and electronic components as well as AC and DC integrated disconnects.

**NOTE:** If the inverter is mounted outside, ensure that the wiring box remains closed during the installation process until access to the box is needed. This precaution will help to avoid damage due to rain, snow, or condensation. Damage to the inverter caused during the installation process will void the warranty. The inverter main housing cover must remain 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 is 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 but 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 45°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.

**WARNING**: Be sure to verify load capacity of wall or mounting area where the inverter will be mounted.

| Inverter Model | Weight |
|---|---|
| PVI 23-28TL | 122lbs (55kg) |

**Table 2.1 – Inverter Weight**

- The ambient temperature must be between -25°C and +45°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.

- The National Electrical Code (NEC) requires the inverter to be connected to a dedicated circuit with no other outlets or devices 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 right of the inverter. As the air intake is on the left side of the inverter section of the unit, there should be at least 12 inches of clear space at the left of the enclosure. Air should be able to flow all around the unit for proper ventilation.

- It is also recommended to have at least 24 inches of clearance at the bottom side for the Inverter LCD to be at eye level (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 45°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.

# 3.0 Inverter Mounting

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

## 3.1 Checking for Shipping Damage

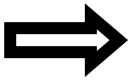
The inverter is thoroughly checked and tested rigorously before it is shipped. Although the shipping container is adequately designed to protect the inverter during shipment, the product may be damaged by poor handling, trucking, or transfer station activity.

Please inspect the inverter thoroughly after it is delivered. If any damage is present, immediately notify the shipping company to make a claim. If there is any question about potential shipping damage, contact Solectria Renewables but do not remove the unit from pallet/packaging. Photos of the damage would also be helpful in documenting potential shipping damage. If the unit is to be returned, an RMA number must be obtained from Solectria Renewables prior to shipping the unit back.

## 3.2 Unpacking and Moving the Inverter into Place

It is recommended to keep the inverter secured in its box and move it as close as possible to the final location prior to removing it.

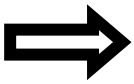
**WARNING:** Any lifting or moving of the inverter, without the aid of equipment, should be performed by *at least* two people.



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

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

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



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

## 3.3 Inverter Positioning and Mounting

The Inverter can be mounted vertically or with a 15°–90° horizontal angle, as shown in Figure 3.1a below.

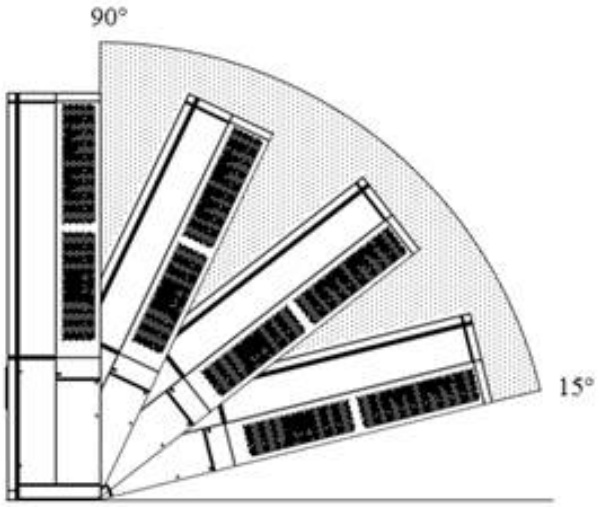



**Figure 3.1a – Allowable Inverter Mounting**

**WARNING:** Do not install the inverter tilted forward, lying on its back, or upside down as shown in Figure 3.1b.

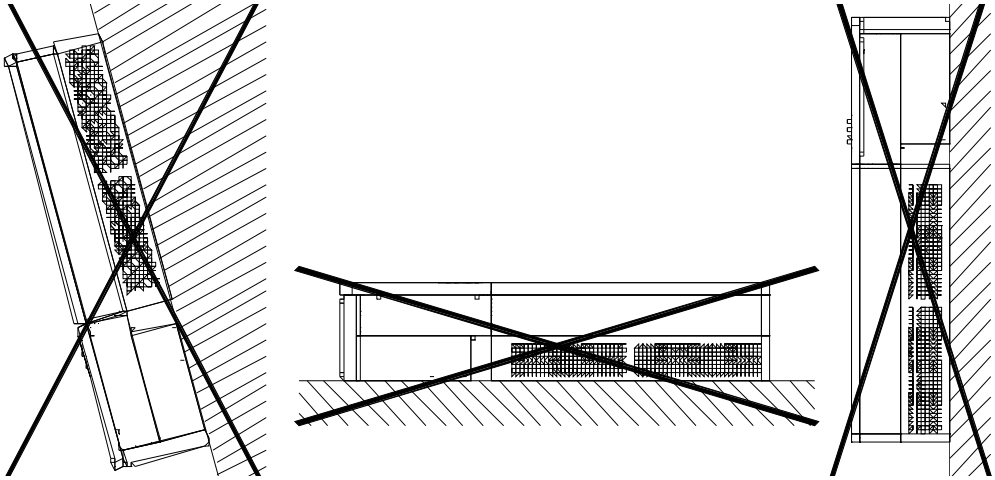


**Figure 3.1b – Unallowable Inverter Mounting**

### 3.3.1 Wall Mounting

The minimum distances that should be met for wall mounting are shown in Figure 3.2 below.

- For adequate cooling, there should be a minimum of ≥ 20 inches of space available between two adjacently mounted inverters.
- A minimum of 12 inches from the left side and 12 inches from the top are needed for adequate access and cooling.
- A distance of 24 inches from the bottom is recommended for the inverter's LCD to be at eye level. If needed, this distance can be lowered to 10 inches.

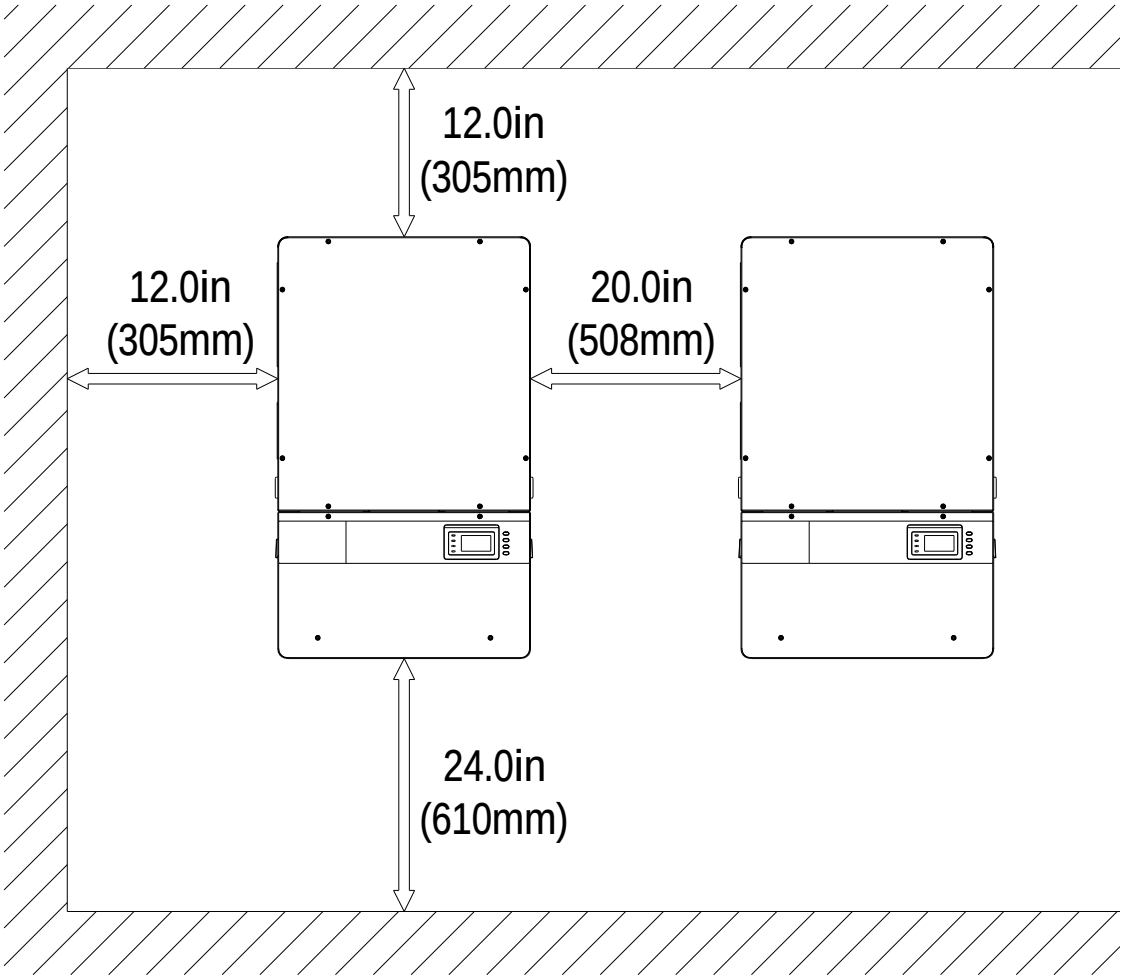



**Figure 3.2 – Wall Mounting Clearance Requirements**

### 3.3.2 Wall Mounting/Mounting Bracket Clearance

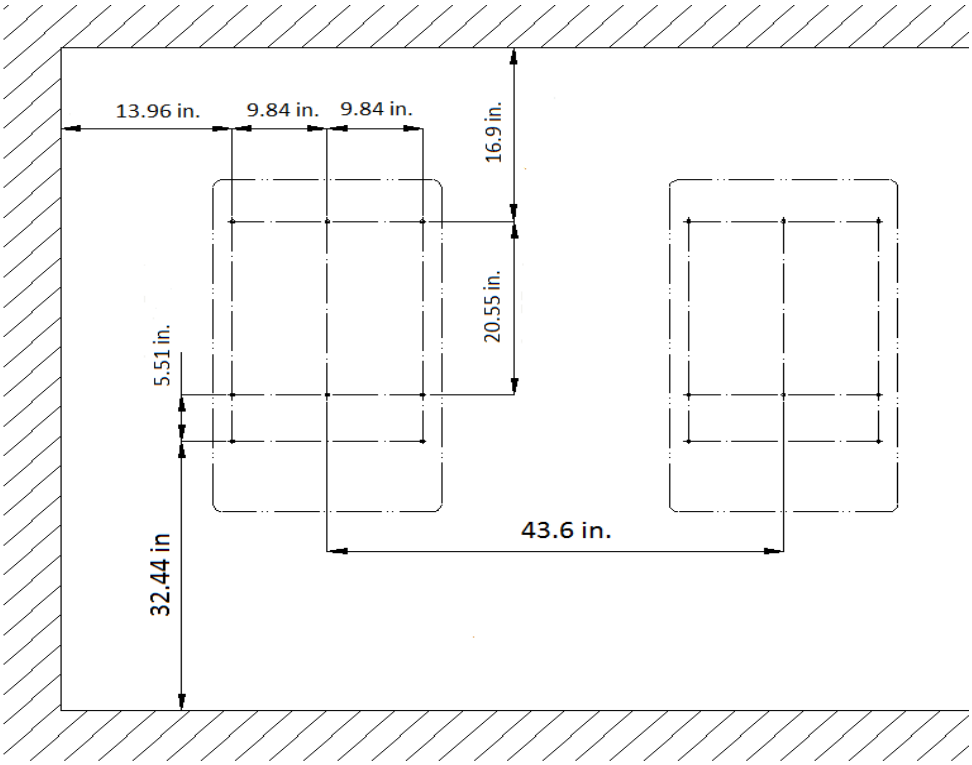



**Figure 3.3 – Wall Mounting Clearance Requirements of Mounting Bracket**

### 3.3.3 Pillar Mounting

The minimum inverter mounting dimensions on a pillar are shown in Figure 3.4 below**.**

