



PVI 60KW

PVI 77KW

PVI 90KW

INSTALLATION AND OPERATION MANUAL

**Commercial, Grid-Tied Photovoltaic
Inverters**

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Subject to Change

IMPORTANT SAFETY INSTRUCTIONS

In this manual “Inverter” or “Inverters” refers to the all inverter models: PVI 60KW, PVI 77KW and PVI 90KW unless one of the specific models is noted.

This manual contains important instructions that shall be followed during installation and maintenance of the PVI 60KW, PVI 77KW AND PVI 90KW 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 a 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 done in accordance with the local and national electrical codes ANSI/NFPA 70.
- The Inverter contains no user serviceable parts. Please contact Solectria Renewables or a Solectria Renewables authorized system installer for maintenance. (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 and on the Inverter unit as well as the PV modules.
- Connection of the Inverter to the electric utility grid must be done 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 opaque (dark) material before wiring them. PV arrays produce electrical energy when exposed to light and could create a hazardous condition.
- The inverter enclosure and disconnects must be locked (requiring a tool or key for access) for protection against risk of injury to persons. The enclosure includes a lockable handle and comes with a key. Keep the key in a safe location in case access to the cabinet is needed. (A replacement for a lost key can be obtained from Solectria Renewables.)

SAVE THESE INSTRUCTIONS

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1 Introduction

The PVI 60KW, PVI 77KW and PVI 90KW are commercial, 3-phase grid-tied PV inverters designed to be inter-connected to the electric utility grid. With this manual the Inverters can be installed and operated safely. This installation guide is used as reference for the commissioning and as a guideline on how to use the inverter most effectively.

Feeding power into 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 480VAC, 3-phase commercial, industrial or institutional facility’s electrical system which is connected to the electrical grid. (208VAC versions are also available.)

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 look into local regulations regarding Net Metering/inter-connection in your local area. Note that some utilities need to change their revenue kWh meter for proper Net metering measurement and billing.

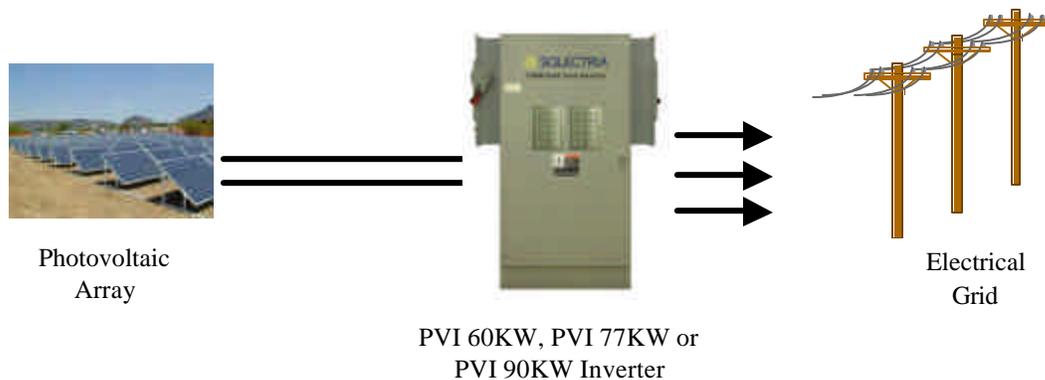


Fig. 1 Grid tied inverter application

2 Installation



WARNING: Before installing the Inverter, read all instructions and caution markings in this manual and on the Inverter as well as on the photovoltaic modules.



WARNING: Electrical installation shall be done in accordance with all local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.



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

2.1 Checking for Shipping Damage

The Inverter is thoroughly checked and tested rigorously before it is shipped. Even though it is bolted onto a rugged, oversized pallet or in a crate for delivery, the inverter can be damaged during shipping.

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

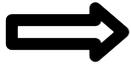
Do not accept the unit if it is visibly damaged or if you note visible damage when signing shipping company receipt. Report damage immediately to shipping company. Do not remove the unit from pallet/package. If it is determined that the unit must be returned, an RMA# must be obtained from Solectria Renewables.

2.2 Inverter Mounting

Removing inverter from pallet and moving inverter:

- Use a fork lift or fork attachment on other equipment if lifting from the bottom. The equipment must be rated for at least 2000lb since the inverter is about 1600 lb. The forks should be set at a 28" outside spacing so they fit just in between the inverter's 4 x 4" aluminum tube feet.
- Alternatively, the inverter can be lifted using the lifting eyes on the top. If using this lifting method, lift with vertical chains and hooks connected to a proper lifting device. Do not lift with an "A" chain between the two eyes as this could bend the inverter's roof.

The Inverter is made up of a rainproof industrial enclosure containing electrical and electronic components including a transformer, filters, a contactor (for zero nighttime power consumption), fuses, a sealed IP64 power & control electronic inverter unit (DMGI660) and AC and DC disconnects mounted on the sides of the main enclosure.



NOTE: If the Inverter is mounted outside, please make sure the enclosure and disconnect doors remains closed in case of rain during the installation process. (Leaving these doors open voids the warranty.) Since the AC and DC connections are made in the side-mounted disconnects only, there is no need to open the main enclosure during hook-up. The disconnect doors should be closed in case of rain.

Notes regarding mounting and placement of the inverter

Criteria for device mounting:

- Because the power electronics is in an IP65 sealed enclosure within the NEMA 3R main 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 even given the unit's robust construction, rainproof design and powerful cooling system.
- For optimal electrical efficiency, use the shortest possible AC and DC cables and use the maximum allowable cable size.
- Avoid installation in close proximity to people or animals, as there is a small amount of audible high-frequency switching noise.
- Install the inverter in an accessible location following NEC codes for enclosure and disconnect door clearances and proximity to other equipment. (See mounting diagram, Fig. 2.2)
- For optimal inverter life and performance, do not mount the inverter in direct sunlight, especially in hot climates, although the inverter is designed to function at full power continuously in up to 45°C ambient temperatures (35°C for the PVI 90KW). In hot climates if the unit must be mounted in direct sunlight a metal sun-shield is recommended. It is recommended that the inverter is mounted on the north side of buildings or on the north side of a PV array (which can provide some shade). It is also recommended to face to door north or east if possible.



CAUTION: Please follow these guidelines:

- The inverter weighs about 1600 lbs. Be sure to verify load capacity of floor, roof or concrete pad mounting area (recommended).
- The ambient temperature must be between -20°C and +45°C for full power, continuous operation. (The inverter will automatically reduce power or shut down to protect itself if ambient air temperature rises above 45°C.). The PVI 90KW is thermally de-rated when the ambient temperature exceeds 35°C and will produce 78-82 kW AC @ 40°C ambient.
- The inverter enclosure and disconnects must be locked (requiring a tool or key for access) for protection against risk of injury to persons. The enclosure includes a lockable handle and comes with a key. Keep the key in a safe location in case access to the cabinet is needed. (A replacement for a lost key can be obtained from Solectria Renewables.)

- The National Electrical Code (NEC) requires that the inverter be connected to a dedicated circuit and no other outlets or device may be connected to this circuit. See NEC Section 690-64(b)(1). 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 Section 690-64(b)(2).
- The cooling air exhausts at the bottom of the unit. Nothing should block the 4" clear space under the enclosure defined by the 4" tall mounting feet.
- A minimum distance of 12 inches (300mm) must be clear above the inverter for ventilation.
- The inverter must be mounted with *at least* a 4" open space behind it. Air should be able to flow up behind the unit from below it to above it.
- 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 less than 45°C (or 35°C for the PVI 90KW). The ambient temperature should be kept as low as possible at all times.
- Correct mounting position for the inverter is vertical with the mounting feet on the floor. This diagram shows the basic inverter dimensions:

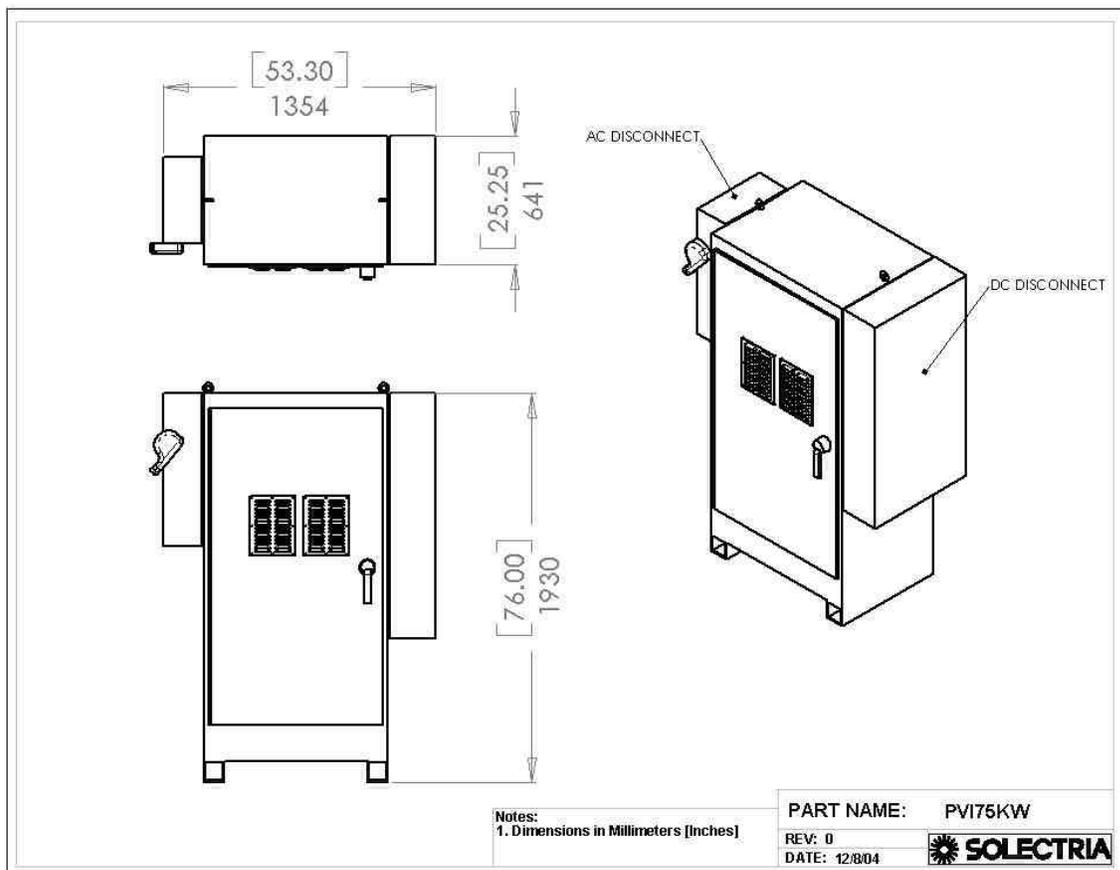


Fig. 2.1 Dimensions to mount the inverter (480VAC version shown in diagram).

