OPERATION and MAINTENANCE MANUAL

for

MODEL PV-5208

5 KW Grid-Tied Photovoltaic Inverter

XANTREX
Smart Choice For **Power**

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS - THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS FOR XANTREX TECHNOLOGY MODEL PV-5208 GRID TIED PHOTOVOLTAIC INVERTER THAT SHALL BE FOLLOWED DURING INSTALLATION AND MAINTENANCE OF THE PV-5208.

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INTRODUCTION

The Xantrex Technology Model PV-5208 is a 5KW Grid Tied Photovoltaic Inverter. It utilizes advanced power electronics to allow interface of a photovoltaic array with a utility grid. The PV-5208 is a highly integrated assembly, consisting of an inverter bridge and associated control electronics all on a single board. The PV-5208 control software provides for complete overall system control with a variety of protective and safety features.

MAJOR COMPONENTS

The major components of the PV-5208 are identified in Drawing No. 151325.

Main Enclosure

The enclosure (**shown in Figure 1-1**) is NEMA-4 rated. The PV-5208 enclosure contains the Integrated Bus Board, output line filter (insuring that the PV-5208 line currents and voltages meet IEEE-519 harmonic distortion requirements), control power transformers, and A/C contactor (PV-5208 A/C output to the grid). Also found within the enclosure are the system protection devices (control power circuit fuses). The operator interface (three LED's) located on the integrated bus board, can be seen through a 3.75 X 1 inch window on the front panel.