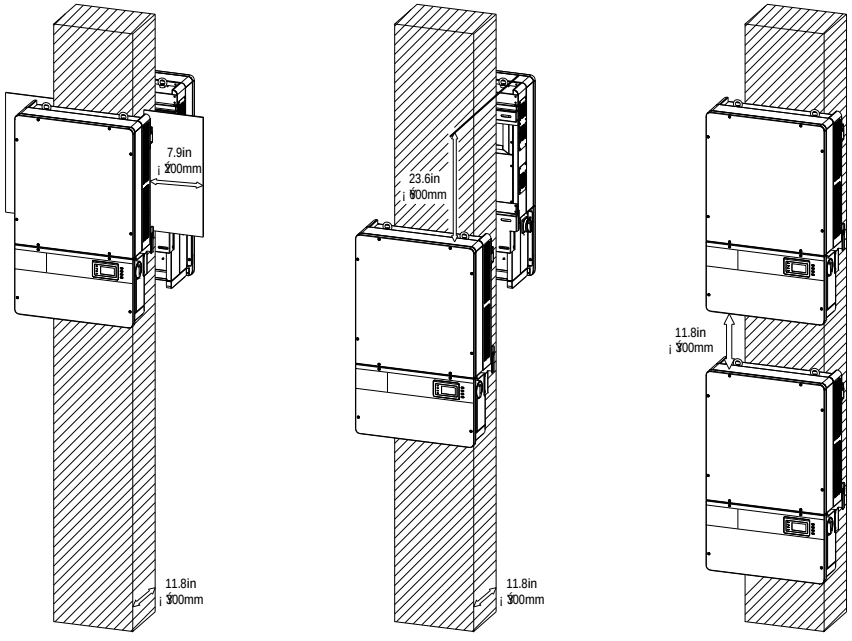



**Figure 3.4 – Inverter Pillar Mounting Dimensions**

## 3.4 Installing the Mounting Bracket

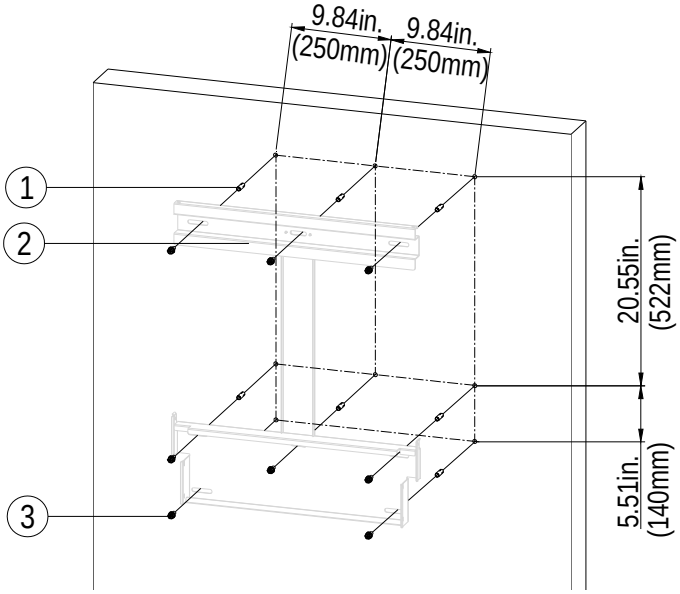



**Figure 3.5 – Inverter Wall Bracket Mounting**

**NOTE:** Always use all (8) mounting plate fasteners.

1. Mark the 8 holes on the load-bearing surface using the available mounting bracket as a template (see Figure 3.5).

2. Drill 8 holes with a 13/32-inch drill bit and install eight "M8 expansion tubes" (available in accessory box).

3. Secure the bracket to the wall using eight M8X25 bolts (available in accessory box). See Figure 3.5.

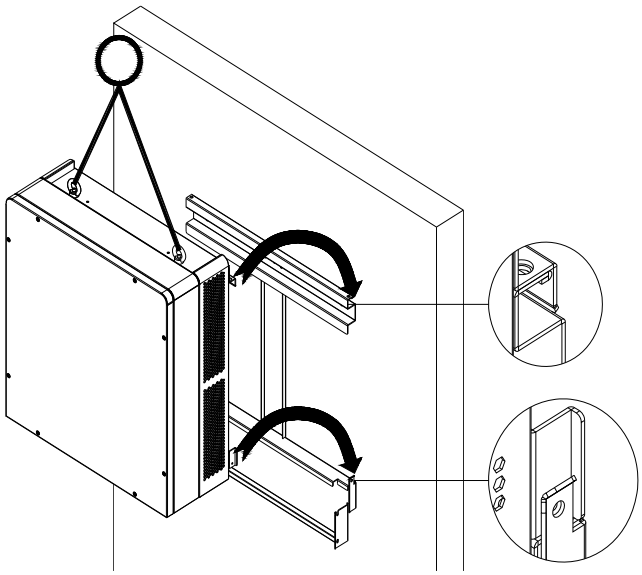


**Figure 3.6 – Inverter Main Housing Mounting**

4. (Option 1) Lift mounting: Attach both lifting eye bolts (available in accessory box) to the inverter housing box. Use a sling rope or bar passed through both eye bolts to mount the inverter to the bracket.

(Option 2) Manual lift: Two people lift the inverter from the bottom and manually mount the inverter to the bracket.

5. Carefully secure the main housing of the inverter onto the bracket.

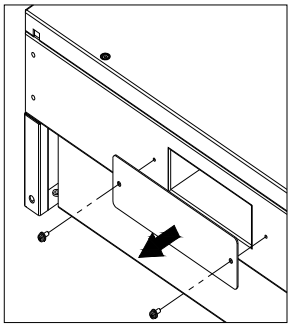


**Figure 3.7 – Remove Cover Plate of Main Housing**

6. Using a #2 Philips screw driver, remove cover plate on the bottom of main housing.

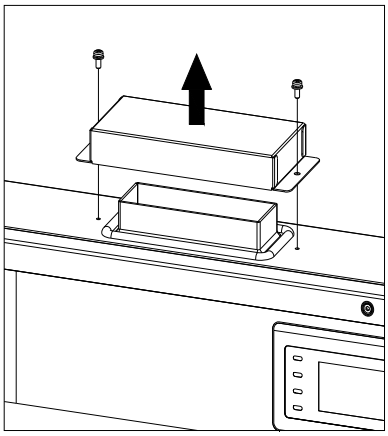


**Figure 3.8 – Remove Cover of Wiring Box**

7. Using a #2 Philips screw driver, remove cover of wiring box and keep the cover (it can be re-secured later onto the enclosure).

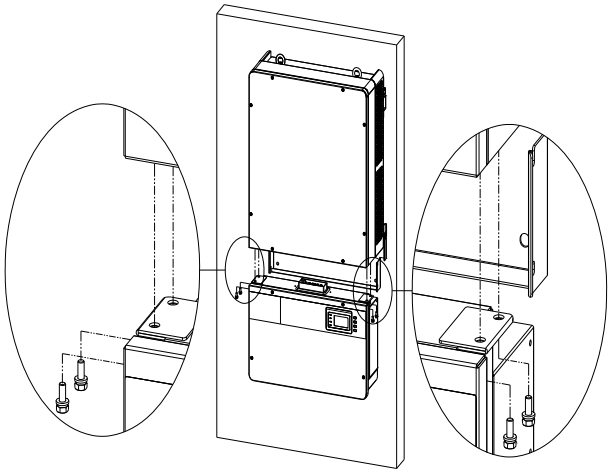


**Figure 3.9 – Connecting the Wire Box to the Main Housing**

8. Connect the wiring box to the main housing using four M6*16 screws (available in accessory box).

Torque = 25in-lbs

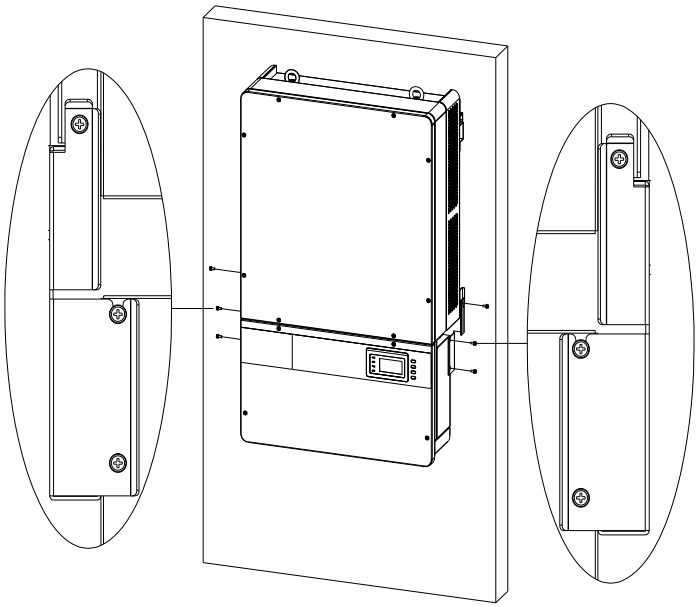


**Figure 3.10 – Fasten the Main Housing and Wiring Box onto the Bracket**

9. Connect the main housing and wiring box to the mounting bracket using a #2 Philips screwdriver and six M5*10 bolts (available in accessory box).

Torque = 14in-lbs

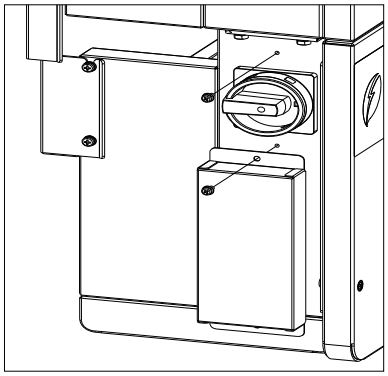


**Figure 3.11 – Attaching the Cover Board**

10. The previously removed cover box can be reattached to the left side of the wiring box (available in accessory box).

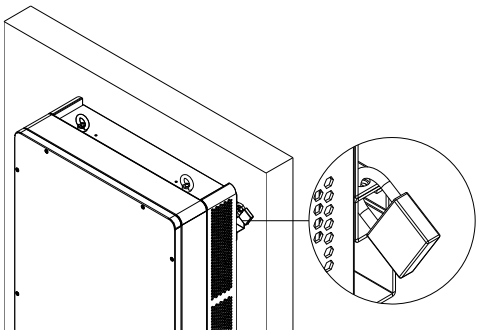


**Figure 3.12 – Installing an Anti-theft Padlock**

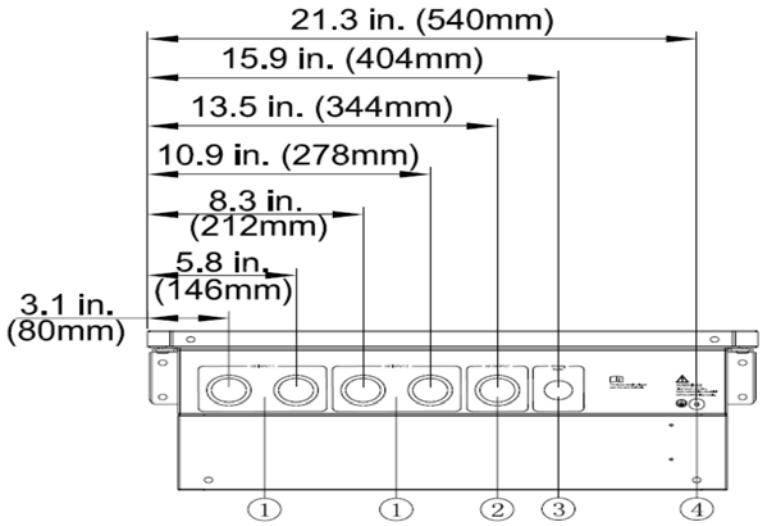
11. An anti-theft padlock can be installed as shown in the image to the left (padlock not available in accessory box).