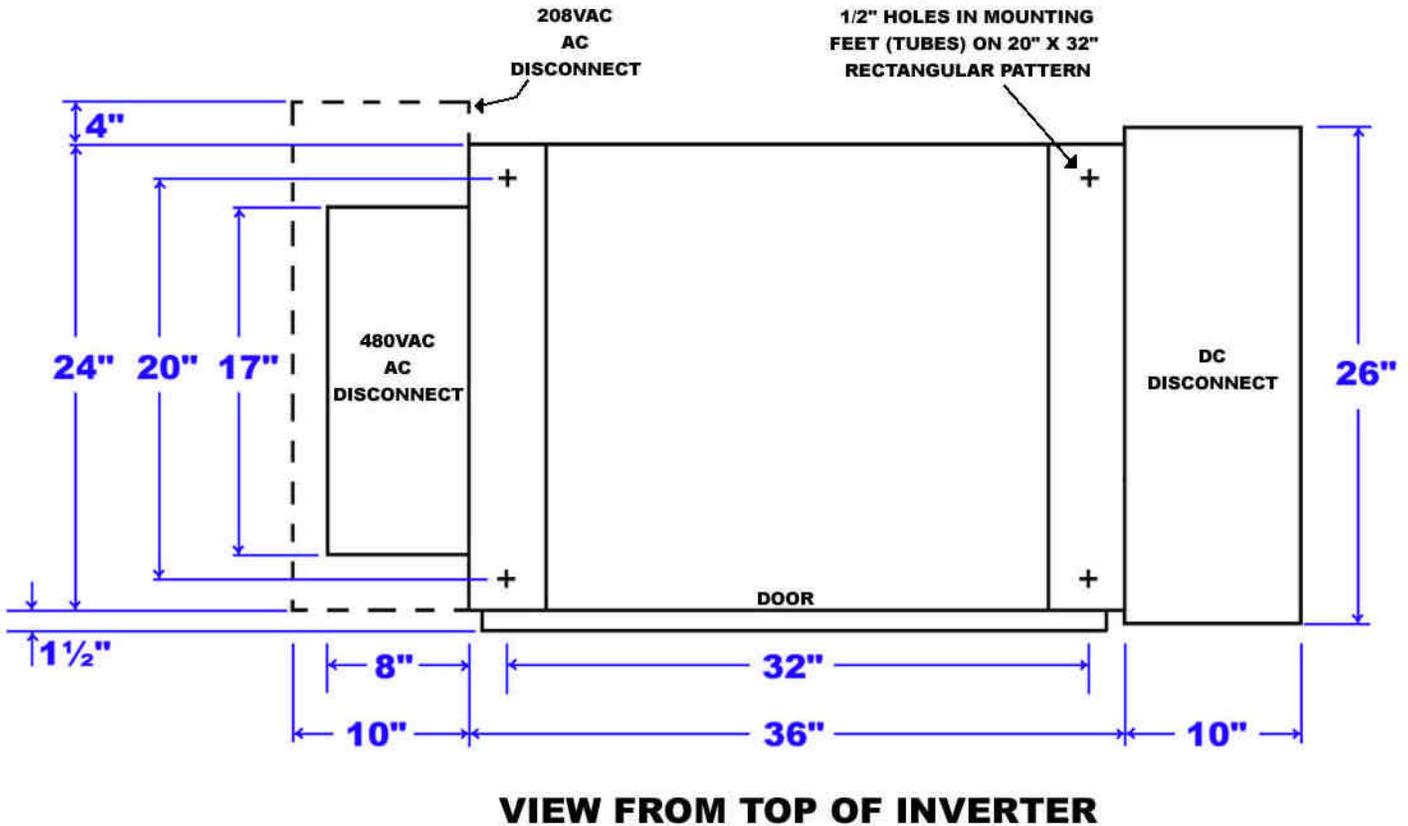


Fig. 2.2 PVI 60KW, PVI 77KW AND PVI 90KW Mounting Hole Diagram

Mounting Details

Using the mounting diagram Fig. 2.2, choose whether floor/roof or concrete pad mounting will be used. The inverter includes mounting feet with 4 holes (1/2", 12mm diameter) on a 20" x 32" rectangular pattern for attaching the inverter. Note that these 4 mounting holes are 2" inside each corner of the main inverter enclosure dimensions which are 24" x 36".

It is recommended to use four hot dip galvanized grade 5 or 8 steel bolts or stainless steel bolts. The correct bolt size is 3/8" (10mm) diameter. Use a heavy lock washer and flat washer with each bolt.



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



NOTE: The 1600 lb. weight of the inverter will exert this added load to floor, roof or pad where mounted. Be sure to verify proper load capacity of mounting surface.



NOTE: If the roof/floor mounting only uses the inverter's mounting feet, be sure you use all 4 available foot mount bolt positions.

2.3 Electrical Connection and Connection To Electrical Utility Grid

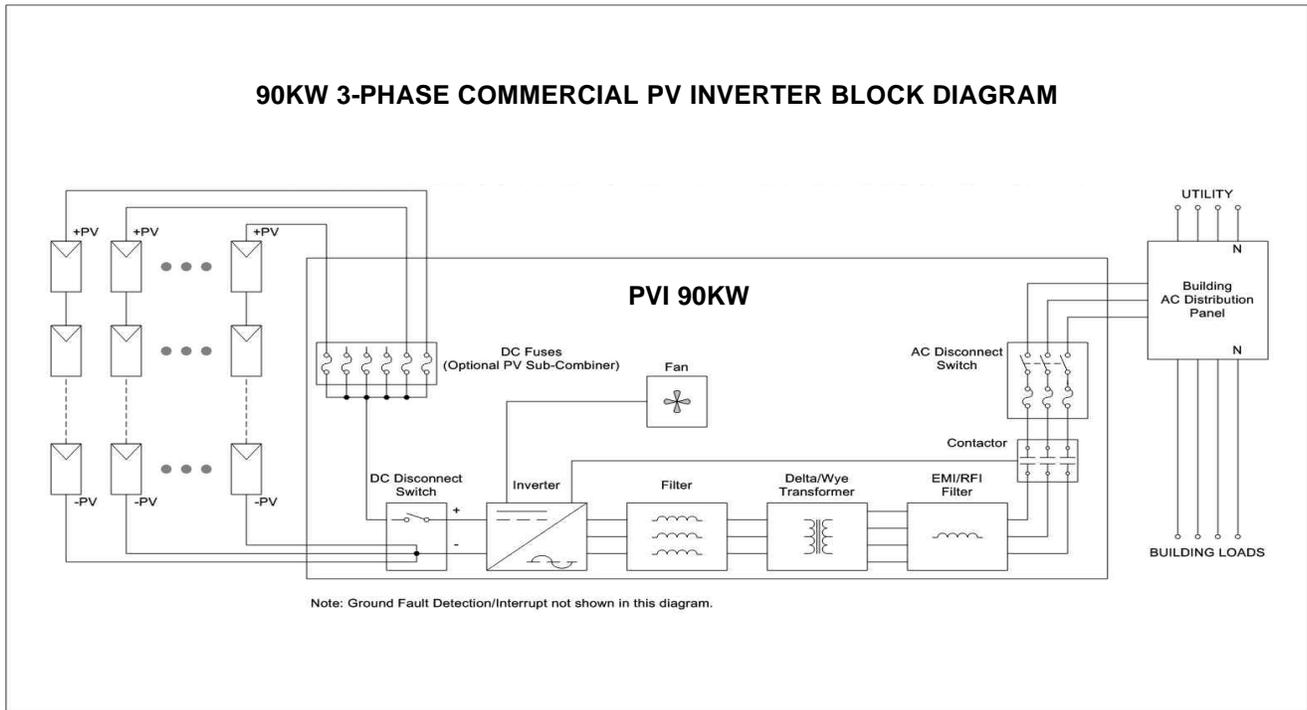


Fig. 3 Simplified electrical connection diagram for the PVI 60KW, PVI 77KW and PVI 90KW



NOTE: For versions of the inverter which do not have fuses in the AC disconnect (such as the standard 208VAC versions or a version with a specially requested AC disconnect), refer to NEC 240.21 regarding the “tap” rule and requirements for over-current protection of output wiring based on distance to over-current protection fuse of circuit breaker protection within specified distances.

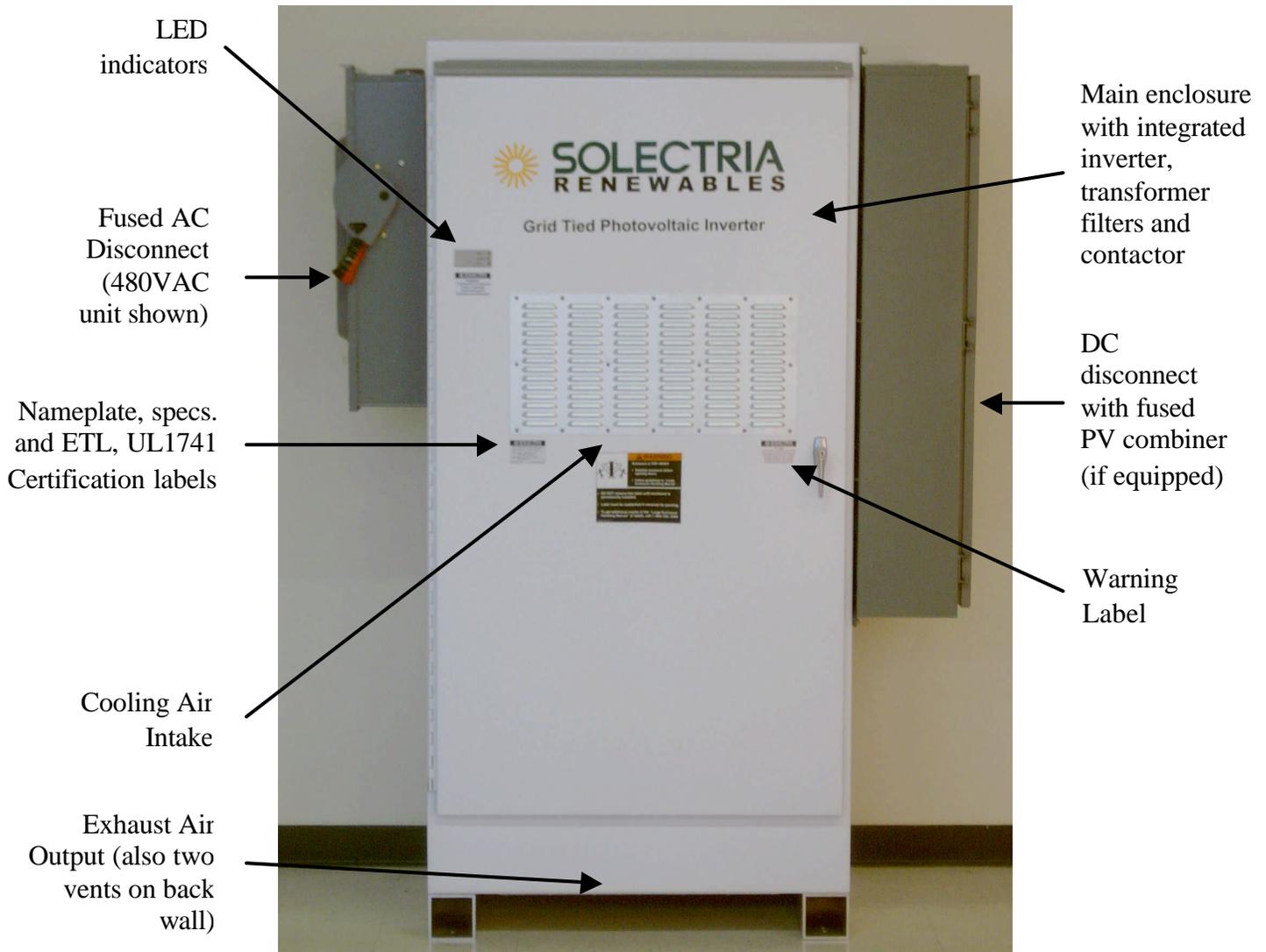


Fig. 4 “Integrated Inverter Package” (480VAC unit shown)



WARNING: All electrical installations shall be done in accordance with all local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.