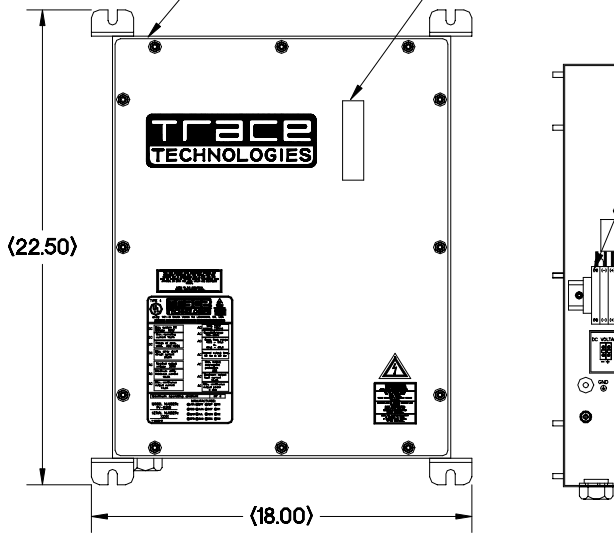


Figure 1-1

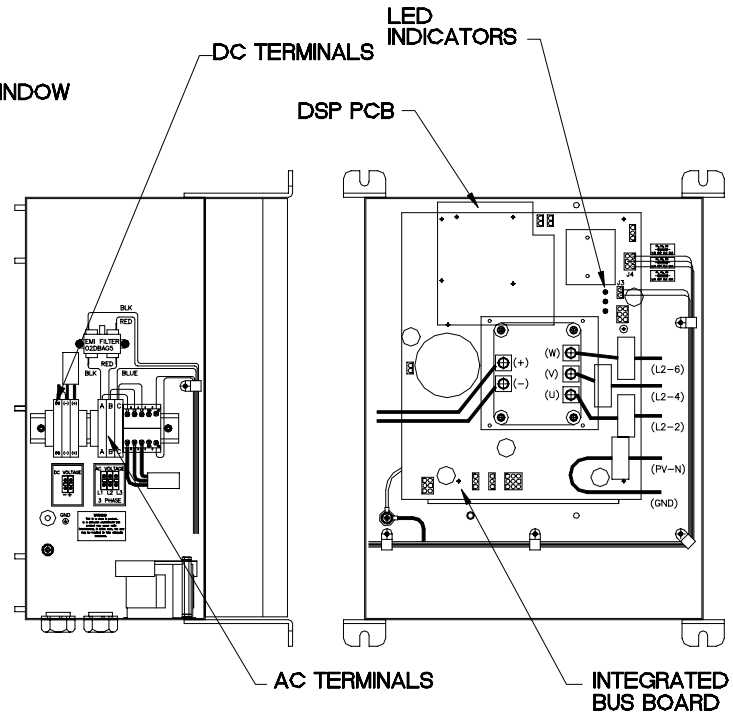


Figure 1-2

CAUTION
The fuses within the PV-5208 are intended for protecting the PV-5208 control circuitry only. They are not intended to provide protection for the PV array or external cabling.

Integrated Bus Board

The PV-5208 design makes use of a fully integrated bus board as shown in **Figure 1-2**. The bus board assembly is mounted to an aluminum extrusion heat sink, which mounts through an opening in the back of the enclosure. The power electronics is comprised of a six pack of IGBT devices, mounted to the heat sink. The bus board is mounted on top of the IGBT six pack device, and is supported through a series of standoffs attached to the heat sink.

The bus board contains all of the necessary control functions to drive the (attached) switching transistors. The bus board contains the following functional circuits: D/C control power supplies (+5V, +/-15V and four isolated +15V sources for the IGBT's), A/C and D/C high voltage measurement, A/C and ground current measurements, contactor and indicator controls, and closed loop PWM modulators. The bus board contains a micro-controller chip to perform the low-level control functions associated with the collection of measurement and driving the pulse width modulators.

A plug in DSP module controls the bus board. The DSP module is designed to the industry standard, PC-104 specification, and is used to perform the majority of the calculations needed to control the bus board. The most significant tasks are: control of PV-5208 electromechanical components and power electronics converters, signal conditioning (digital filtering and transformations), and communication with the operator interface and system sensors.

The PV array ties directly to the DC bus. The inverter controller manages the transfer of power between the DC bus and the utility grid.

INTERCONNECTION STANDARDS COMPLIANCE

The PV-5208 has been tested and certified by Underwriters Laboratories to be in compliance with **UL1741 Static Inverters And Charge Controllers For Use In Photovoltaic Power Systems,** as well as **IEEE-P929-2000 Recommended Practice For Utility Interface Of Photovoltaic (PV) Systems.**

IEEE-P929-2000 provides guidance regarding equipment and functions necessary to ensure compatible operation of photovoltaic systems which are connected in parallel with the electric utility. UL1741 is the test procedure performed by Underwriters Laboratory on the PV-5208 to verify it meets the recommendations of IEEE-P929-2000. Refer to both documents for details of these recommendations and test procedures.

SPECIFICATIONS

The PV-5208 has been designed for photovoltaic power systems, which operate within the following specifications. Application of the PV-5208 in a manner inconsistent with these specifications may cause damage to the PV-5208 and other system components, and is a violation of the terms of the warranty.

Nominal AC Line Voltage	208 VAC
Maximum AC Line Current	15.9 ARMS (at low line voltage)
Nominal Line Frequency	60 Hz, ± 0.5 Hz
Continuous AC Load	5.0 KW @ 208 vAC
PV Maximum Voltage	600 VDC
Peak Power Tracking Window	280*-600 VDC
*PV Minimum Peak Power Tracking Voltage	280-330* VDC
PV Maximum Current	16.7 ADC
PV Configuration	Monopolar negative grounded, or bi-polar neutral ground
Operating Temperature	**-20 to 50° C
Storage Temperature	-40 to 50° C
Maximum Ambient Temperature Rating	50° C
Relative Humidity	To 95%, Non-condensing
Elevation	Derated above 6,600 feet
Dimensions (in inches)	22.5 X 18 X 12.63
Weight	Approx. 90 lbs.
Enclosure Type	NEMA 4
UL Listing File	File-E199356

*Dependent on actual AC line voltage. Refer to Section 4 for detail on the minimum power tracking voltage.
**If ambient temperature is between -20 to 0° C, the unit must be powered up in standby for at least one hour prior to going on-line.