# 4.0 Grounding Connections

**WARNING**: All electrical installations must be performed in accordance with all applicable local electrical codes, and must be done by electrically qualified personal. Only make AC and DC grounding 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 23TL and PVI 28TL are shown below:




| Position | Connection Entry |
|---|---|
| 1 | Knockout holes for DC input wires and equipment ground (1”or 1-1/4”) |
| 2 | Knockout hole for AC output and ground wires (1”or 1-1/4”) |
| 3 | Knockout hole for communication wires (3/4”) |
| 4 | External Ground Connection |

**Figure 4.1 – Knockouts and External Ground Connection**

PVI 23TL and PVI 28TL inverters have a ground bar with four terminals used to terminate the equipment ground, each terminal can accept a single copper conductor ranging from 6 to 10 AWG (Torque = 14 in-lbs), one stud that fits a M5 nut to terminate the AC system ground (Torque = 14 in-lbs), and an external ground point (Torque 14 in-lbs). The stud and external ground can accept a single copper conductor ranging from 8 to 10 AWG.

**NOTE:** Lug for stud is located in the accessory box.

**WARNING:** Install grounding conductors per local codes and standards.

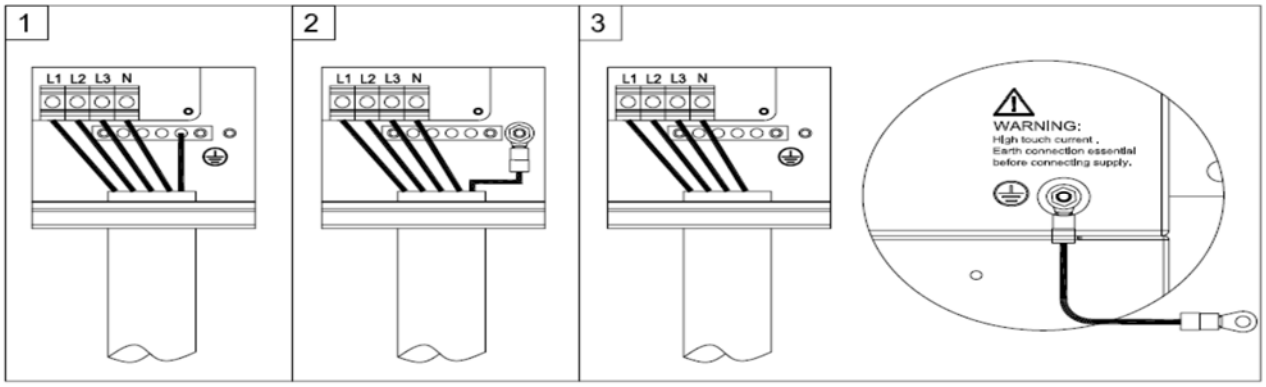



**Figure 4.2 – Ground Wiring Connection**

# 5.0 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 personal in accordance to local and national electrical code.

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

**WARNING:** Remove all fuses with a fuse puller 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 bypassing them, verify that the DC voltage is less than 1000 VDC in all conditions. DC voltages over 1000 VDC will damage the inverter. Configure the array such that the open circuit voltage will never exceed 1000 VDC. **Warranty is void if more than 1000 VDC 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 rated fuses as originally installed.

**WARNING:** Use copper wire for all DC and AC wire connections.

## 5.1 Maximum Power Point Trackers

The Inverter is designed with two separate MPP Trackers (Dual MPPT) which can operate independently or combined. The default option is two individual independent trackers. This option allows sites with shading and/or unbalanced string sizes to be connected to two separate zones, this allows for higher tracking efficiency and greater revenue. However, this also means that one must consider these two zones as two separate inverters and power must be balanced as much as possible between.

**NOTE:** Connecting all of the inputs at zone "PV1" will result in only utilizing 50% of the inverter power.

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

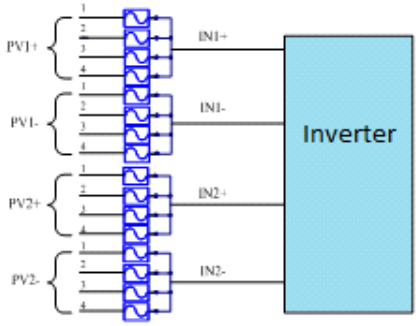
| DC Input | 2 MPPTs Working Independently (Dual MPPT) | Wire Size |
|---|---|---|
| 8 strings |   | 10 AWG |

**Figure 5.1 – Standard String Configurations**

This revision B manual is intended for use with the "Gen I" wiring box design shown below on the left. If the inverter contains the "Gen II" wiring bow shown below on the right, please refer to the manuals listed as revision C or later, which can be obtained electronically through the Solectria website.

| Before Change (Gen I) | After Change (Gen II) |
|---|---|
| (1) PVI23TL SN:1159<br>(2) PVI28TL SN:1160 | (1) PVI23TL SN:1223<br>(2) PVI28TL SN:1224 |
|  |  |

**Figure 5.2 – Wiring Box Design Change**

**WARNING:** Strings must be balanced for optimum performance and revenue. When doing DC/AC ratio sizing, perform calculations on the zone level unless you intend to combine MPPT.

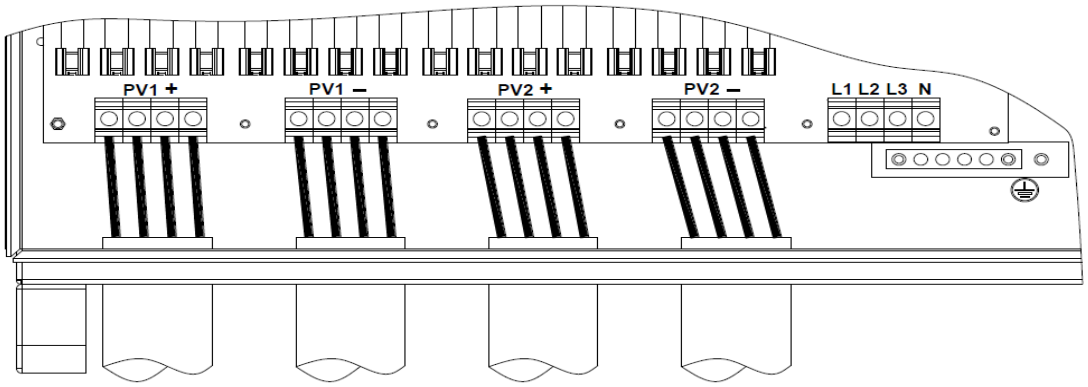



**Figure 5.3 – Typical DC Wiring Connection**

Figure 5.3 below shows the default status of the switch S401.

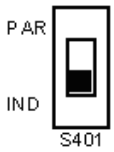



**Figure 5.4 – Switch Configuration for Two Individual (Dual) MPPT Zones**

**NOTE:** Switch S401 is located under the "Enter" control key inside of the wiring box.

Combining the zones helps make sure that one zone is not overloaded while the other is under loaded. This might be the case when designing an odd number of strings or sizing with a high DC/AC ratio.

### 5.1.1 Setting the Single (Combined) MPPT

The two MPPT zones can be combined using the following steps:

1. Remove the cover of the wiring box.
2. Use a #2 Philips head screwdriver and remove the wire connected to terminal J9 and J10.
3. Add the connecting busbar from the accessory kit to terminals J9 and J10 (see Figure 5.4).
4. Return wires removed in step 2 and torque the busbar to 10 in-lbs.

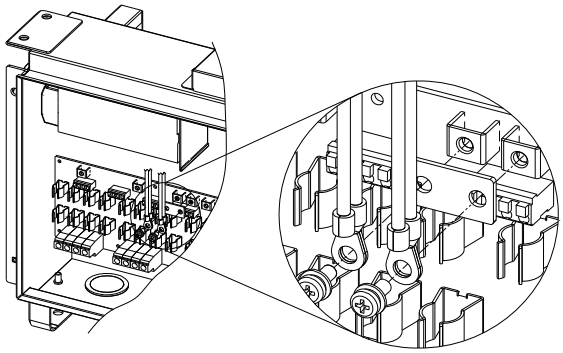


**Figure 5.5 – Busbar Connection Used for Single (Combined) MPPT Option**

5. Set switch S401 to parallel/combined (PAR) mode.

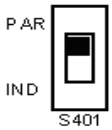



**Figure 5.6 – Switch Configuration for One Combined MPPT Zone**

Dual tracking MPPT might seem overwhelming at first, contact us at **inverters@solectria.com**
If you have further questions, we are here to help.

## 5.3 DC Wiring

90°C PV copper conductors must be used for wiring for DC 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 of 125% as indicated by UL 1741.

**NOTE:** Always connect an equal number of wires to PV1 and PV2 connectors for dual MPPT zone operation. If an odd number of connections are required, we recommend setting the inverter to single (combined) MPPT zone.

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 inputs | Configuration | Max. DC Wire Size | Recommend PV Fuse | Conductors Torque (ALL) | Fuse Type |
|---|---|---|---|---|---|
| 8 inputs | Standard use of integrated string combiner box | 10 AWG | 12A/1000 V for PVI 23/28TL | 10in-lbs | PV Fuse |
| 7 inputs* | Standard use of integrated string combiner box | 10 AWG | 15A/1000 V for PVI 23/28TL | 10in-lbs | PV Fuse |
| 6 inputs | Standard use of integrated string combiner box | 10 AWG | 15A/1000 V for PVI 23TL 20A/1000 V for PVI 28TL | 10in-lbs | PV Fuse |
| 5 inputs* | Standard use of integrated string combiner box | 10 AWG | 20A/1000 V for PVI 23/28TL | 10in-lbs | PV Fuse |
| 4 inputs | Standard use of integrated string combiner box | 10 AWG | 25A/1000 V for PVI 23/28TL | 10in-lbs | PV Fuse |
| String combiner box bypass, 2 inputs | Two standard inputs that bypass integrated string combiner box and use separate MPPT channels | 8 AWG | Fuse Bypass | 10in-lbs | PV Fuse |
| String combiner box bypass, 2 inputs | Two standard inputs that bypass integrated string combiner box and use combined MPPT channels | 8 AWG | Fuse Bypass | 10in-lbs | PV Fuse |

*Consider combining MPPT zones for such configuration.