The negative DC, Photovoltaic connection is grounded within the inverter through the ground fault detection and interrupt circuit (GFDI). The PV negative should not be grounded at any other point in the system. The PV positive must never be grounded at any time.

When conduit hubs are used on the AC and DC disconnect boxes in an outdoor or wet location, rain-tight or wet location hubs that comply with the requirements in the Standard For Fittings For Conduit and Outlet Boxes, UL514B, are to be used.

For AC, 3-phase wiring, first verify proper phase sequence, and then use 1 AWG, (recommended for the 480VAC version) minimum 90°C (194°F), copper wire for

connection with the inverter's 3-phase AC disconnect. (250KCMILs recommended minimum for the 208VAC version.) Torque terminal screws to 275 in-lb on the 480VAC version and 340 in-lbs on the 208VAC version. Voltage drop and other considerations may dictate that larger wire sizes be used. (A maximum of 250KCMIL copper conductor wire (and 750KCMIL for the 208VAC version). A 1/0 AWG copper ground wire can be used for both the 480VAC and 208VAC versions. Verify that any wire size choices meet NEC requirements. Parallel wiring may conform to code for AC (and/or DC) side of your wiring to the inverter.

For DC (PV) wiring, a 3 AWG conductor (recommended) DC equipment ground should be connected to the ground bar in the DC (PV) disconnect.

If the inverter is not equipped with an integrated fused PV sub-combiner, a minimum conductor size of 4/0, 90°C (194°F) copper wire must be used for the DC (PV) positive and negative conductors. A maximum of 750KCMIL copper wire can be used for positive & negative conductors and 1/0 AWG DC equipment ground if NEC and local code allows it for your installation and configuration. Torque the (+) terminal screws to 550 in-lbs, torque the (-) terminal screws to 340 in-lbs and the ground screw to 200 in-lbs.

Lightning and Surge Protection:

The inverter is designed with certain protections against surges in voltage including certification to ANSI/IEEE 62.41/62.42 (as required in the NY SIR), however added protection and solid grounding provisions are important for best protection against utility surges and surges created by indirect lightning strikes.

The installation of a Delta lightning surge arrester or other UL listed arrester of the correct specification is recommended on both the DC and AC sides of inverter. This can be installed on the outside of the DC disconnect and wired using the manufacturer's directions. This device gives important added protection from indirect lightning strikes and resulting surges that provide protection beyond the inverter's UL1741 requirements. It is suggested to drive a ground rod specifically for the PV array. It is also a very good idea to have the lightning protection system of the building checked and upgraded if needed before the PV system is installed. (Are there air conductors/lightning rods along the roof line of the building well above the PV array? Do you see a copper ground wire running from the air conductors to a ground rod?) These added protections are especially important for area prone to thunder storms and possible nearby lightning strikes. Although these added precautions will not guarantee that there will be *no* damage from lightning, they can help prevent or limit potential damage.

Grounding Electrode Conductor:

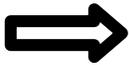
As with all PV systems, a Grounding Electrode Conductor must be installed per UL690.47 (and 250.166). This conductor should be sized according to these NEC requirements. This conductor should be terminated on the ground bar in the DC disconnect. If the grounding electrode conductor is required to be larger than 3AWG (the size of the Inverters' internal grounding conductors), then the grounding electrode conductor should enter the lower section of the main Inverter enclosure through a rain-tight conduit fitting and the conductor should be terminated under the left side of the large aluminum shelf above the transformer on the provided star/bonding point stud. This stud comes out of a PEMnut at the left

end of the second aluminum angle support under the shelf. You should use an appropriate lug for the conductor and a corrosion-prevention grease between lug and aluminum bracket. (If a longer stud is needed, replace with a longer 1/4-20 bolt above which is threaded all the way up to the bolt head.)



WARNING: The wiring connections of the inverter to the DC-voltage from the PV strings and the AC-voltage of the utility must be done with the AC and DC disconnects off, building AC source circuit panel/breaker off and the PV module strings disconnected (or covered up).

- Connect the building, 3-phase conductors and AC equipment ground at AC disconnect “LINE” terminals (L1, L2, L3) and ground bar. Phase sequence MUST be correct.
- Connect the PV strings to the DC disconnect enclosure positive (switched) terminal (+) and negative terminal. Connect the DC equipment ground to the ground bar.
- Connect PV modules, strings, combiners or uncover them.



- Verify proper AC and DC voltages and DC polarity. Verify proper AC phasing! The connection of the grid to the inverter must follow the L1/A, L2/B and L3/C order. Test with a phase direction tester or a scopemeter. **NOTE:** It may be necessary to swap the phase A&B wires connecting the building circuit to the inverter’s disconnect if building phasing or wiring anywhere between utility and the inverter is not in proper phase sequence. Incorrect phase sequence at the 3-phase AC connection in the AC disconnect will damage the inverter. Turn on the inverter by switching building/utility 3-phase breakers ON then turning on inverter’s AC disconnect followed by DC disconnect.

To disconnect the inverter from the building/utility grid, turn off the DC disconnect, then the AC disconnect. Turn off the AC 3-phase building/utility breaker if needed.

Connection to dedicated 480V AC, 3-phase circuit, 125A circuit for PVI 60KW and PVI 77KW or 150A for PVI 90KW, 2 AWG to 250KCMIL copper wire. Torque to 275 in-lb. (Shown without plastic safety cover). If 208V AC version, circuit should be 250A for PVI 60KW and PVI 77KW or 300A for PVI 90KW. Phase sequence MUST be wired correctly.

125A or 150A Fuses (for 480V AC version), 600V, FRS-R-125 or -150 (If 208V AC version, no fuses)

AC Equipment Ground connection 3AWG to 1/0AWG copper wire



Fig. 5 AC disconnect (480VAC inverter version shown)

PV ground/frame connections 3AWG-1/0 copper wire

PV negative (-) connections 4/0 - 750KCMIL copper wire (1-2 wires); torque to 340 in-lbs.

(this is the positive terminal in units with the positive grounded option.)



PV positive (+) connections 4/0 - 750KCMIL copper wire torque to 550 in-lb. (this is the negative terminal in units with the positive grounded option.)

Fig. 6 DC disconnect without Fused PV Sub-combiner

Customer/installer conductors not shown.



WARNING: Fuses in the inverter's AC disconnect must only be replaced with 600V, Type RK5, FRS-R-125, 125A for the PVI 60KW and PVI 77KW, 480VAC versions or FRS-R-150, 150A fuses for the PVI 90KW, 480VAC inverter. The 208VAC versions of the PVI60, 77 and 90KW have un-fused disconnects. (These rely on the over-current protection of the building circuit. The PVI60 and 77 require 250A fuse, FRS-R-250 and 300A, FRS-R-300 for the PVI 90KW.)



WARNING: If inverter is equipped with the fused PV sub-combiner, fuses in DC disconnect must only be replaced with 600V DC rated fast-acting fuses. Always refer to PV module and combiner fuse ratings and specification before selecting or replacing fuses.

Connection Wiring To Electrical Utility Grid

The PVI 60KW, PVI 77KW or PVI 90KW must be connected to the grid with 3 conductors and an AC equipment-grounding conductor. A 125A breaker is recommended for the dedicated PV system circuit breaker for the PVI 60KW and PVI 77KW, 480VAC version, and 150A for the PVI 90KW, 480VAC version. (a 250A circuit breaker is recommended for the 208VAC versions of the PVI 60KW and PVI 77KW, and a 300A breaker for the PVI 90KW, 208VAC version.)

The grid impedance value at the connection point should be as low as possible to avoid an increase of the AC-voltage to non-permissible values while the inverter feeds to the grid. Minimizing wiring impedance also results in higher system efficiency.



EXAMPLE: The impedance is the sum of the electricity grid impedance at building distribution and all impedance values of conductors and connections.

Single conductor impedance values are:

- approximately 0.04 Ohm for 250 feet (76.2 m) 2 AWG conductors
- approximately 0.025 Ohm for 250 feet (76.2 m) 1/0 AWG conductors
- approximately 0.012 Ohm for 250 feet (76.2 m) 4/0 AWG conductors
- Conductor impedance of < 0.025 Ohm is recommended

It is recommended that the total impedance phase to phase of the grid plus the interconnecting AC conductors should be less than 0.035 Ohm for the 480VAC versions and about ½ this, or 0.015 Ohm for the 208VAC versions.

Connection of the PV-panels to the DC disconnect enclosure with or without integrated fused PV sub-combiner



WARNING: Follow PV module and combiner manufacturer directions. PV-arrays produce electrical energy when exposed to light and could create a hazardous condition. (One method used to assure safety from shock is to completely cover the surface of all PV-arrays with opaque (dark) material before wiring them.)

Depending on the type of PV-modules used it is possible to use different numbers of parallel strings. (Appendix B shows some example PV string sizing tables.)



WARNING: Before connecting the connectors of the PV-panel to the DC disconnect enclosure fused PV sub-combiner (if equipped) or + and – terminal block if not equipped with combiner check the correct polarity and admissible PV-panel voltage between the + and the - cable connectors of the PV panel.

The PV-panel open circuit voltage must be below 600V DC ($V_{pv} < 600V DC$) under all conditions as per NEC 690-7. Please read the Technical Info section and see PV string sizing table in Appendix B.

Inverter with fused PV sub-combiner in DC disconnect enclosure:

There are up to 6 fuse blocks for up to 6 PV combiner connections. The positive (+) wire from each string is connected to each fuse block bottom screw terminal. There are also 6 negative positions to be used for negative (-) connections on the negative (-) terminal block. Conductors from array field combiners to inverter sub-combiner fuse holder terminals must be sized according to the paralleled string group (combined) current ratings with appropriate multipliers/de-rating per NEC.

Inverter without fused PV sub-combiner in the DC disconnect enclosure:

There are positive and negative terminals for connection of a combined PV power feed from a customer-provided external fused PV combiner system.



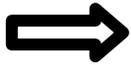
WARNING: A fused, correctly rated PV combiner and in some cases, sub-combiner, must be used with this version of the inverter.



WARNING: Even when in the off position, the DC disconnect will remain live on the PV side (“line”) when the PV modules are in daylight. The inverter (“load”) side of the disconnect will also remain live after the disconnect has been shut off until 60 seconds after the LEDs turn off, as electrolytic DC bus capacitors in the inverter discharge.

3 Commissioning the Inverter PV System

The inverter is mounted, all connections are made and you are ready to power it up.



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



WARNING: Make a final check for correctness of all AC and DC wiring to the inverter and in the system.



NOTE: With the PV modules connected and inverter disconnects still off, it is a good final precaution to check PV polarity once more simply by carefully using a 600V, DC rated digital volt meter and probing the positive (+) and negative (-) PV connections in the disconnect enclosure.