EQUIPMENT SYMBOL

Chassis ground – Customer supplied system ground connection point. This symbol may be found near a stud within the main enclosure. It is provided as a location to bond the electrical system equipment ground.

SAFETY FEATURES

WARNING
The PV-5208 enclosure contains exposed high voltage conductors. The enclosure front panel should remain closed, except during maintenance or testing. These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that specified in the operating instructions unless you are qualified to do so. Do not remove the front panel if extreme moisture is present (rain or heavy dew).

Front Panel Indicators

The PV-5208 incorporates three colored LED indicators, used to show the current operating state of the inverter. These LEDs are located on the integrated bus board, which may be viewed through the window located on the front access panel. The indicators have the following meanings:

- **Red:** Fault Mode - The inverter has sensed an abnormal condition. To reset the unit (clearing the fault condition), cycle the on/off switch (see below).
- **Amber:** Sleep Mode – The inverter is waiting for sufficient PV voltage to start the inverter.
- **Green:** Operator Mode - The inverter is active and generating A/C current.

Enclosure Front Access Panel

The front panel of the PV-5208 enclosure is fastened with twelve M6 stainless steel hex nuts. It is required that the PV-5208 enclosure front panel be securely fastened during normal operation.

WARNING
The PV-5208 does not incorporate a door interlock switch. Please make sure the unit is powered down, and isolated from the utility grid and PV panels, prior to opening the enclosure access panel. Allow 5 minutes for any stored potentials to be discharged, prior to opening the unit. The front access panel of the PV-5208 enclosure must be securely fastened during normal operation.

Fault Reporting

Any fault conditions are reported to the operator interface. The red LED will light and the green LED will flash the corresponding number of the fault. Refer to Section 5, Troubleshooting, for detailed descriptions of system fault conditions.

PV Ground Fault Detection

The PV-5208 is equipped with ground fault detection circuitry (see section 3, installation and section 7, system schematic for further detail). Upon detection of 1.5 amps of ground fault current, the PV-5208 executes an orderly shutdown, and annunciates a ground fault at the operator interface. The PV-5208 will remain faulted until the ground fault is remedied and cleared (see section 5, troubleshooting). To enable this feature, a jumper must be installed between TBDC- and TB NEUT on the PV input terminal block. This must be the only point of PV conductor ground.

ISOLATION PROCEDURE

Anti Island Protection

A digital phase-shift-loop (PSL) circuit is implemented in the DSP inverter controller to prevent "Islanding" of the PV-5208.

The DSP continuously makes minor adjustments to the power factor phase angle above and below unity. In the event of a utility outage, these adjustments destabilize the feedback between the inverter and the remaining load, resulting in an over/under frequency or voltage condition. The PV-5208 then performs an orderly shutdown. The fault condition will remain until the utility voltage and frequency have returned to normal for 5 minutes.

This method has been extensively tested and proven to exceed the requirements of UL 1741.

The following procedure should be followed to de-energize the PV-5208 for maintenance:

WARNING
The terminals of the PV input may be energized if the arrays are energized. In addition, allow 5 minutes for all capacitors within the enclosure to discharge after disconnecting the PV-5208 from AC and DC sources.

1. Open the PV array disconnect switch (if present).
2. Open the AC interface disconnect (if present).
3. Open the isolation transformer circuit breaker.
4. Install lockout devices on the isolation transformer circuit breaker and PV disconnect switch (if present).

ISOLATION TRANSFORMER REQUIREMENTS

The PV-5208 UL1741 certification requires an isolation transformer be wired between the inverter AC output and the utility interconnection. Any standard dry-type isolation transformer is compatible with the PV-5208 as long as the inverter side is rated for a minimum of 5KVA continuous duty. If UL1741 and NEC690 is not a requirement of your PV installation, you may be able to connect the PV-5208 to the utility source without an isolation transformer. **Special considerations must be taken to do this. Incorrect installations may result in irreparable damage to the PV-5208 and utility.** Contact Xantrex Technology if you have any questions.