**Table 5.1 – Wire Sizes Associated with Integrated Fused PV Combiner**

### 5.3.1 Fuse Bypass

**WARNING:** DC fuses inside the wiring box must be removed before any of the configurations in Table 5.2 are attempted.

**WARNING:** Fusing at an external combiner box is required for all of the connections in Table 5.2.

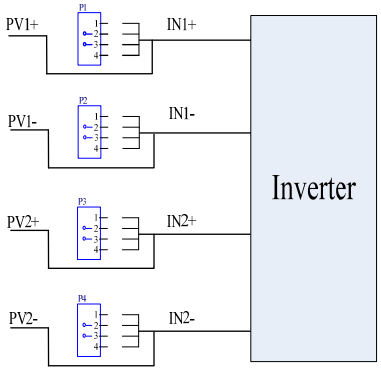
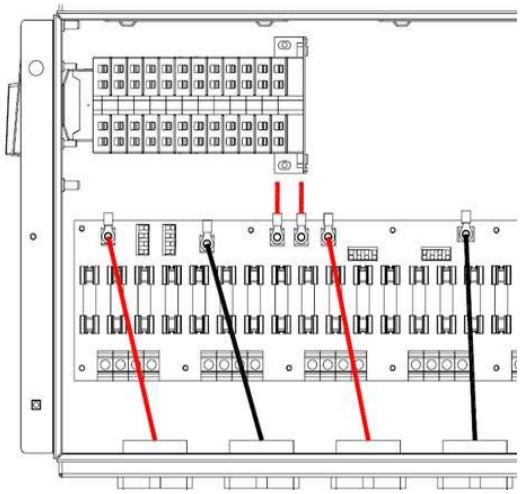
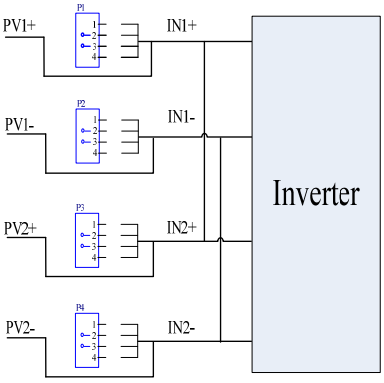
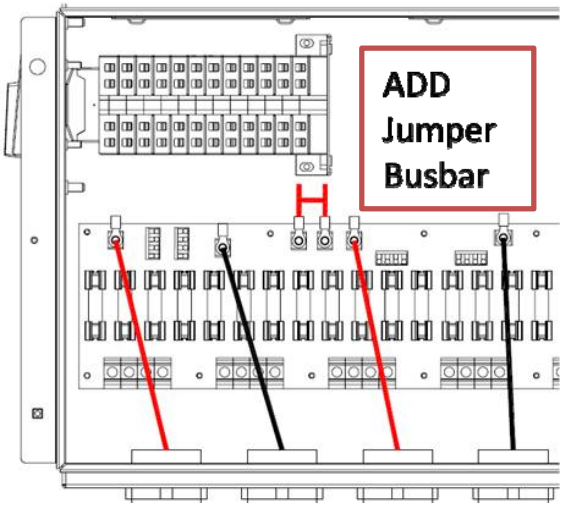
| DC Inputs/ MPPT Zones | Configuration Type | Proper Wiring | S401 Switch | Wire |
|---|---|---|---|---|
| 2 Inputs -2 MPPT Zones |  |  | IND | 8 AWG |
| 2 Inputs - 1 MPPT Zone |  |  | PAR | 8 AWG |

**Table 5.2 – Internal String Combiner Bypass Options**

# 6.0 AC Connections at the Inverter

Both the PVI 23TL and PVI 28TL 3-phase AC wiring is recommended to be installed with five conductors, one per phase along with a neutral and an AC equipment ground as per local requirements.

**WARNING:** The terminal is rated for CU wire only.

- The integrated disconnect switch terminals are listed for 75°C wire. See NEC 310.10 or the Canadian Electrical Code regarding the 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 of 125% 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 | Number of Conductors | Max. AC Wire Size | Min. AC Wire Size | Torque | Max. AC Output Current | Recommended Breaker Size |
|---|---|---|---|---|---|---|---|
| **PVI 23TL** | 480V | 3 (1 per phase) plus neutral | 6AWG | 8AWG | 30in-lbs | 32A | 40A |
| **PVI 28TL** | 480V | 3 (1 per phase) plus neutral | 6AWG | 8AWG | 30in-lbs | 39A | 50A |

**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 8-10AWG. 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 = 14in-lbs).

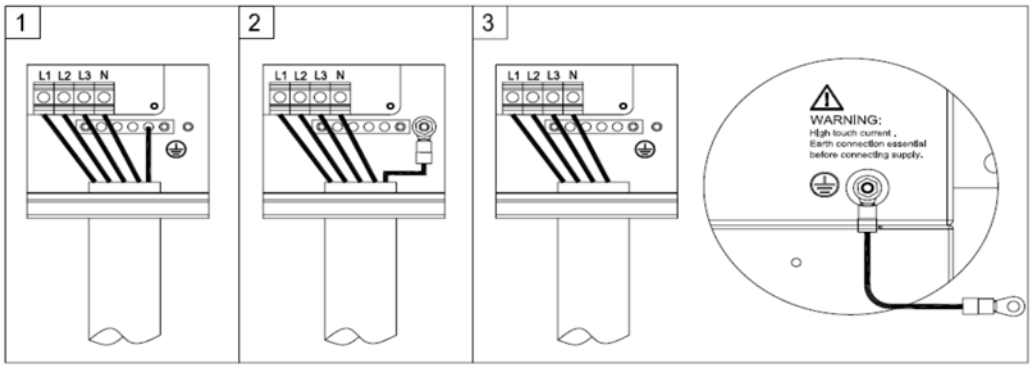



**Figure 6.1 – AC Wire and Grounding Connections**

## 6.1 AC Interconnections to Grid

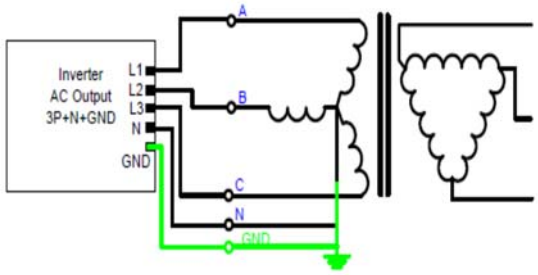
| Description | Configuration | Inverter Compatibility |
|---|---|---|
| 4 Wire WYE (3 phase + Neutral +GND) |  | Compatible with 23TL<br>Compatible with 28TL |
| Other Configurations | All other configurations not mentioned in this document, such as Corner Grounded Delta | Not compatible with 23TL<br>Not compatible with 28TL |

**Table 6.2 – Allowable AC Interconnections to Grid**

**WARNING:** Do not use power tools to reinstall the wiring box cover.

# 7.0 Communication Connections

PVI 23-28TL inverters support industry standard RS-485 Modbus communication. Below is information on the available communication interfaces.

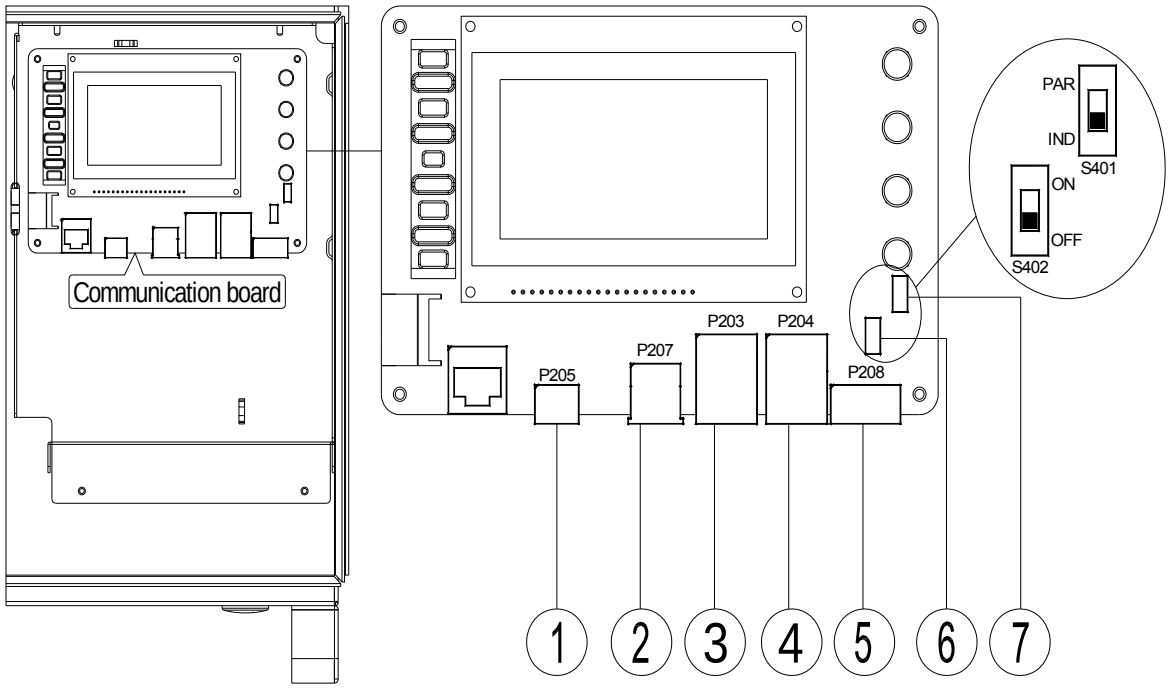
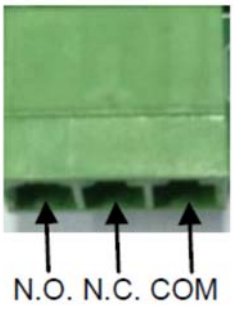
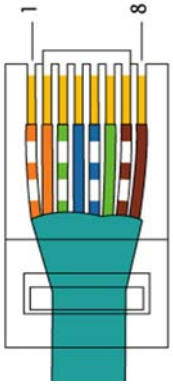
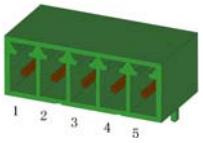
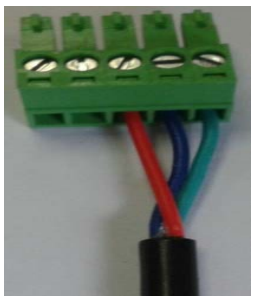



**Figure 7.1 – Communication Section of the Inverter**

<table>
<tr><th>Item #</th><th>Port Name</th><th>Item Name</th><th>Port Image</th><th>Configuration Description</th></tr>
<tr><td>1</td><td>P205</td><td>Dry Contact</td><td> 
</td><td>Remote alarm option. Contact us at inverters@solectria.com for possible configuration.</td></tr>
<tr><td>2</td><td>P207</td><td>USB Port</td><td>  </td><td>Port used for firmware upgrade.<br>Not available for customer use.</td></tr>
<tr><td>3 and 4</td><td>P203 and P204</td><td>RS-485 RJ45 Port</td><td> 

</td><td>There are two RS-485 signal ports on the inverter.
<table>
<tr><th>No.</th><th>Color</th><th>Function</th></tr>
<tr><td>1</td><td>White Orange</td><td>485+</td></tr>
<tr><td>2</td><td>Orange</td><td>N.C.</td></tr>
<tr><td>3</td><td>White Green</td><td>485-</td></tr>
<tr><td>4</td><td>Blue</td><td>N.C.</td></tr>
<tr><td>5</td><td>White Blue</td><td>N.C.</td></tr>
<tr><td>6</td><td>Green</td><td>N.C.</td></tr>
<tr><td>7</td><td>White Brown</td><td>COM</td></tr>
<tr><td>8</td><td>Brown</td><td>N.C.</td></tr>
</table></td></tr>
<tr><td>5</td><td>P208</td><td>RS-485 Port (5-Pin Connector)</td><td> 

Single Inverters
 </td><td>5-pin connector also available for RS-485 communication.
Single Inverter
<table>
<tr><th>No.</th><th>Color</th></tr>
<tr><td>1</td><td>NC</td></tr>
<tr><td>2</td><td>NC</td></tr>
<tr><td>3</td><td>RED_RS485+</td></tr>
<tr><td>4</td><td>Blue_RS485 -</td></tr>
<tr><td>5</td><td>Com</td></tr>
</table></td></tr>
</table>

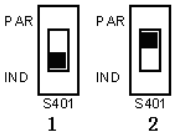
| | | | | |
|---|---|---|---|---|
| **6** | S402 | 120Ω Termination Switch for RS-485 Communication |  | 120 Ω resistor that can be added for impedance matching on the Modbus (RS-485).<br>This switch should only be turned on for the last inverter in the daisy chain. |
| **7** | S401 | MPPT Zone Configuration |  | Used for changing between Dual and Single MPPT configuration. Covered in detail in Chapter 5. |

**Table 7.1 – Available Communication Options in PVI 23-28TL Inverter**

## 7.1 Connecting TL Inverters with Third Party Data Acquisition Systems

For multiple inverters at one location it is possible to use one Data Acquisition System for up to 16 inverters.