Turning on the inverter:

- Turn on the dedicated 3-phase circuit breaker on the building electrical panel
- Verify the proper phase sequence at the “line” side terminals of the AC disconnect
- Turn on the Inverter’s 3-phase AC disconnect
- Turn on the Inverter’s DC disconnect
- Watch the LED indicators for initialization (all three LEDs on)
- Listen for contactor clunk (inverter on-line)
- Listen for slight 60 Hz hum (transformer on-line)
- Watch for blinking green LED and high frequency switching sound followed by solid green LED (inverter on-line and beginning to feed power into 3-phase circuit) to confirm that the inverter is operating normally

Operation:

The control electronics and DSP will be active as soon as DC (PV) voltage reaches 300V DC. The inverter will go on-line with the utility/building 3-phase grid when the DC voltage first exceeds 400V DC (strike voltage). Next, the inverter will load the array, bringing the DC voltage down from 400V DC to not less than 325V DC.

Once there is enough PV power at 325V DC to back feed 3-phase AC power switching will automatically feed power to the grid.

Because the inverter goes completely off line at night or in dark conditions when no power can be produced, there are no idling losses, adding 1-2% additional energy production annually over an inverter design that remains on all the time.

Operating states, GFDI status and error indications shown by the LED indicators, which are described in chapter 4, “Power, GFDI and Error LED Indicators”.

4 Power, GFDI and Error LED Indicators

The inverter operates automatically without the need for user interaction or maintenance.

The Inverter automatically starts back feeding 3-phase AC power into the grid every morning as the sun rises, as soon as sufficient DC voltage and PV power is available. The inverter DSP runs through various checks before going online with the grid and feeding power into the grid.

The LED indicators mounted on the right-hand side of the enclosure just above the DC disconnect give the installer and user a good, quick look at what state the inverter is in and if it is operating normally.

GREEN – indicates “power”, the unit is powered up and/or feeding power to the grid

RED – “ERROR” or “FAULT”, the inverter is not providing power due to an error or fault

RED & YELLOW – together indicate that a ground fault has been detected and it must be located before the inverter will function. Check GFDI fuse if RED LED remains as solid.

If the GFDI fuse is blown, see “Opening the Main Enclosure” section and Fig. 8, “Description and Location of Components”. Follow these instructions carefully (disconnecting AC & DC power) and locate, check and replace the GFDI fuse with a 5A midget fuse 600V DC rated such as Solectria Renewables P/N KLKD005, or Bussman P/N KLKD-5.



Fig. 7 Front view of inverter showing LED indicators and ground fault warning label

Description of LED symbols used to indicate LED status in this manual

- LED Off
- ◐ LED flashing (25% on, 75% off)
- ◑ LED on once per second
- ◒ LED on two times per second
- ◓ LED on with short interruptions (75% on, 25% off)
- LED on

LED indicator		Operating condition	Description
green:		standby (night)	input voltage < 300 VDC
yellow:			
red:			
green:		initialization	unit is being initialized
yellow:			
red:			
green:		stop	input voltage low <325V
yellow:			
red:			
green:		stop	input voltage high > 550V (600 VDC is the maximum allowable PV open circuit voltage)
yellow:			
red:			
green:		waiting, checking grid	presence of valid grid conditions Is being checked
yellow:			
red:			
green:		waiting for AC disconnect/breaker to be closed	grid voltage Is absent
yellow:			
red:			
green:		feeding grid MPP or constant voltage mode	normal daytime operation
yellow:			
red:			
green:		de-rating mode	reduction of power fed to the grid due to increased temperature of the heat sink
yellow:			
red:			
green:		waiting for stronger sun	available DC power is too low
yellow:			
red:			
green:		ground fault	ground fault of the PV panels see chapter 5
yellow:			
red:			
green:		GFDI fuse failure	GFDI fuse is defective see chapter 5
yellow:			
red:			
green:		failure	internal or external failure, exact description on blink code call Solectria Renewables
yellow:			
red:			
green:		utility failure	a failure of the utility (i.e. a blackout or brownout) has occurred unit attempts to restart every five minutes
yellow:			
red:			

5 Trouble Shooting

The Inverters are designed, produced and rigorously tested for long life and reliability in a wide range of climate conditions, voltage and power levels.

With a properly shipped, sited, mounted, wired and tested installation, the integrated inverter units should give many years of trouble-free and maintenance-free service.

The following trouble shooting information will help in the event that the inverter does not function, stops functioning or does not provide full performance.



WARNING: Before attempting to open disconnects or the main enclosure, read the entire manual, especially warning messages and “Opening The Main Enclosure” later in this section. Only qualified personnel should attempt to open any of these enclosure doors or do any service or troubleshooting.

PV system not functioning

- Check LED indicator status
- Check connection to grid, 3-phase AC power
- Check DC (PV) string connections or main PV feed conductor connections
- Verify PV voltage range including hot module temperature MPP voltage and cold module temperature, open circuit voltage (OCV)
- Contact installer or Solectria Renewables if malfunction persists
- If contacting Solectria Renewables for assistance, please provide part number, serial number, short description of problem (LED indicator status, when problem started, how often problem occurs, under what conditions the problem occurs) and information on PV modules (string layout, number of modules per string, number of strings, module model and part number, output power, short-circuit current and open circuit voltage)

Some specific problems that can be identified quickly

GFDI Problem: If the LED indicators show a ground fault problem but the GFDI fuse is not blown then a ground fault in PV array or wiring must be found. If the LED indicators show that the GFDI fuse is blown, the fault in PV array or wiring must be found and GFDI fuse replaced. For fuse replacement, see section 4 “Power, GFDI and Error LED Indicators”.

Inverter over-heating and power de-rating: If the power output is lower than normal and there is an LED indication of power de-rating due to high temperature, check the following

- Is the ambient air temp above 45°C? (or over 35°C for the PVI 90KW?)
- Is the intake (front) louver grill or output (bottom) visibly blocked?

Unit over heating, power de-rating, or unit not putting out power

- Check insect screens in front louver grill on main enclosure door for clogging from dust, pollen and debris. The louver/grill can be removed with 18 Philips screws holding it on and insect screen can be cleaned or replaced.
- Fan not running, blocked or slow
 - Check fan fuse inside main enclosure (10A) AC.
 - Check fan relay inside main enclosure.
 - Check the fan, make sure it spins freely (when unit turned off).
- No grid sensing
 - Grid sensing fuses blown (0.1A) AC inside main enclosure. Contact Solectria Renewables (Do not replace fuses, as this represents an abnormal failure).
- No LED indications when sun is shining. If grid voltage and DC (PV) voltage is present and no response from inverter is evident
 - Verify AC & DC (PV) voltages are within proper ranges.
 - Verify fuses in AC & DC (PV) disconnect are good (if equipped with PV sub-combiner).

If at some point it is determined that the unit or any part of the unit should be shipped to Solectria Renewables for repair or replacement, be sure to get an RMA# from Solectria Renewables and use the same packing method as when it was shipped to you, or request instruction on packing and/or packing materials from Solectria Renewables to help insure a safe shipment. The 65 lb core inverter electronics unit is easy to remove and replace.

Opening the Main Enclosure

Normally the main enclosure (or disconnects) will not have to be opened for any reason by the user. If opening the unit is necessary follow these guidelines:



WARNING: The inverter should only be opened up by authorized and qualified service personnel.



WARNING: Only open the inverter when it is clear and dry outside if the inverter is outdoors. As with any electrical system do not work on it if there is a potential of an electrical storm.



WARNING: Both DC and AC disconnects must be in the off position and wait 60 seconds after the LED indicators are off before opening as electrolytic capacitors on the internal DC “bus” are discharging during this time.

- Switch off DC disconnect
- Switch off AC disconnect (and AC building panel circuit breaker if desired)
- Watch until all LED indicators have been off for 60 seconds (if not already off)
- Open handle on door (use key if locked)

See Fig. 8 and “Inside the Main Enclosure You Will See” section that follows.

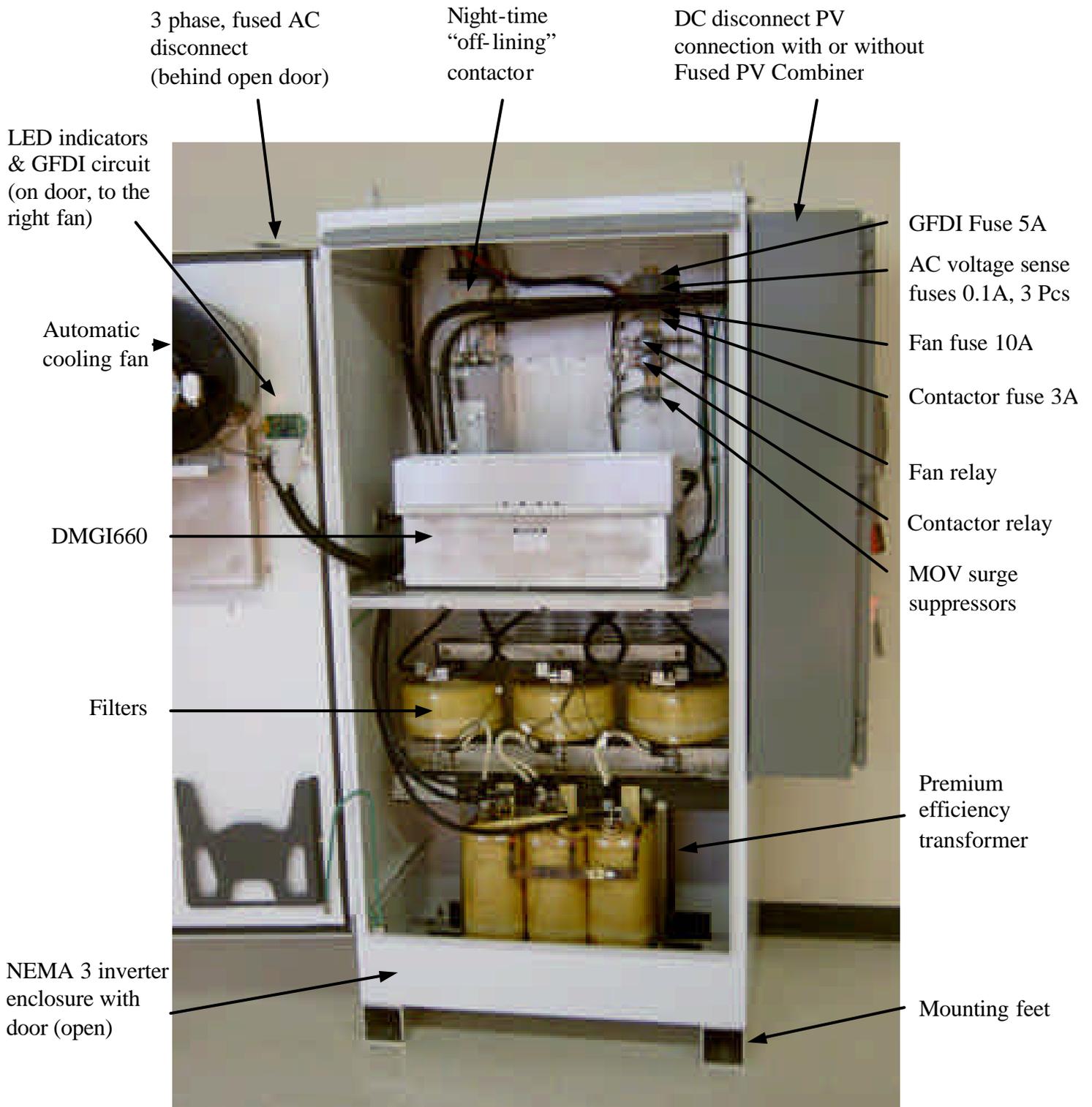


Fig. 8 Description and location of components

Inside the Main Enclosure you will see:

- DMGI660 Controller and power electronics inverter module with fan
- Isolation transformer
- Filters
 - 3 Round Torroids
 - 1 Rectangular Filter
- Night-time 3-phase off-lining contactor
- Fuse blocks
 - GFDI 5A DC fuse KLKD, 600 VDC rated
 - Grid Sense Phase A 0.1 A AC Fuse (L1), KLM, 500 VAC rated
 - Grid Sense Phase B 0.1 A AC Fuse (L2), KLM, 500 VAC rated
 - Grid Sense Phase C 0.1 A AC Fuse (L3), KLM, 500 VAC rated
 - Fan 10 A, AC Fuse, KLM, 500 VAC rated
 - Contactor 3 A, AC Fuse, KLM, 500 VAC rated
- Fan Control Relay
- Contactor Control Relay
- GFDI/LED Indicator PCB

Before closing the main enclosure always check for any signs of problems such as corrosion, loose parts, insect or animal infestation, excessive dirt/dust or over heated or deformed/aged-looking parts. Also be sure if any wires were moved or cable ties cut, that they are replaced as new.