WARNING
Check with the local utility of jurisdiction when selecting the winding configuration of the isolation transformer. Individual utilities may have unique requirements related to isolation transformer wiring. Some winding configurations may keep the PV-5208 from detecting a loss of phase condition on the utility system which may allow potentially lethal voltage to be present on the open phase wirings.

Inverter Side Isolation Transformer Requirements

The inverter side transformer windings may be configured either delta or WYE, and must be rated for 208 VAC. Xantrex Technology recommends using a delta wound transformer to avoid installation mistakes. **If a WYE wound transformer is used to interface with the PV-5208, and the PV array is grounded, the neutral (X0) must be left floating.** If the neutral is tied to ground, the inverter will suffer irreparable damage.

Utility Side Isolation Transformer Requirements

The utility side isolation transformer windings may be configured either delta or WYE, and must be rated for the utility voltage at the point of utility interconnection. Check with the utility of jurisdiction when selecting an isolation transformer configuration. If a WYE wound transformer is used to interface with the utility, it is not necessary to connect the neutral (X0) to ground. The PV-5208 is a balanced, three phase, current sourcing inverter, and only operates with the presence of a stable utility voltage. Single phase grounded loads which may be present between the transformer and utility, will maintain their existing ground reference at the utility distribution transformer. Grounding the neutral of a WYE wound transformer may create an “open delta” condition, depending on the utility configuration. **This condition may keep the PV-5208 from detecting a loss of phase condition on the utility system, which may allow potentially lethal voltage to be present on the open phase wiring.**

Contact your Xantrex Technology distributor if you have any questions regarding isolation transformer requirements.

For Grounded Monopolar PV Configurations

It is required to install an isolation transformer between the inverter and a grounded utility source (4 wire, grounded neutral) when using a grounded PV array configuration. An isolation transformer will isolate the AC and DC ground points and protect the inverter from damaging ground current loops.

For Floated or Bipolar PV Array Configurations

It is highly recommended to install an isolation transformer between the inverter and a grounded utility source (4 wire, ground neutral). In the event of a PV array ground fault, during inverter operation, a ground loop will be created between the utility neutral ground and the ground fault. This ground loop will, in effect, create a phase to phase short across the IGBT device diodes. This generally results in irreparable damage to the IGBT devices.

TORQUE AND WIRE GAUGE SPECIFICATIONS

The following torque specifications are to be used on all electrical interfaces made during installation of the PV-5208.

Torque Table	
Terminal Block or Bolt Size	Torque Setting
M6-1	52 in lbs./5.9 Nm
AC and DC Terminal Blocks	N/A

The following table shows acceptable wire gauges to be connected to the PV-5208 AC and DC inputs.

Wire Gauge Table	
Termination	Wire AWG
Distribution Block (AC)	#24-8
Distribution Block (DC)	#24-8

INSTALLATION INSTRUCTIONS

CAUTION
All wiring methods shall be in accordance with the National Electrical Code ANSI/ NFPA 70. All power conductors interfacing to the PV-5208 should be sized in accordance with the National Electric Code ANSI/NFPA 70 and local codes. Large gauge wire must have a minimum bend radius dependent upon the wire gauge (refer to the National Electric Code, Article 373-6B). Take care to keep the wire bundles away from any sharp edges which may damage wire insulation over time. Xantrex Technology recommends using No. 8 AWG, 105 degrees C, minimum, copper wire for all connections with the PV-5208.

Ventilation Considerations

1. Maintain a minimum 6" clearance above and below the PV-5208 for proper cooling fan operation.
2. Maintain a minimum 1" clearance to the left and right of the PV-5208.