Connect the inverter's RS-485 together can be done using standard RJ-45 Ethernet patch cords and plugging these into RJ-45 jacks at each inverter on the right side of the wiring board. Alternatively one can utilize the 5 pin connector (P208) and a shielded twisted pair cable.

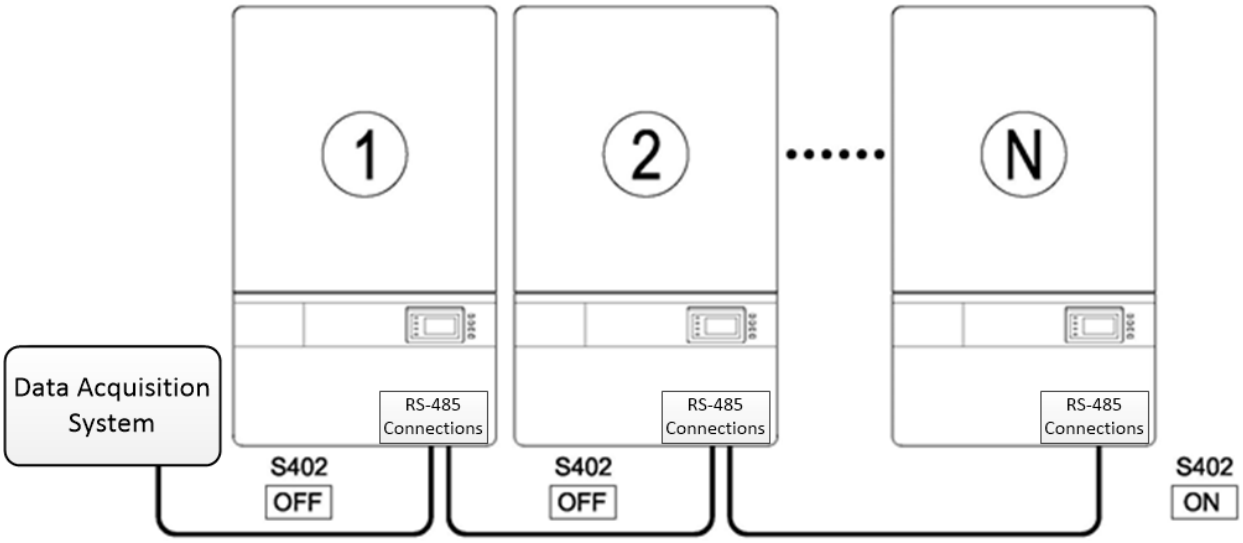



**Figure 7.2 – Multiple Inverters with Third Party Data Acquisition System**

**NOTE:** The Data Acquisition System must have the same **Baud Rate** (9600 default) as the inverter for proper communication. However, each inverter requires its unique Modbus ID.

## 7.2 Connecting TL Inverters using SolrenView Monitoring Option

Solectria offers SolrenView monitoring option for the PVI 23-28 TL inverters. This option includes the SolrenView data logger which can be integrated with the inverter's wiring box. The SolrenView logger is used to connect the TL inverters to the Solectria SolrenView web based monitoring site.

The SolrenView gateway can be factory installed, distributor installed, or field installed and is installed out of view inside of the inverter.

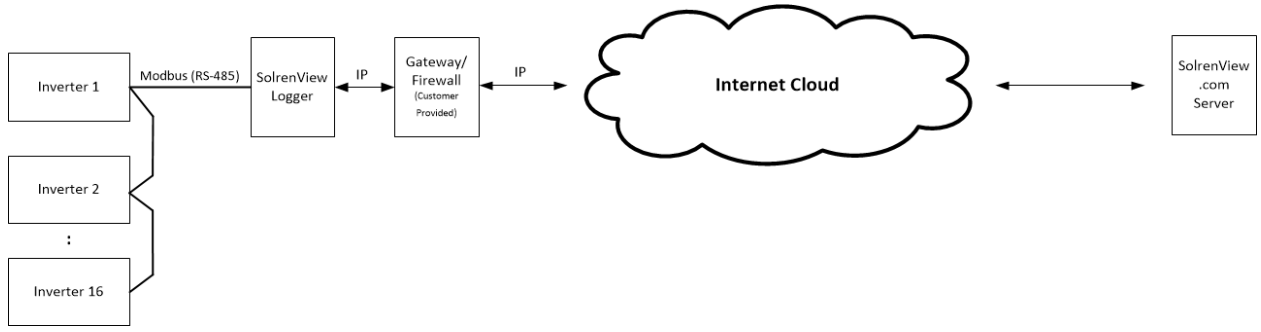



**Figure 7.3 – High Level Block Diagram of the SolrenView Data Acquisition Infrastructure**

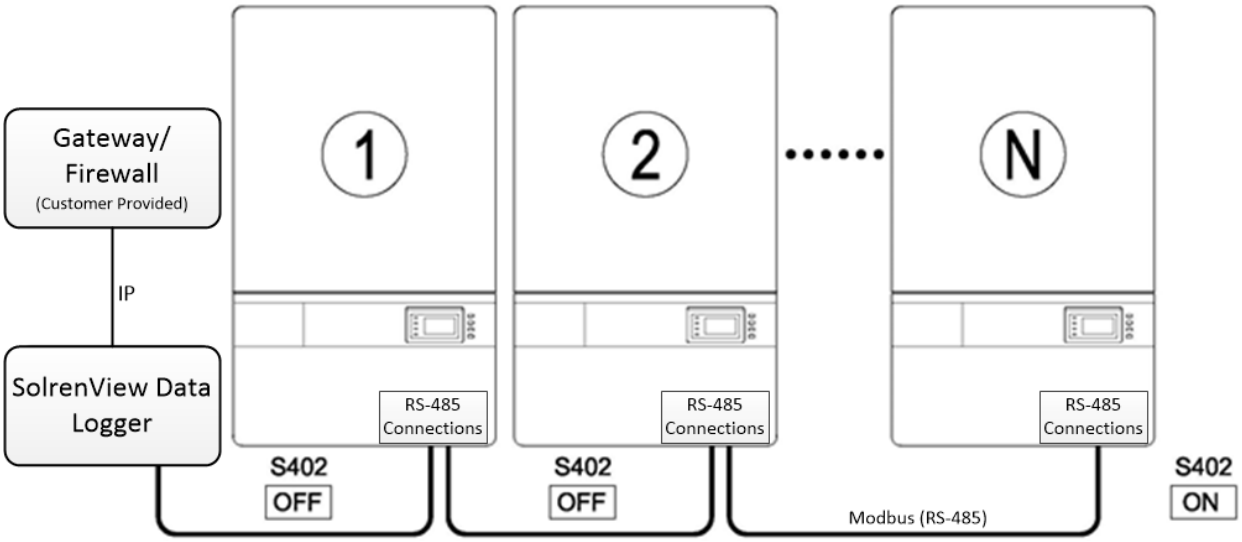
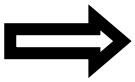



**Figure 7.4 – Multiple Inverters with SolrenView Data Logger**

**NOTE:** The SolrenView data logger in Figure 7.4 is typically installed inside the first inverter. It is shown outside for clarity reasons.

# 8.0 Commissioning the Inverter PV System

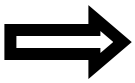
Before commissioning, ensure that the inverter is mounted, all connections are made, and the inverter is ready to power up.



**NOTE:** Make sure all tools, parts, etc., are removed from the vicinity of the inverter before turning it 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 volt meter and probing the positive (+) and negative (-) PV connections.

## 8.1 Turning On the Inverter

1. Turn on the dedicated three-phase circuit breaker or disconnect switch at the building service.
2. Turn on AC disconnect.
3. Turn on DC disconnect.

## 8.2 Operation

The inverter will connect to the electric grid when the DC voltage first exceeds 330VDC (strike voltage) and 300W of power is available. The inverter will shut down when the DC voltage falls below 300VDC.

## 8.3 Turning Off the Inverter

1. Choose **"4 settings"** from the **Main Menu**, and press **ENT**.
2. Choose **"1 ON/OFF"**. Move the cursor to **"OFF"** and press **ENT**.
3. The inverter will slowly ramp down the current and shutdown.
4. Turn off the DC disconnect followed by the AC disconnect.

# 9.0 LCD and LED Indicators

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

## 9.1 LCD

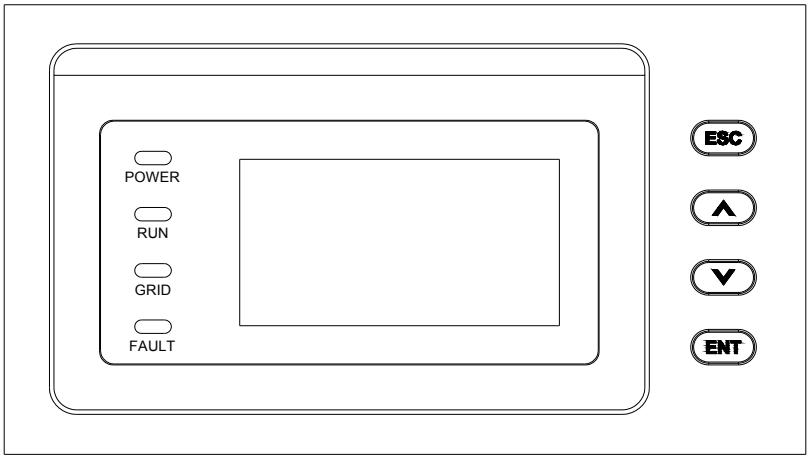



**Figure 9.1 – LCD**

The four touch keys below are available to help the customer scroll through the information.

| Key | Description | Function |
|---|---|---|
|  | Escape key | Back/End/Mute |
|  | Enter key | Confirm entering the menu/Confirm set point |
|  | Up | Page-up in selection menu/+1 setting increment |
|  | Down | Page-down in selection menu/-1 setting decrement |

**Table 9.1 – Key Descriptions**

The LEDs on the left indicate the operational status of the inverter.