To Open the DC Disconnect:

To open DC disconnect while off: (note that certain terminals are live inside even when off)
Turn the Bottom release screw counter clockwise and the aluminum handle will flip to the right (counter-clockwise). You can now open the door using the aluminum handle.

To open DC disconnect while on: (note that ALL terminals are live when on)
Turn the Bottom release screw counter clockwise and the aluminum handle will flip to the right (counter-clockwise). Next, turn the upper screw counter-clockwise while pulling the door open with the aluminum handle and the door should open.

You can spin the aluminum handle around in the counter-clockwise direction and it goes "click, click click" as it turns. Nothing is broken in this case. Just keep turning the handle until it is at the 4:00 position when the door is open (or 6:00 position when door is closed.)

6 Product Warranty & RMA Policy

6.1 Warranty Policy

The Solectria Renewables Warranty Policy is stated below.

Solectria Renewables Warranty Coverage:

Solectria Renewables Limited Warranties are provided by Solectria Renewables, LLC. ("Solectria Renewables") and cover defects in workmanship and materials.

Duration of a Solectria Renewables Warranty Period:

The warranty period is 60 months from the date of purchase of the PVI1800, PVI2500, PVI13kW or PVI 60KW, PVI 77KW and PVI 90KW by the end user or 64 months after the delivery date from Solectria Renewables to installer, dealer, distributor (merchant) whichever is shorter. If a warranty extension has been purchased, the term is defined as extension beyond 60 months. For example, if a 5-year extension (to 10 years total) is purchased, the term becomes 120 months from date of purchase.

If Solectria Renewables repairs or replaces a product, its warranty continues for the remaining portion of the original Warranty Period or 90 days from the date of the return shipment to the customer, whichever is greater.

All warranties are null and void if full payment for products and associated shipping are not received in full and in a timely manner by Solectria Renewables.

Please contact Solectria Renewables Customer Service for further details on other products.

What will Solectria Renewables do?

Solectria Renewables will, at its option, repair or replace the defective product free of charge, provided that you notify Solectria Renewables of the product defect within the Warranty Period for your product, and provided that Solectria Renewables, through inspection, establishes the existence of such a defect and that it is covered by the Limited Warranty.

Solectria Renewables will, at its option, use new and/or reconditioned parts in performing warranty repair and building replacement products. Solectria Renewables reserves the right to use parts or products of original or improved design in the repair or replacement. All replaced products and all parts removed from repaired products become the property of Solectria Renewables.

Solectria Renewables will attempt to repair the unit within a reasonable time period (there is no reimbursement for lost energy production.)

Solectria Renewables covers both parts and labor necessary to repair the product, and return shipment to the customer via a Solectria Renewables-selected non-expedited surface freight within the contiguous United States and Canada. Alaska and Hawaii are excluded. Contact Solectria Renewables customer service for details on freight policy for return shipments outside of the contiguous United States and Canada.

In the event an extended warranty option has been purchased, this extended warranty only applies to exposed outdoor locations (defined as rooftop or open/unprotected locations) if the product has been purchased to include the gasket-sealed AC and DC disconnect option or has a protective cover around 3 sides of inverter unit (back and sides) and over the top, 4'-60" away from back and top and 30"-96" from sides.

Obtaining Service:

If your product requires troubleshooting or warranty service, contact your merchant. If you are unable to contact your merchant, or the merchant is unable to provide service, contact Solectria Renewables directly at the number listed on the website in the customer service section for your product.

Direct returns may be performed according to the Solectria Renewables Return Material Authorization Policy.

In any warranty claim, dated proof of purchase must accompany the product and the product must not have been disassembled or modified without prior written authorization by Solectria Renewables.

Proof of purchase may be in any one of the following forms:

- The dated purchase receipt from the original purchase of the product at point of sale to the end user, or
- The dated merchant invoice or purchase receipt showing original equipment manufacturer (OEM) status, or
- The dated invoice or purchase receipt showing the product exchanged under warranty.

What does the Solectria Renewables warranty not cover?

Solectria Renewables Limited Warranties do not cover normal wear and tear of the product or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. These warranties do not apply to and Solectria Renewables will not be responsible for any defect in or damage to:

- a) The product if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment;
- b) The product if it has been subjected to fire, water, generalized corrosion, biological infestations, acts of God or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Solectria Renewables product specifications including high input voltage from generators and lightning strikes;
- c) The product if repairs have been done to it other than by Solectria Renewables;
- d) The product if it is used as a component part of a product expressly warranted by another manufacturer;
- e) The product if its original identification (trade mark, serial number) markings have been defaced, altered, or removed;
- f) The product if it has been damaged in shipping
- g) Any installation and operation beyond the scope covered by relevant safety regulations (UL1741, NEC, etc.);

DISCLAIMER

SOLECTRIA RENEWABLES LIMITED WARRANTIES ARE THE SOLE AND EXCLUSIVE WARRANTY PROVIDED BY SOLECTRIA RENEWABLES IN CONNECTION WITH YOUR SOLECTRIA RENEWABLES PRODUCT AND ARE, WHERE PERMITTED BY LAW, IN LIEU OF ALL OTHER WARRANTIES, CONDITIONS, GUARANTEES, REPRESENTATIONS, OBLIGATIONS AND LIABILITIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE IN CONNECTION WITH THE PRODUCT, HOWEVER ARISING (WHETHER BY CONTRACT, TORT, NEGLIGENCE, PRINCIPLES OF MANUFACTURER'S LIABILITY, OPERATION OF LAW, CONDUCT, STATEMENT OR OTHERWISE), INCLUDING WITHOUT RESTRICTION ANY IMPLIED WARRANTY OR CONDITION OF QUALITY, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE TO THE EXTENT REQUIRED UNDER APPLICABLE LAW TO APPLY TO THE PRODUCT SHALL BE LIMITED IN DURATION TO THE PERIOD STIPULATED UNDER THIS LIMITED WARRANTY.

IN NO EVENT WILL SOLECTRIA RENEWABLES, LLC, INCLUDING ITS SUPPLIERS, MANUFACTURERS, VENDORS, SUBCONTRACTORS, DISTRIBUTORS, DEALERS AND ANY OTHER AFFILIATES BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING WHETHER IN CONTRACT OR TORT INCLUDING WITHOUT RESTRICTION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, ANY PERSONAL INJURY, ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF ANY USE, MISUSE OR ABUSE, OR THE (IN-) CORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT.

Solectria Renewables neither assumes nor authorizes any other person to assume for it any other liability in connection with the repair or replacement of the Product.

Exclusions of the Policy:

If your product is a consumer product, federal law does not allow an exclusion of implied warranties. To the extent you are entitled to implied warranties under federal law, to the extent permitted by applicable law they are limited to the duration of this Limited Warranty. Some states and provinces do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply to you. This Limited Warranty gives you specific legal rights. You may have other rights, which may vary from state to state or province to province.

WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, UNLESS SPECIFICALLY AGREED TO BY IT IN WRITING, SOLECTRIA RENEWABLES

(a) MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION PROVIDED BY IT IN CONNECTION WITH THE PRODUCT; AND

(b) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSSES, DAMAGES, COSTS OR EXPENSES, WHETHER SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION.

THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER'S RISK.

WARNING: LIMITATIONS ON USE

Please refer to your product user manual for limitations on uses of the product. Specifically, please note that Solectria Renewables products are not intended for use in connection with life support systems and Solectria Renewables makes no warranty or representation in connection with any use of the product for such purposes.

Please review our Return Merchandise Authorization Policy for returning product to Solectria Renewables.

6.2 Return Material Authorization Policy

Please review our Return Merchandise Authorization Policy below after reviewing our Solectria Renewables Warranty Policy.

Obtaining a required, Return Material Authorization:

Before returning a product directly to Solectria Renewables you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. Products must also be shipped prepaid. Product shipments will be refused and returned at your expense if they are unauthorized, returned without an RMA number clearly marked on the outside of the shipping box, if they are shipped collect, or if they are shipped to the wrong location.

Information Solectria Renewables needs when you are obtaining service:

- 1) The model names and serial number of your product
- 2) Information about the installation and use of the unit
- 3) Information about the failure and/or reason for the return
- 4) A copy of your dated proof of purchase.

Preparing the product for shipping:

- 1) Package the unit safely, preferably using the original box and packing materials. Please ensure that your product is shipped fully insured in the original packaging or equivalent. This warranty will not apply where the product is damaged due to improper packaging.
- 2) Include the following:
 - a. The RMA number supplied by Solectria Renewables, LLC clearly marked on the outside of the box
 - b. A return address to which the unit can be shipped. Post office boxes are not acceptable.
 - c. A contact telephone number where you can be reached during work hours.
 - d. A brief description of the problem.Ship the unit prepaid to the address provided by your Solectria Renewables customer service representative.

Returning a product from outside of the USA or Canada:

In addition to the above, you **MUST** include return freight funds and are fully responsible for all documents, duties, tariffs, and deposits.

7 Technical Data

Technical Information and specifications – see appendix for complete PVI 60KW, PVI 77KW AND PVI 90KW data sheet

Input (DC) from PV array:

- Maximum open circuit voltage of PV array: 600V DC



WARNING: NEC 690-7 must be followed to calculate the maximum number of PV modules allowed for a maximum inverter open circuit voltage (OCV) of 600V DC in extreme cold temperatures for the installation location.