| LED Light | Status | Indication | Troubleshooting |
|---|---|---|---|
| **Power** | Light on | DC voltage available at the inverter | No need, Standard Operation |
| | Light off | Low DC or possible power supply problem | 1. Check DC input polarity is correct.<br>2. Verify DC voltage above 180VDC.<br>3. Verify DC disconnect switch is on. |
| **RUN** | Light on | Inverter is producing power | No need, Standard Operation |
| | Flash | Derating<br>(light on 0.5s, light off 1.5s) | Verify Inverters ambient temperature isn't above 45°C.<br>**NOTE:** If the input power is above the rated output power the inverter will derate. |
| | Light off | Inverter is not producing power | 1. Verify that there is no Snow on the array.<br>2. Check if Error light is on or flashing; if so skip to Section 10. |
| **GRID** | Light on | AC voltage is available at the inverter | No need, Standard Operation |
| | Flash | AC voltage out of setting range<br>(light on 0.5s, light off 1.5s) | Check AC voltage and verify it is within range IEEE 1547 specified range. |
| | Light off | No AC voltage at the inverter | Verify that AC is available at the inverter. |
| **FAULT** | Light on | Indicates a possible fault | Note the LCD message and refer to the Fault part of Section 10. |
| | Slow flash | Indicates an Alarm<br>(light on 0.5s, light off 2s) | Note the LCD message and refer to the Alarm part of Section 10. |
| | Fast flash | Indicates protective action being triggered<br>(light on 0.5s, light off 0.5s) | Note the LCD message and refer to the Protection part of Section 10. |
| | Light off | No fault | No need, Standard Operation |

**Table 9.2 – LED Indicators Meaning**

## 9.2 Screen Descriptions

### 9.2.1 Main Screen (Default)

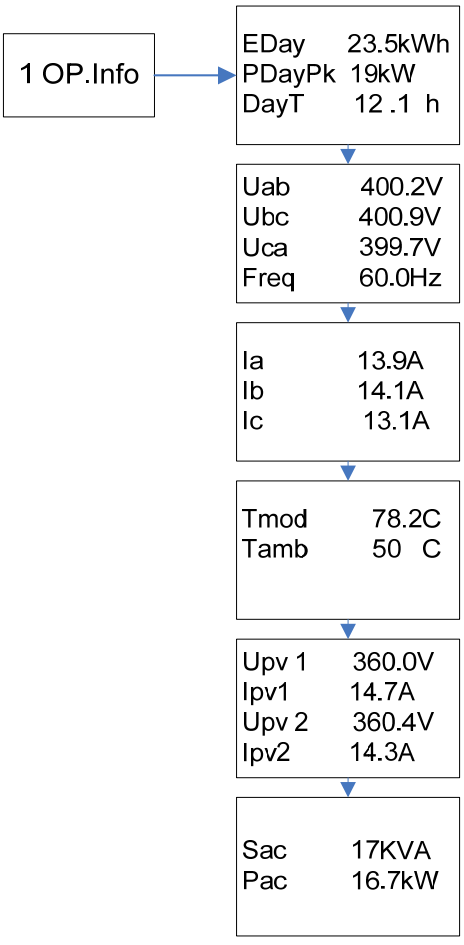
Press **ESC** to move from the **Main (Default)** screen into the **Start Menu**.

### 9.2.2 Start Menu

1. Operation Info
2. Alarm
3. History
4. Settings
5. Power Dispatch

### 9.2.3 Operation Info Menu

The **Info 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 (EDay) Energy (kWh)* | *Cumulative AC* |
| AC Power Output (PDayPk) (kW) | *AC Power Output* |
| Run Time (DayT) | *Hours* |
| | |
| AC1 Voltage (Uab) | *AC Voltage (V)* |
| AC2 Voltage (Ubc) | *AC Voltage (V)* |
| AC3 Voltage (Uca) | *AC Voltage (V)* |
| AC Freq. | *AC Frequency (Hz)* |
| | |
| AC1 Current (Ia) | *AC Current (A)* |
| AC2 Current (Ib) | *AC Current (A)* |
| AC3 Current (Ic) | *AC Current (A)* |
| | |
| Heatsink Temperature | *°C* |
| Ambient Temperature | *°C* |
| | |
| DC Voltage (Upv1) | *DC Voltage (V)* |
| DC Current (Ipv1) | *DC Current (A)* |
| DC Voltage (Upv2) | *DC Voltage (V)* |
| DC Current (Ipv2) | *DC Current (A)* |
| | |
| Sac | *Apparent Power (kVA)* |
| Pac | *Real Power (kW)* |

**Table 9.3 – Operation Information Submenu**

### 9.2.4 Alarm Menu

The **Alarm Menu** displays inverter alarms and faults, 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**. Any fault message will be indicated in the **Alarm Menu**.

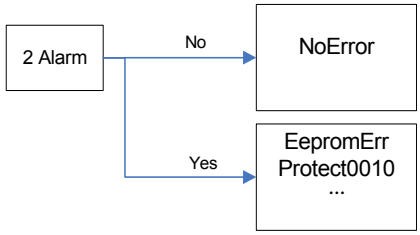



**Figure 9.2 – Present Fault Information**

### 9.2.5 History Menu

The **History 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 the most recent fault messages recorded and retrieved.
2. The last 21 days of operation history data is available.
3. Product software/hardware and serial number information.
4. Cumulative generated power information.

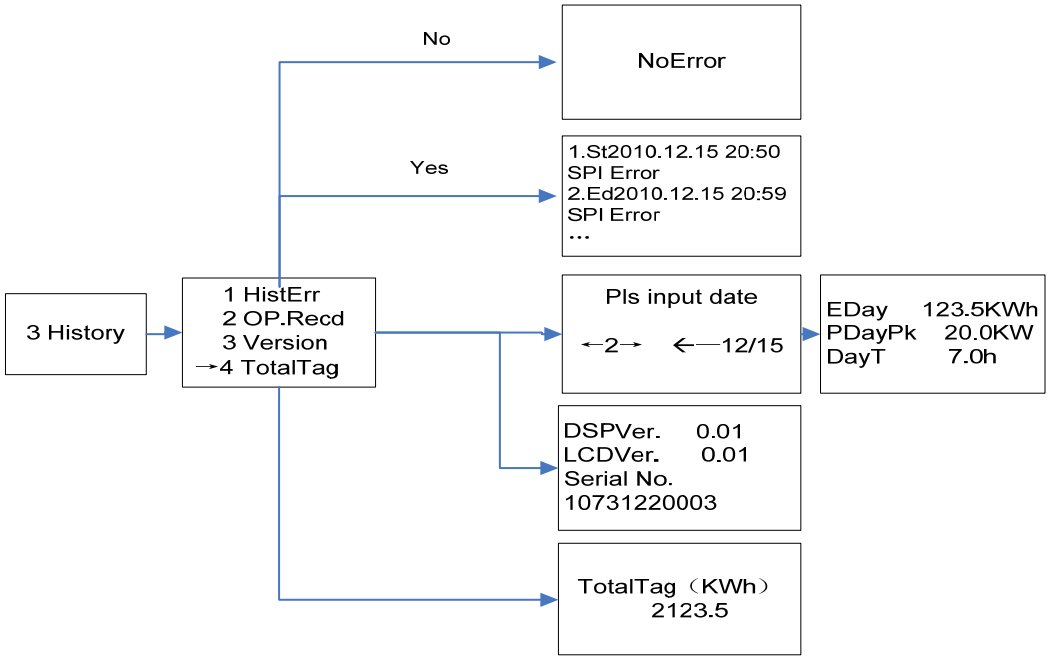



**Figure 9.3 – History Menu and Submenu**

### 9.2.6 Settings Menu

The inverter parameters can be adjusted by using commands in the **Settings Menu** as shown in Figure 9.7 below. Options such as Power ON/OFF, Language, Sounds, Date, Communications, and MPPT can simply be changed/set from the **Settings Menu**.

**NOTE:** When prompted for a password, enter the following: **UP**, **DOWN**, **UP**, **DOWN,** then **ENT**.

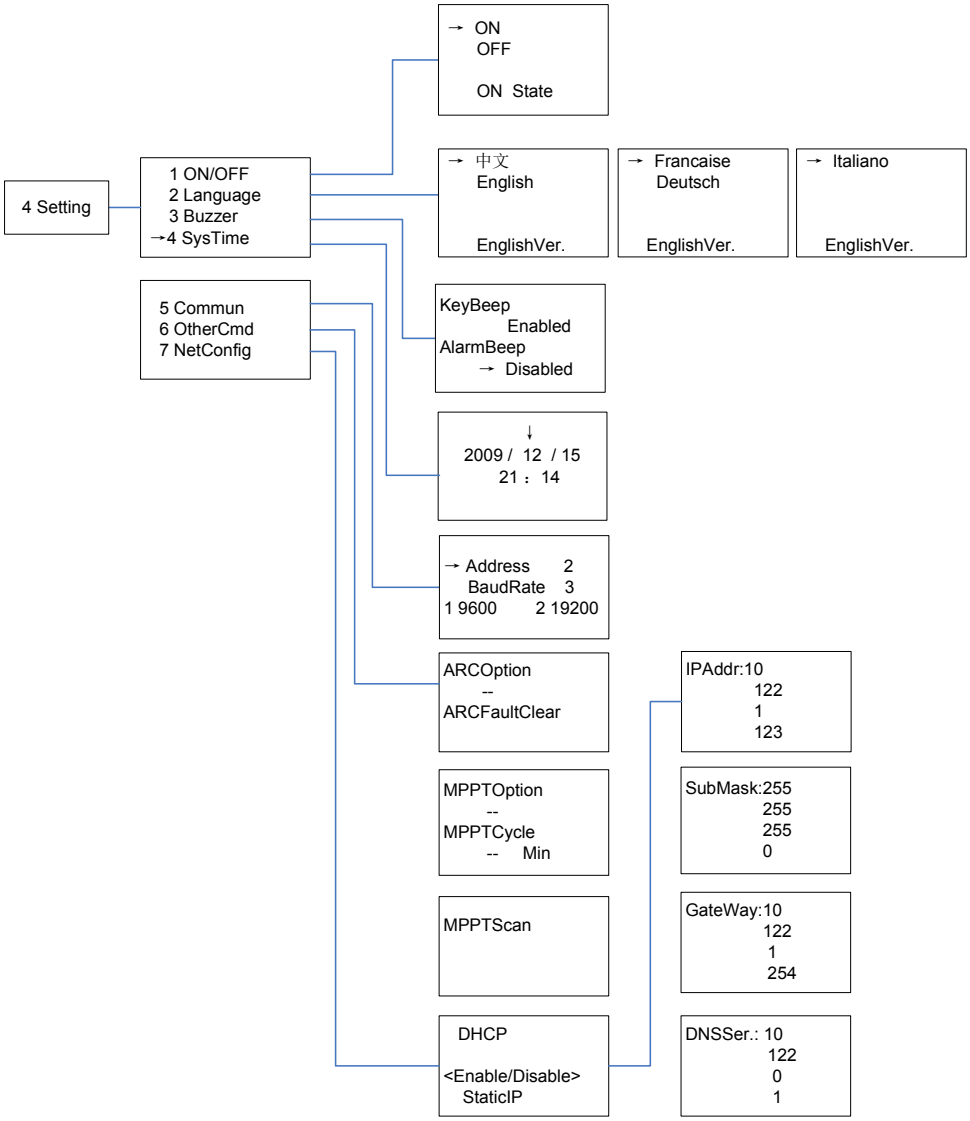



**Figure 9.4 – System Setup Menu and Submenu**

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

**NOTE:** When connecting multiple inverter (up to 16) to a single data logger each inverter requires a unique **Address (Inverter ID)**.

### 9.2.7 Power Dispatch

"ActivePower" and "PowerFactor" parameters can be set up through the LCD as well as remotely.

**NOTE:** These parameters are only adjustable with permission from the local utility.

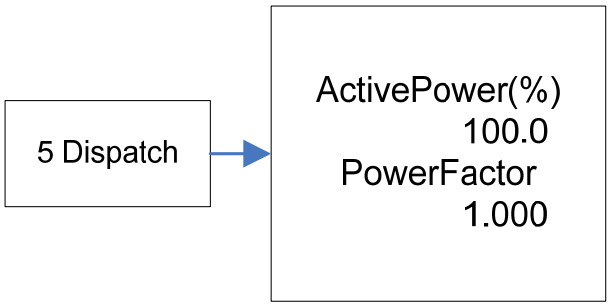



**Figure 9.5 – Active Power and Power Factor Settings**

**NOTE:** When prompted for a password, enter the following: **UP**, **DOWN**, **UP**, **DOWN,** then **ENT**.

**NOTE:** It is often common at sites with High AC voltage above 1.05p.u that the Utility would like to modify the power factor to reduce the voltage at the point of common coupling. This can be done by setting the inverter to absorb vars. For the PVI 23-28TL this can be achieved by setting the inverter to a negative value. For example, one would set the power factor to -0.95 which will help reduce the AC voltage at site by allowing the inverter to absorb vars.

If you are interested in enabling these features or in further understanding their capabilities, please contact us at support@solectria.com for more details.

# 10.0 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. 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.<br>2. Temperature sensor is damaged. | 1. Verify temperature reading off of the display.<br>2. Switch off the inverter's internal disconnects.<br>3. Switch the Inverter back on.<br>4. If error does not clear, contact Solectria Customer Service. |
| Alarm | 2. SPICommErr | Inverter's internal communication failure | 1. Poor connection of the inverter's internal communication connector. | 1. Observe for 5min and see whether the alarm is cleared automatically.<br>2. Switch off the inverter's internal disconnects.<br>3. Switch the Inverter back on.<br>4. If error does not clear, contact Solectria Customer Service. |
| Alarm | 3. IntFanErr | Inverter's internal fan (can't be seen externally) is not operating properly | 1. Fan service life has expired.<br>2. Fan connector is making a poor connection. | 1. Observe for 5min and see whether the alarm is cleared automatically.<br>2. Switch off the inverter's internal disconnects.<br>3. Switch the Inverter back on.<br>4. If error does not clear, contact Solectria Customer Service. |
| Alarm | 4. ExtFanErr | One of the three external fans is not operating properly | 1. Fan is blocked. | 1. Observe for 5min and see whether the alarm is cleared automatically.<br>2. Switch off the inverter's internal disconnects.<br>3. Check the fan blades for debris. |

| | | | | |
|---|---|---|---|---|
| | | | 2. Fan service life has ended.<br>3. Fan socket connecter is making a poor connection. | 4. Switch the Inverter back on.<br>5. If error does not clear, contact Solectria Customer Service. |
| Alarm | 5. EepromErr | Incorrect memory reading | 1. A problem with the inverter's internal memory. | 1. Observe for 5min and see whether the alarm is cleared automatically.<br>2. If error does not clear, contact Solectria Customer Service. |
| Protection | 1. Arc Board Error | Internal Arc board self-check error | 1. Possible communication error between Arc board and Inverter.<br>2. Abnormal reading within the Arc board. | 1. Observe for 5min and see whether the alarm is cleared automatically.<br>2. If error does not clear, contact Solectria Customer Service. |
| Protection | 2. OverTemp | Ambient temperature or temperature inside inverter is too high | 1. Ambient temperature outside the inverter is too high.<br>2. Fan is blocked.<br>3. Poor cooling due to improper installation. | 1. Confirm that external ambient temperature is within the specified range of operating temperature.<br>2. Verify air inlet and outlet are not blocked.<br>3. Verify fan is not blocked.<br>4. Verify proper spacing was followed during installation.<br>5. Observe for 30min and see whether the alarm is cleared automatically.<br>6. If error does not clear, contact Solectria Customer Service. |
| Protection | 3. GridV.OutLim | Grid voltage exceeds the specified range | 1. Grid voltage is abnormal.<br>2. No AC voltage at the inverter.<br>3. Improper AC wiring (see Section 6.1).<br>4. Loose AC connections. | 1. Observe for 10min and see whether the alarm is cleared automatically.<br>2. Verify Grid Voltage is within range.<br>3. Verify proper AC wiring.<br>4. If error does not clear, contact Solectria Customer Service. |

| | | | | |
|---|---|---|---|---|
| Protection | 4. GridF.OutLim | Grid voltage frequency is abnormal | 1. Grid frequency is out of range.<br>2. Loose AC connections. | 1. Observe for 10min and see whether the alarm is cleared automatically.<br>2. Verify grid frequency is within range.<br>3. Verify proper AC wiring.<br>4. If error does not clear, Contact Solectria Customer Service. |
| Protection | 5- PV1 (2) VoltOver | DC input voltage exceeds the specified value | 1. DC over-voltage. | 1. Observe for 30min and see whether the alarm is cleared automatically.<br>2. Verify DC open circuit input voltage is within specified range.<br>3. Switch off the inverter's internal disconnects. Switch the Inverter back on.<br>4. If error does not clear, contact Solectria Customer Service. |
| Protection | 6. 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.<br>2. If error does not clear, contact Solectria Customer Service. |
| Protection | 7. GFCI.Err | DC leakage current is above recommended value | 1. Excessive parasitic capacitance on PV module due to insulation failure.<br>2. Abnormal grounding conditions. | 1. Observe for 10min and see whether the alarm is cleared automatically.<br>2. Contact System installer to check installation for possible Ground Fault.<br>3. If error does not clear, contact Solectria Customer Service. |
| Protection | 8. IsolationErr | DC insulation impedance to ground | 1. Insulation to ground is below recommended value. | Contact System installer to check installation for possible Ground Fault. |

| | | | | |
|---|---|---|---|---|
| Protection | 9. IntProtect 0010-0260 | Internal problem within the inverter | 1. One of the inverter's internal protection features was triggered causing the inverter to shut down. | 1. Observe for 10min and see whether the alarm is cleared automatically.<br>2. If error does not clear, contact Solectria Customer Service. |
| Protection | 10. Arc Protect | Inverter shuts down due to a possible Arc fault concern | 1. An internal Arc fault occurred on the DC side.<br>2. Fault with the Arc board. | 1. Have qualified Electrical Personnel inspect wiring section of Inverter.<br>2. If no issues are found, contact Solectria Customer Service. |
| Fault | 1. IntFault0010-150 | Internal non-critical fault within the inverter | 1. A fault occurred internally within the inverter. | 1. The inverter will restart once the fault is cleared.<br>2. If error does not clear, contact Solectria Customer Service. |

**Table 10.1 – Troubleshooting**

# 11.0 Product Maintenance

Regular maintenance helps extend product lifetime and performance.

## 11.1 Check the Electrical Connection

Check all the cable connections once every 6 months, by performing the following steps:

1. Turn off inverter DC disconnect.
2. Turn off inverter AC disconnect.
3. Lock out all DC and AC sources to the inverter.
4. Verify absence of DC and AC voltages at the wiring box.
5. Check for loose or untightened cables; follow torque and safety instructions in the manual.
6. Check for cable damage, especially whether the cable surface is scratched or smooth. Repair or replace the cables if necessary.

## 11.2 Clean the Air Vent Filter

On average, it is recommended to check the air vent of the fans once every 6 months. Do so by performing the following steps:

1. Turn off inverter DC disconnect.
2. Turn off inverter AC disconnect.
3. Lock out all DC and AC sources to the inverter.
4. Verify absence of DC and AC voltages at the wiring box.
5. Use Philips Screw driver to remove Vent covers.
6. Clean vents using dry cloth.
7. Return Screws (torque = 10in-lbs).

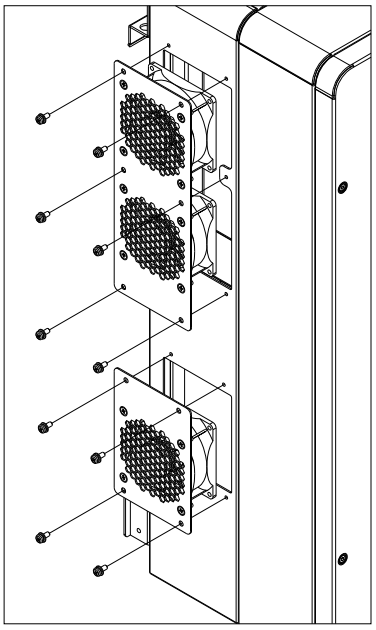


**Figure 11.1 – Fan Vent Locations**

# 12.0 Product Warranty and RMA Policy

## 12.1 Warranty and Registration

The warranty and RMA statements for this product are available online at http://www.solectria.com//site/assets/files/1091/inverter_warranty-1.pdf.

If you do not have access to the internet or would like to request a copy to be mailed to you, please contact the Solectria Renewables Customer Service Department at 978-683-9700.

# 13.0 Technical Data

## 13.1 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 23TL | PVI 28TL | Unit |
|---|---|---|---|
| Nominal Output Voltage | 480 | 480 | VAC |
| Operating AC Voltage Range | 88 – 110% | | VAC |
| Operating Frequency | 60 | | Hz |
| Output Frequency Range | 59.3-60.5 (adjustable 55-65) | | |
| Power Factor | Unity, > 0.99 (adjustable ±0.8) | | |
| Total Harmonic Distortion (THD) @ Rated Load | < 3% | | |
| Continuous Output Power | 23 | 28 | kW |
| Continuous Output Current (VAC) @ Nominal Voltage | 27.7 | 33.7 | Amps |
| Maximum Output Current @ 88% VAC | 32 | 39 | Amps |
| Grid Connection Type | 3ø+/N/GND | | |
| One Cycle Short Circuit Current (L-N/GND)/Duration | 52.9Amps RMS/20ms | | |
| One Cycle Short Circuit Current (L1/L2/L3)/Duration | 69.6Amps RMS/20ms | | |

**Table 13.1 – AC Output Specifications**

| | PVI 23TL | PVI 28TL |
|---|---|---|
| Peak Efficiency | 98.6% | 98.5% |
| CEC Weighted Efficiency | 98.0% | 98.0% |
| Tare Loss | 1W | 1W |

**Table 13.2 – Efficiency of Inverters**

## 13.2 Input DC (PV) Specifications

| | PVI23TL | PVI 28TL | Units |
|---|---|---|---|
| Absolute Maximum Input Voltage | 1000 | | VDC |
| Maximum PV Power | 15.5 per MPPT (31) | 19 per MPPT (38) | kW |
| Operating Input Voltage | 300-900 | | VDC |
| Strike (Startup Voltage/Power) | 330VDC/300W | | |
| MPPT Input Voltage Range | 480-800 | 500-800 | VDC |
| MPPT Trackers | 2 with 4-Fused Inputs per Zone | | |
| Maximum Operating Input Current | 25 per MPPT (50) | 29 per MPPT (58) | Amps |
| Maximum Short Circuit Current | 41 per MPPT (82) | 48 per MPPT (96) | Amps |

**Table 13.3 – DC Input Specifications**

## 13.3 Other Specifications

| | |
|---|---|
| Integrated String Combiner Option | 8 String Inputs , 12-15 A (4 per MPPT) |
| Operational Ambient Temperature | -13° to 140°F (-25° to 60°C) Derating occurs above 45°C |
| Storage Temperature | -22° to 158°F (-30° to 70°C) |
| dBA (Decibel) Rating | < 55dBA @ 3m |
| Operating Altitude | 13123ft/400m (derating from 6562ft/2000m) |
| Inverter Enclosure | Type 4 |
| Safety Listings & Certifications | UL 1741/IEEE 1547, IEEE 1547.1, UL 1699B<br>CSA C22.2#107.1, FCC part 15 B |
| Certification Agency | CSA |
| Weight | 122lbs (55kg) |
| BTU Rating | 1911BTU/Hr |

**Table 13.4 – Other Specifications**

## 13.4 Temperature Derating Curve

Figure 13.1 shows the standard power derating curve for a PVI 23-28TL inverter. The inverter operates at full power up to 45°C and derates linearly until 60°C where it shuts down to protect itself.