- See PV string sizing charts in Appendix B



The open circuit voltage of PV modules depends on the cell temperature and the solar irradiation. The highest open circuit voltage occurs when the PV modules are at the coldest temperature and in bright sun. (See the following figure – Fig. 9)

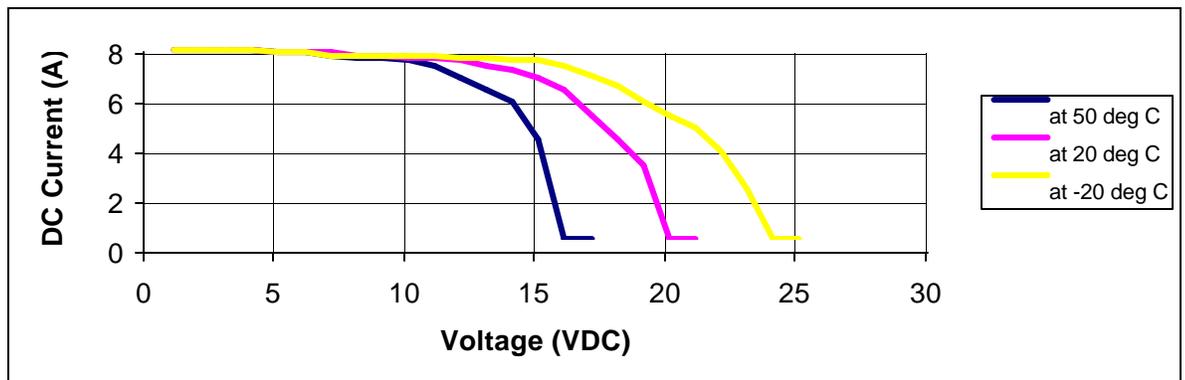


Fig. 9 Example representative PV module voltage – current characteristic at various cell temperatures

Because the PV modules also have a reduction in voltage at high cell temperatures, you must make sure the MPP voltage of the strings will not drop below the minimum inverter DC input voltage of 325V DC in very hot temperature conditions.

Both the maximum open circuit voltage (OCV) when at cold extreme and minimum MPP voltage when at hot extreme can be calculated for a PV module using its specification sheet. PV module string sizing can then be used to determine how many modules can/should be used in a string.

Input DC (PV) specifications for PVI 60KW, PVI 77KW AND PVI 90KW inverters

Inverter Model	PVI 60KW	PVI 77KW	PVI 90KW	
Operating voltage range (power)	325-550	325-550	325-550	VDC
Input voltage MPP range	330-500	330-500	330-500	VDC
Max continuous power range	340-480	340-480	340-480	VDC
Maximum open circuit voltage (under all conditions)	600	600	600	VDC
Maximum input current				
208 and 480VAC versions	190	244	285	ADC
CEC eligible max. input current				
208VAC version	N/A	247	N/A	ADC
480VAC version	N/A	260	N/A	ADC
Maximum input power (inverter limited)	65	83	97	kW DC
Maximum recommended PV power (modules @ STC)	50-70	70-85	85-110	kW DC
DC disconnect for PV positive (+)	included	included	included	
Ground fault detection, must detect	5	5	5	A
Ground fault interrupt	8	8	8	A

Output to AC grid connection:

The inverters are designed to feed power into a standard 60Hz, 3-phase 480V AC utility service or 480V AC provided within a facility by a transformer of not less than 150kVA. The 208VAC versions connect to a 208VAC service or facility transformer rated no less than 150kW. As required by NEC, there must be a dedicated 3-phase circuit breaker for the PV inverter connection. This circuit breaker or fusing (and wiring) must have a rating of the following:

100A minimum for the PVI 60KW-480VAC version
125A minimum for the PVI 77KW-480VAC version
150A minimum for the PVI 90KW-480VAC version

250A required for the PVI 60KW-208VAC version*
250A required for the PVI 77KW-208VAC version*
300A required for the PVI 90KW-208VAC version*

* the current protection device must not exceed these values and should be this exact value.

Since fuses are included in the AC disconnect of the 480VAC inverter versions, the service and dedicated breaker can exceed the recommended minimums above as long as wiring is sized correctly and does not exceed the AC disconnects' maximum allowed wire size: 250KCMIL. The inverter is designed to work with the range of AC voltages for a 480VAC 3-phase service defined by UL1741 of 438V-528V. The 208VAC output version of the inverter has an AC voltage range of 190V to 228V.

Output (AC) specifications for PVI 60KW, PVI 77KW AND PVI 90KW Inverter:

Inverter Voltage		208	480	VAC
Nominal and Maximum output power (and CEC eligible output power)	PVI 60KW	61	60	kW AC
	PVI 77KW	82	82	kW AC
	PVI 90KW	95	95	kW AC
Operating voltage range		185 - 228	425 - 528	VAC
Operating frequency range		59.3 - 60.5	59.3 - 60.5	Hz
Maximum Output Current	PVI 60KW	168	73	A _{rms}
	PVI 77KW	216	94	A _{rms}
	PVI 90KW	248	109	A _{rms}
CEC eligible Maximum Output Current	PVI 77KW	218	100	A _{rms}
Peak short circuit output current		7	7	kA
Total Harmonic distortion (THD, @ full power)		< 5	< 5	%
Power Factor		> 95	> 95	%
Anti-islanding protection		per UL1741		
AC disconnect, 3-phase		included		
Over current protection		inverter limited		
Short circuit protection		per UL1741		
Surge test		per UL1741 per NY SIR		
Inverter peak Efficiency* (50%-100% load) (complete integrated unit with transformer)		95	96	%

Other specifications:

Ground fault protection	2005 NEC 690.5
DC sub-combiner-fuse enclosure (Optional)	35A-100A fuses available 4-8 pole, NEMA 3R, TVSS
DC Disconnect (Integral)	Break load rated, NEMA 3R
Ambient Temperature	-25° to 45° C
Storage Temperature	-40° to 70° C
Cooling	Forced Convection
Enclosure	rainproof per UL1741
Enclosure-electronics	IP-62 (design)

*Does not include MPP tracking and other transitory phenomena.