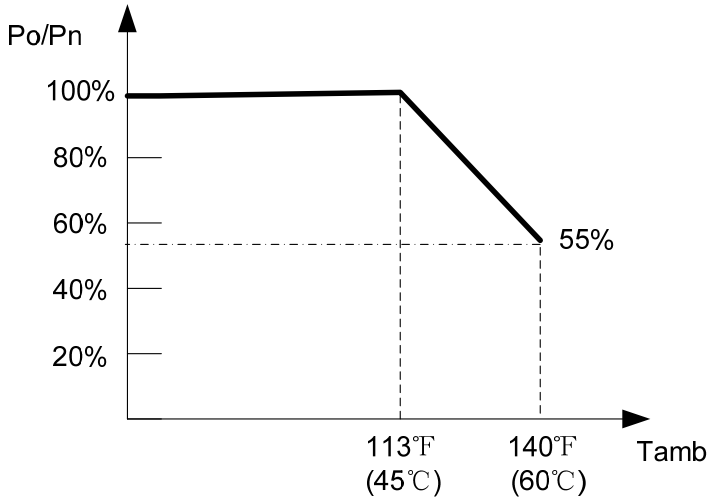



**Figure 13.1 – Temperature Derating Curve**

## 13.5 Power Derating Curve Out of MPPT Zone

Figure 13.2 below shows the standard derating curve outside of the MPPT zone. Inverters derate linearly outside their rated MPPT range.

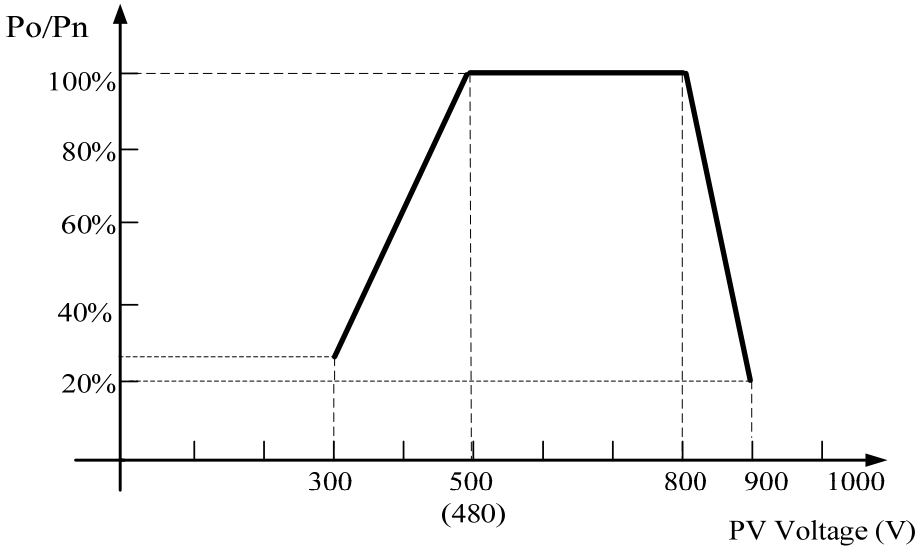



**Figure 13.2 – Power Derating Outside of MPPT Range**

## 13.6 Altitude Derating Curve

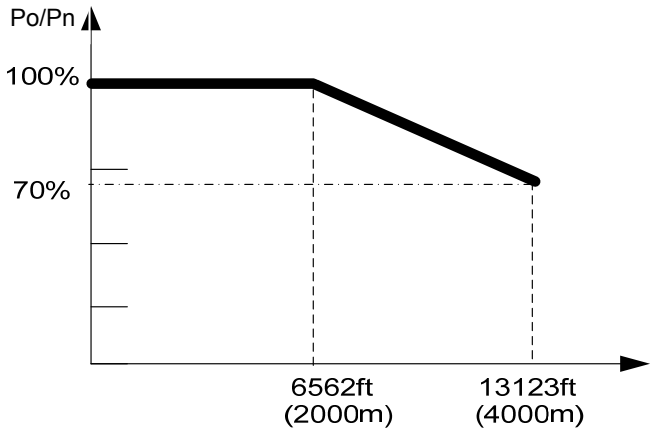



**Figure 13.3 – Derating at High Altitudes**

## 13.7 Internal Circuit Diagram

The basic power flow within the PVI 23-28TL series of inverters is below. Note that the GFDI circuit is not depicted.

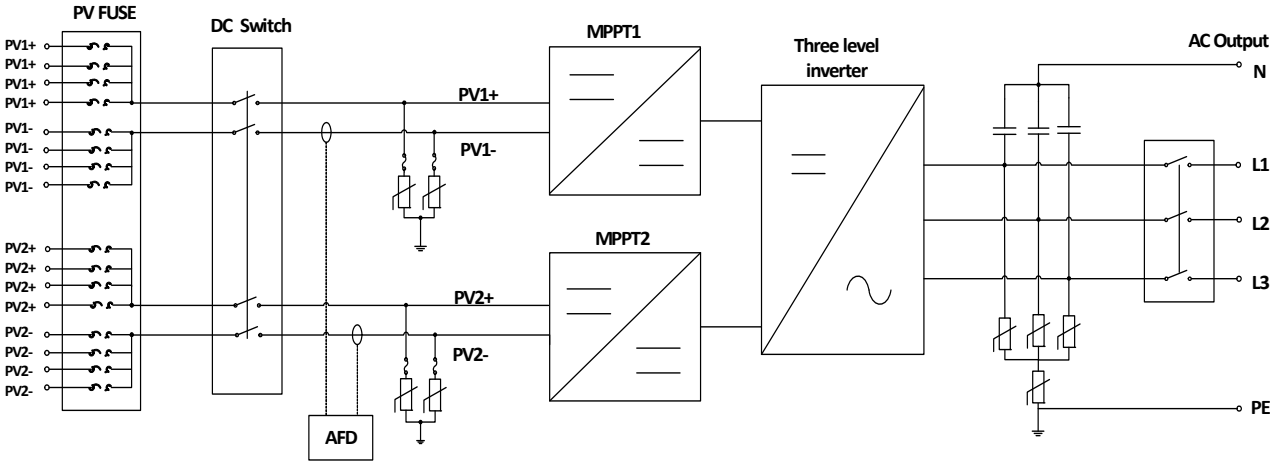



**Figure 13.4 – Simplified Internal Circuit Diagram for PVI 23-28TL Series Inverters**

# 14.0 Accessory Options

The PVI 23-28TL comes with several options that allow the inverter to support a wide range of real life applications.

## 14.1 SolrenView Monitoring

OPT-SRV-LCD, as discussed in Section 7.2, allows customers to purchase the only monitoring system that is designed to support PVI 23-28TL to the fullest. SolrenView can be placed inside the inverter so no external enclosure is needed. RS-485 and DC wires can be fed into SolrenView directly off of the inverter.


**Figure 14.1 – SolrenView Monitoring Installed Inside Wiring Box**

## 14.2 Shade Cover

OPT-SHADECOVER-PVI-23-28 is specifically designed for inverters mounted at a 15-degree tilt angle. It protects the inverter from harsh weather and direct sunlight/extremely hot temperatures while reducing thermal gain on the inverter and increasing energy production. PVEL, now part of BEW/DNV Kema, performed field testing of the shade cover temperature effects of the inverter case temperatures. The normalized data analysis showed 2-15% less temperature rise on the inverter case temperatures. Front, Back and Top temp rise was 6%, 4%, 15% lower with the Shade cover (as shown in table below).

| | **Inverter1** | | | | | |
|---|---|---|---|---|---|---|
| **Measurement Location** | **Top** | **East** | **West** | **Front** | **Back** | **Bottom** |
| **Without Shade Plate [$T_{Case}/T_{Ambient}$]** | 1.98 | 1.53 | 1.71 | 1.54 | 1.47 | 1.26 |
| **Shade Plate on Inverter1 [$T_{Case}/T_{Ambient}$]** | 1.67 | 1.47 | 1.66 | 1.45 | 1.41 | 1.23 |
| **Percent Difference [Shade Plate-Without Shade Plate](%)** | -15.65 | -3.36 | -3.01 | -6.26 | -4.20 | -2.34 |

**Table 14.1 – Normalized (to Measure Ambient Temperatures) Case Temperatures at Various Locations on the Inverter**

Figure 14.2 below shows an inverter installed rack mounted with the Solectria Shade cover.

**Figure 14.2 – Inverter With Shade Cover Installed**

## 14.3 AC & DC Disconnect Covers

OPT-DISCOCOVER-PVI-23-28 is a tamper resistant cover for the AC and DC disconnects. It is for customers that have inverters in public places so the disconnects cannot be turned while the inverter is running.

**Figure 14.3 – Temper Proof Cover**

# 15.0 Appendices

## Appendix A – PVI 23-28TL Datasheet

http://www.solectria.com/support/documentation/

## Appendix B – String Sizing Tool

http://solectria.com/support/string-sizing-tool/

## Appendix C – Contact Information

Solectria Renewables, LLC
360 Merrimack Street
Lawrence, Massachusetts 01843
USA

| | |
|---|---|
| Tel: | 978.683.9700 |
| Fax: | 978.683.9702 |
| Sales Support: | inverters@solectria.com |
| Customer Support: | service@solrectria.com |
| Website: | www.solectria.com |


## Appendix D – Authorized Distributors

Please visit:
http://www.solectria.com/products/how-to-buy/

## Appendix E – UL 1741 / UL 1699B/ IEEE 1547 / CSA 22.2#107.1 Authorization to Mark

CSA Group

# Certificate of Compliance

**Certificate:** 2665124 **Master Contract:** 259363

**Project:** 2716241 **Date Issued:** April 1, 2014

**Issued to:** **Solectria Renewables,LLC.**
**360 Marrimack St.Bldg 9,**
**Lawrence,**
**MA,01843,**
**USA**
**Attention: Mr. James Worden**

***The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only***

C US

**Issued by:** *Kyle Song*
Kyle Song

**PRODUCTS**

CLASS 5311 09 - POWER SUPPLIES - Distributed Generation Power Systems Equipment
CLASS 5311 89 - POWER SUPPLIES - Distributed Generation Power Systems Equipment - Certified to U.S. Standards

Utility Interactive Inverter, Model PVI 23TL-480 and PVI 28TL-480, permanently connected.

For details related to rating, size, configuration, etc., reference should be made to the CSA Certification Record,Certificate of Compliance Annex A, or the Descriptive Report.

**APPLICABLE REQUIREMENTS**

CSA-C22.2 No. 107.1-01 - General Use Power Supplies

*UL Std. No.1741-Second Edition - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources(January 28, 2010)

UL 1699B - Outline of Investigation for Photovoltaic (PV) DC Arc-Fault Circuit Protection (Issue Number 2, January 14, 2013)

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