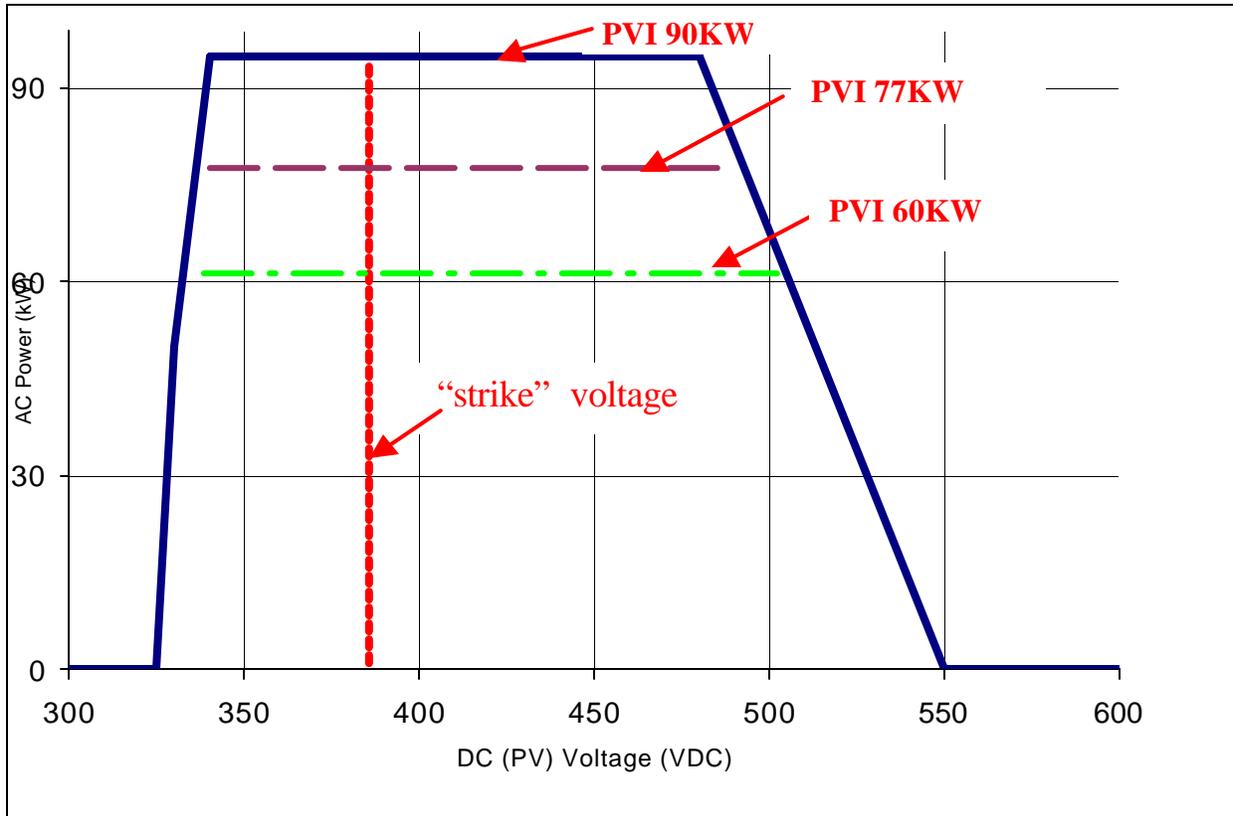


Fig. 10 AC Output power of PVI 60KW, PVI 77KW and PVI 90KW inverters

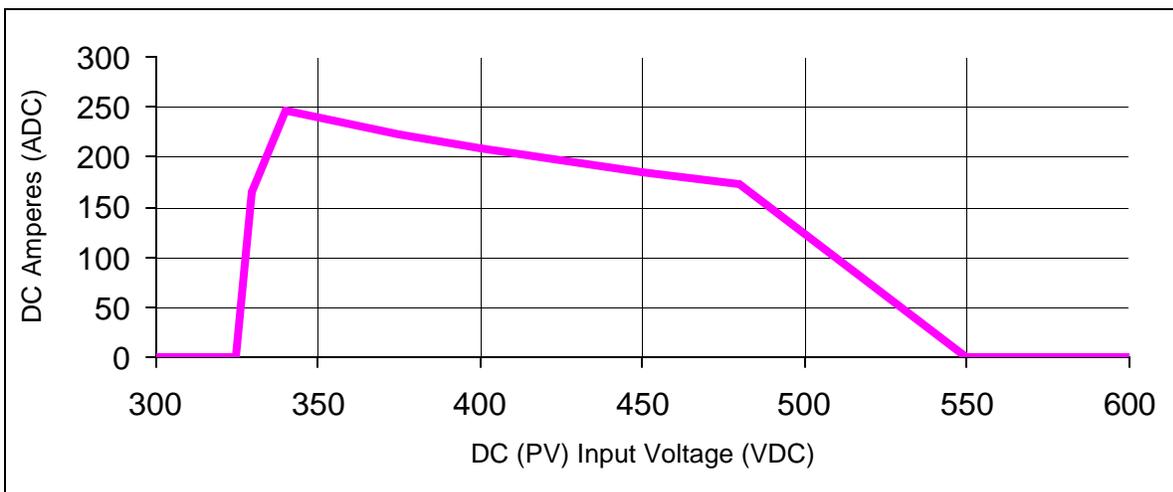


Fig. 11 Example maximum continuous DC current input for PVI 77KW

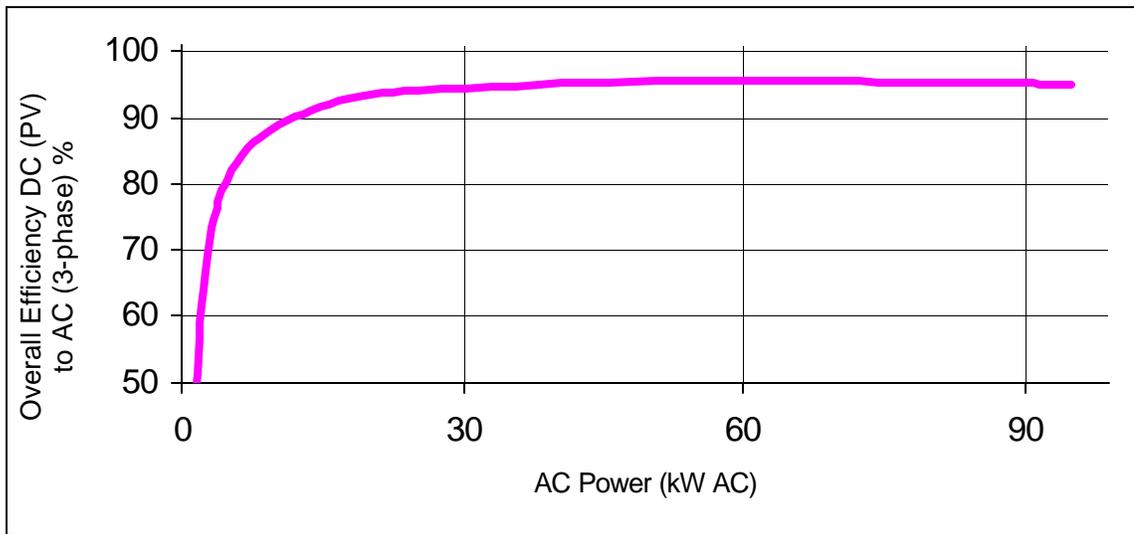
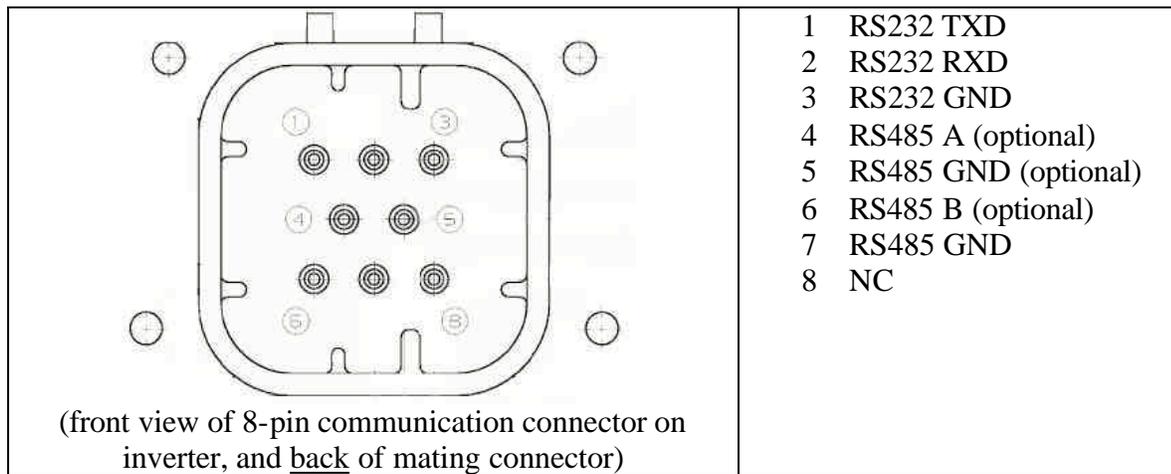


Fig. 12 PVI 90KW peak efficiency plot at 390VDC input and 25C ambient temperature (peak efficiency values were measured with a 3% accurate power meter setup and do not include any losses caused by long wires and transitory phenomena, i.e. MPP tracking)

Pin assignment RS232 / RS485 (optional)



Mating AMPSEAL 8-pin connector, Tyco part#: 776286-1
 AMSEAL crimp contact, Tyco part#: 770854-3

Warning:

RS232 and RS485 (optional) share the same serial port and must be used alternatively!

When equipped with an optional RS485 communication interface, this inverter can be daisy-chained with any other residential or commercial Solectria Renewables' PV inverter for data logging. Each inverter needs to be set to a unique network ID.

Please call for information on data logging options / wiring diagrams. See Fat Spaniel manual if the inverter is equipped with Fat Spaniel Inverter Direct.

Appendix A – PVI 60KW, PVI 77KW and PVI 90KW Data Sheet



Commercial Grid-Tied Photovoltaic Inverters

PVI 60KW, PVI 77KW, PVI 90KW

Overview: Integrated PV Inverter

The Solectria Renewables PVI 60KW, PVI 77KW and PVI 90KW are rugged, DSP-controlled, premium efficient PV inverters for grid-connected commercial and utility 3-phase PV systems. The core of the inverter, a 600VDC version of Solectria's proven DMGI 660 distributed generation inverter, uses state-of-the-art control techniques and devices including space vector PWM, a precision MPT algorithm, and low-loss IGBTs. With peak inverter power electronics efficiency over 98% (over 96% including the transformer and filters) and fully integrated packaging, these inverters set a new industry standard for efficiency, ease of installation and use, reliability and installed cost.

Applications

- 40-95kWAC, 60Hz, 480VAC or 208VAC, 3-phase, grid-tied commercial PV systems (50-115kWDC STC array).
- Multiple inverters can be used together in any combination for 150, 200, 500kW or larger PV systems.
- Designed for mounting as convenient, in full sun, driving rain and drifting snow: rooftop/ground or indoors.
- Can be used for other renewable and distributed generation applications such as wind power, hydro, geothermal and biomass. Contact us if interested.

Features & Options

- Fully integrated design includes transformer, filters, heavy duty, visible blade AC & DC disconnects (w/optional DC sub-combiner fuses).
- No night-time standby losses.
- Industry-leading overall efficiency.
- Simple set-up and connections (connect DC from PV combiners and 3-phase AC connections).
- Precision DSP-controlled Maximum Power Tracking Algorithm.
- High-reliability design, based on 16 years of power electronics development, includes sealed power and signal electronics unit and high-efficiency magnetics.
- Optional fused DC sub-combiner (4-8 fuses, 40-100A).
- Optional positive grounded version.

Connectivity

- RS232 for diagnostics and data capture.
- RS485 option for communication with multiple inverters in larger system, and with other systems and with long lines.
- Fat Spaniel Inverter-Direct data monitoring option

Safety Features

- Electronic temperature protection.
- DC Ground-fault detection and interrupt.
- Current limit protections.
- Standards-compliance: Designed to: UL-1741, IEEE-1547, FCC-15 Parts A&B.
- All inverters Listed to UL-1741 and tested to NY SIR surge Test Requirements. Units are also listed on CEC's eligible equipment list.



Specifications	PVI 60KW	PVI 77KW	PVI 90KW
Output			
Continuous AC Power	60 kW	82 kW	95 kW
CEC Eligible AC Power	208VAC: 60 kW 480VAC: 60 kW	82 kW 82 kW	95 kW 95 kW
Power Factor	> 0.99		
Voltage (L-L), ±10%	208 / 480 VAC, 3-Ph		
Rated Current	208VAC: 166A 480VAC: 73A	224A 94A	261A 115A
Current Distortion	< 5% THD, Nom power		
Frequency, ±1 %	60 Hz		
Inverter Electronics Peak Efficiency	> 98% (50%-100% load)		
Overall Peak Efficiency ¹	> 96% (50%-100% load)		
Input			
Array Configuration:	Monopole, negative grounded (pos ground opt)		
Max V _{oc} ²	600 VDC		
Maximum DC Current	190A	248A	287A
CEC Eligible DC Current	177A	241A	279A
MPT Voltage Range	330-500 VDC		
CEC Full Power Voltage Range	346-480 VDC		
Protection³			
AC Grid-connection (Standards Compliance: See "Safety Features")	Over/Under Voltage, Over Current Over/Under Freq., DC Ground Fault (GFDI)		
AC Disconnect (Integral)	NEMA 3R, Integral		
DC Sub-Combiner w/Fuses (Optional ⁴)	40A-100A fuses available, 3-8 pole, NEMA 3R, TVSS		
DC Disconnect (Integral)	Break load rated, NEMA 3R		
Environmental			
Ambient Temperature	-20 to 45 deg C (full power)		
Storage Temperature	-40 to 70 deg C		
Cooling	Automatic Forced Convection		
Enclosure	Rain Proof (UL1741)		
Electronics Enclosure	Sealed (IP62)		
General			
Weight lb (kg)	1526 (694)	1591 (713)	1610 (732)
Dimensions: inch [mm]	208VAC: 76[1930] H x 56[1422] W x 29.3[744] D 480VAC: 76[1930] H x 54[1372] W x 25.3[643] D	(Height w/o lifting eyes)	
Communications, Optional Data Acquisition	RS232, RS485, PVIDAQ PC software, Fat Spaniel Inverter-Direct Option		
Warranty	5 years (warranty extensions available)		

¹ Fully Integrated Package: Includes premium efficient transformer, filters, brushless blower, AC & DC disconnects. (≈95.5% for 208VAC versions)
² Max Open circuit voltage (V_{oc}) of PV array (= 1.25 x V_{m, rated} per NEC 690-7).
³ Complies with grid connection and safety standards ("Safety Features")
⁴ Integrated into inverter package if selected.

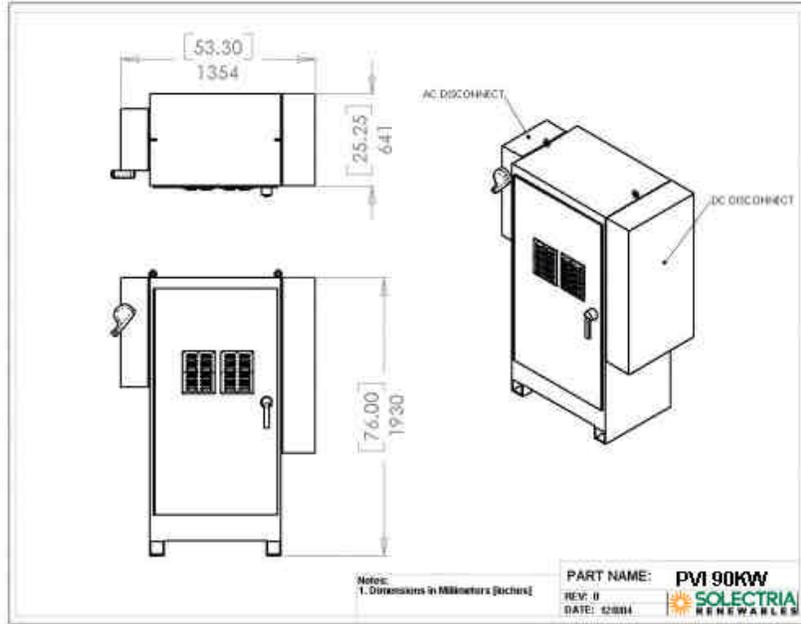


Commercial Grid-Tied Photovoltaic Inverters

PVI 60KW, PVI 77KW, PVI 90KW

Dimensions (PVI 60KW, PVI 77KW, PVI 90KW) 480VAC shown.

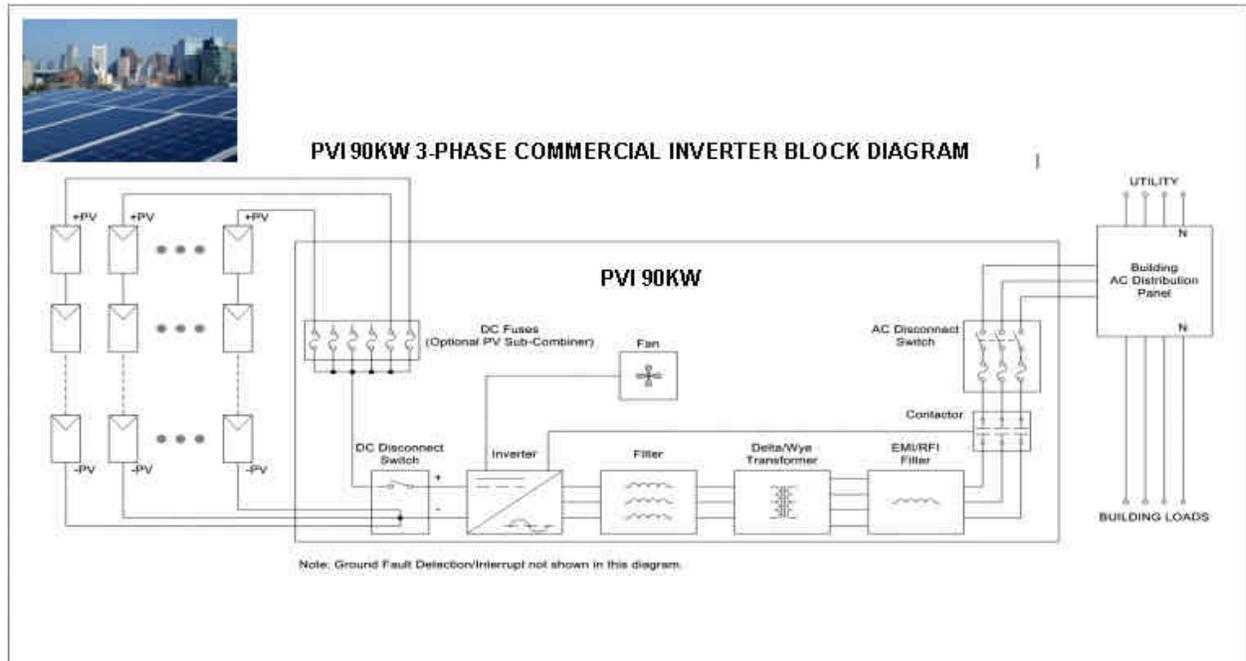
208VAC version dimensions are 56" wide and 29" deep.



Typical Installation

String Sizing:
www.solren.com

System Block Diagram (PVI 60KW, PVI 77KW, PVI 90KW)



360 Massachusetts Street, Building 9, Lawrence MA 01843 USA • Tel: 978.683.9700 • Fax: 978.683.9702 • www.its@solren.com • www.solren.com
Revised June, 2006. All specifications subject to change.

Appendix B – Example PV string sizing chart(s)

Please See the website for detailed string sizing charts for many popular PV modules:

www.solren.com Go to the Products page and the Photovoltaic inverters page.

Specific Link: http://www.solren.com/downloads/PVI_60_77_90KWString.pdf

PV Module String Sizing for use with Solectria Renewables PVI 60KW, PVI 77KW and PVI 90KW PV inverters

Note that these are suggested configurations only. Verify all the actual site temperature extremes and conditions will yield voltages and power levels within the specifications of the inverter and other components used in the system. For the examples shown with lower numbers of modules in series, verify the hot module operating voltage if the system is to be installed in a hot climate to make sure that the MPT voltage is always above 330VDC (including margin for wire losses, etc.) on the hottest days. It is good to plan for 340VDC.

Note that the PTC rating of the PVI 60KW and PVI 77KW cannot be over 60kW, 77kW respectively due to the product continuous AC output rating specification.

Note that the PVI 90KW is not tested for CEC. The values given in the PTC system power rating rows for the PVI 90KW are only for your reference. This inverter's 90kW AC output is continuous up to 35°C. Due to the large system sizes possible for use with this inverter, there are many numbers of parallel strings that are not shown between these values...

Module Manufacturer	Evergreen											
Module Model	EC-115-GD											
Voltage @ MPT	17.3 VDC											
Current @ MPT	6.65 ADC											
Current, short circuit	7.26 ADC											
OCV @ 25 deg C cells	21.5 VDC											
OCV @ extreme cold (-40C)	26.875 VDC											
Power @ MPT	115 W											
	PTC Power Rating											
Modules total in array	528	616	660	770	792	924	552	598	644	782	805	920
Modules per string	22	22	22	22	22	22	23	23	23	23	23	23
Strings in Parallel	24	28	30	35	36	42	24	26	28	34	35	40
Voltage @ MPT	380.6	380.6	380.6	380.6	380.6	380.6	397.9	397.9	397.9	397.9	397.9	397.9
OCV @ 25 deg C cells	473	473	473	473	473	473	494.5	494.5	494.5	494.5	494.5	494.5
OCV @ extreme cold (-40C)	591.25	591.25	591.25	591.25	591.25	591.25	618.125	618.125	618.125	618.125	618.125	618.125
Power (DC-STC) @ MPT	60720	70840	75900	88550	91080	106260	63480	68770	74060	89930	92575	105800
PTC system power rating	50082	58429	62602	73036	75123	87643	52358	56721	61085	74174	76356	87264
Inverter Used	PVI60KW	PVI60KW	PVI77KW	PVI77KW	PVI90KW	PVI90KW	PVI60KW*	PVI60KW**	PVI77KW**	PVI77KW**	PVI90KW**	PVI90KW**

Module Manufacturer	GE/AstroPower											
Module Model	GEPV-173-MCA (or -MCB)											
Voltage @ MPT	25 VDC											
Current @ MPT	6.6 ADC											
Current, short circuit	7.4 ADC											
OCV @ 25 deg C cells	32 VDC											
OCV @ extreme cold (-40C)	40 VDC											
Power @ MPT	165 W											
	PTC Power Rating											
Modules total in array	300	360	375	405	450	480	495	525	540	570	600	630
Modules per string	15	15	15	15	15	15	15	15	15	15	15	15
Strings in Parallel	20	24	25	27	30	32	33	35	36	38	40	42
Voltage @ MPT	375	375	375	375	375	375	375	375	375	375	375	375
OCV @ 25 deg C cells	480	480	480	480	480	480	480	480	480	480	480	480
OCV @ extreme cold (-40C)	600	600	600	600	600	600	600	600	600	600	600	600
Power (DC-STC) @ MPT	49500	59400	61875	66825	74250	79200	81675	86625	89100	94050	99000	103950
PTC system power rating	42504	51005	53130	57380	63756	68006	70132	74382	76507	80758	85008	89258
Inverter Used	PVI60KW	PVI60KW	PVI60KW	PVI60KW	PVI77KW	PVI77KW	PVI77KW	PVI77KW	PVI90KW	PVI90KW	PVI90KW	PVI90KW

Module Manufacturer	RWE Schott/ASE Americas											
Module Model	ASE-300-DGF/50											
Voltage @ MPT	52 VDC											
Current @ MPT	6.05 ADC											
Current, short circuit	6.6 ADC											
OCV @ 25 deg C cells	60 VDC											
OCV @ extreme cold (-40C)	75 VDC											
Power @ MPT	315 W											
	PTC Power Rating											
Modules total in array	160	176	192	200	224	240	256	280	288	320	336	344
Modules per string	8	8	8	8	8	8	8	8	8	8	8	8
Strings in Parallel	20	22	24	25	28	30	32	35	36	40	42	43
Voltage @ MPT	416	416	416	416	416	416	416	416	416	416	416	416
OCV @ 25 deg C cells	480	480	480	480	480	480	480	480	480	480	480	480
OCV @ extreme cold (-40C)	600	600	600	600	600	600	600	600	600	600	600	600
Power (DC-STC) @ MPT	50400	55440	60480	63000	70560	75600	80640	88200	90720	100800	105840	108360
PTC system power rating	41628	45791	49954	52035	58279	62442	66605	72849	74931	83256	87419	89501
Inverter Used	PVI60KW	PVI60KW	PVI60KW	PVI60KW	PVI77KW	PVI77KW	PVI77KW	PVI77KW	PVI90KW	PVI90KW	PVI90KW	PVI90KW

Module Manufacturer	Sanyo											
Module Model	HIP-190BA2											
Voltage @ MPT	54.8 VDC											
Current @ MPT	3.47 ADC											
Current, short circuit	3.75 ADC											
OCV @ 25 deg C cells	67.5 VDC											
OCV @ extreme cold (-40C)	84.375 VDC											
Power @ MPT	190 W											
	PTC Power Rating											
Modules total in array	280	315	336	350	378	392	420	448	476	504	525	546
Modules per string	7	7	7	7	7	7	7	7	7	7	7	7
Strings in Parallel	40	45	48	50	54	56	60	64	68	72	75	78
Voltage @ MPT	383.6	383.6	383.6	383.6	383.6	383.6	383.6	383.6	383.6	383.6	383.6	383.6
OCV @ 25 deg C cells	472.5	472.5	472.5	472.5	472.5	472.5	472.5	472.5	472.5	472.5	472.5	472.5
OCV @ extreme cold (-40C)	590.625	590.625	590.625	590.625	590.625	590.625	590.625	590.625	590.625	590.625	590.625	590.625
Power (DC-STC) @ MPT	53200	59850	63840	66500	71820	74480	79800	85120	90440	95760	99750	103740
PTC system power rating	46033	51787	55240	57541	62145	64446	69050	73653	78256	82860	86312	89765
Inverter Used	PVI60KW	PVI60KW	PVI60KW	PVI60KW	PVI77KW	PVI77KW	PVI77KW	PVI77KW	PVI90KW	PVI90KW	PVI90KW	PVI90KW

Appendix C - Contact Information

Solectria Renewables LLC
360 Merrimack Street
Building 9, Floor 2
Lawrence, Massachusetts, USA

Tel: 978.683-9700

Fax: 978.683-9702

Email: inverters@solren.com

Website: www.solren.com

Authorized Distributors/Dealers/Installers/Designers:

See website for complete and updated listing: www.solren.com

Specific Link: <http://www.solren.com/contact/dist.htm>

Appendix D – UL1741 Authorization Letter to Mark Product:



AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

Applicant:	Solectria Renewables			
Contact:	Name:	Mr. James Worden	Phone:	978-683-9700 FAX 978-683-9702
Manufacturer:	Solectria Renewables 360 Merrimack St. Lawrence, MA 01843			
Party Authorized To Apply Mark:	Same as Manufacturer			
Report Issuing Office:	Intertek - Cortland			
Report No.:	3078439-A01			
Product Covered:	Commercial, Grid – Tied Photovoltaic Inverter, Model PVI XX kW; where XX is 60, 77, or 90			
Description:	The model PVI XX kW is a Utility – Interactive Photo Voltaic (PV) inverter for grid – connected commercial and utility 3 phase parallel service.			
Standard(s):	Standard for Safety Inverters, Converters, and Controllers for Use in Independent Power Systems (UL 1741 1 st Edition dated January 17, 2001)			

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Authorized by: Michelle Drake for Date: September 22, 2005
 William T. Starr, Certification Manager

Control Number: 3058249

This document supercedes all previous Authorizations to Mark for the noted Report Number.

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