Installation

1. The unit must be mounted at least 3' off the ground, and 12" above any horizontal surface.
2. Screw two 3/8" x 3-1/2" long lag bolts into existing studs in the wall (16-inch mounting center) at lower mounting level on PV-5208. Lag bolts should be horizontally level with each other. Leave a minimum of 1" of bolt protruding from the wall.
3. Place the PV-5208 bottom mounting ears, shown in **Figure 3-1 and Figure 3-2** onto installed lag bolts. (See following page.)
4. Hold the unit against wall and install upper lag bolts (3/8" x 3-1/2"). Tighten bolts firmly.
5. Tighten lower lag bolts while unit is held in place.
6. Install two 1-1/2" liquid tight connectors (included with the PV-5208) where shown in **Figure 3-3**. (See following page.)

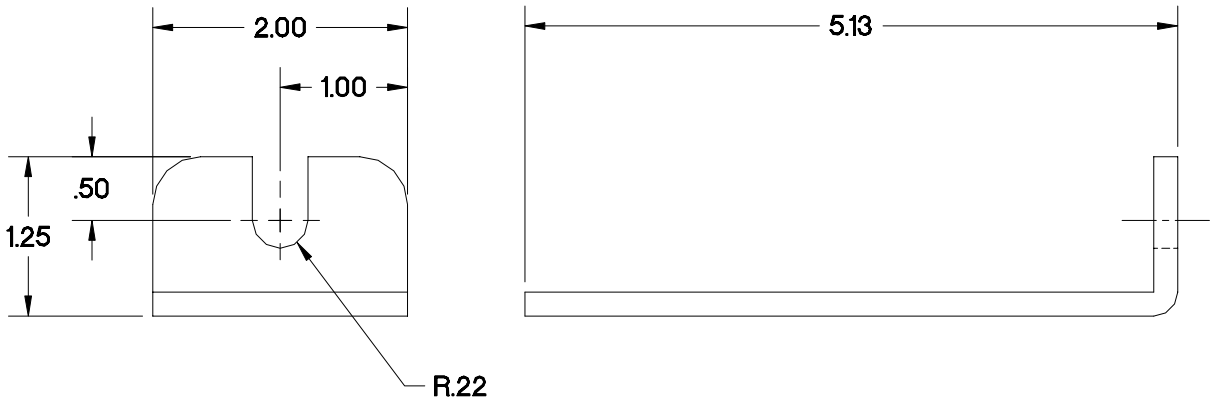


Figure 3-1

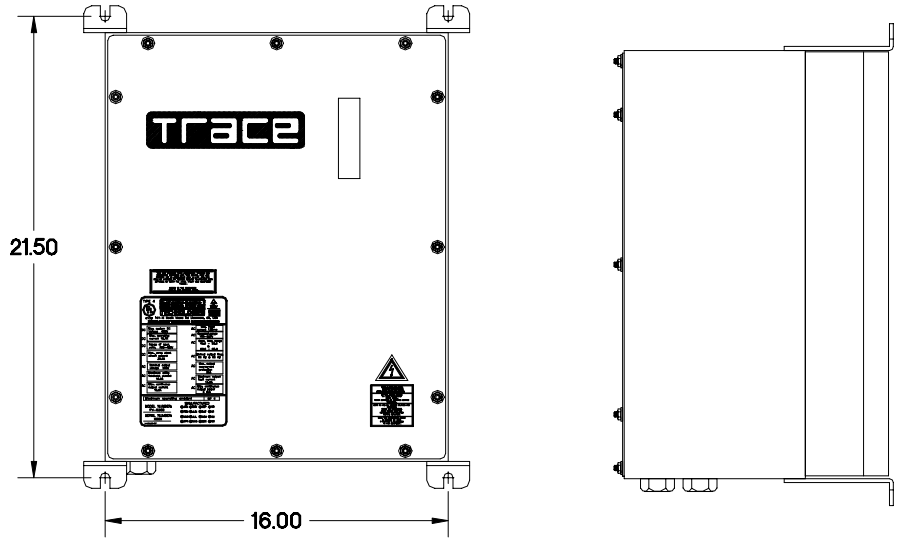


Figure 3-2

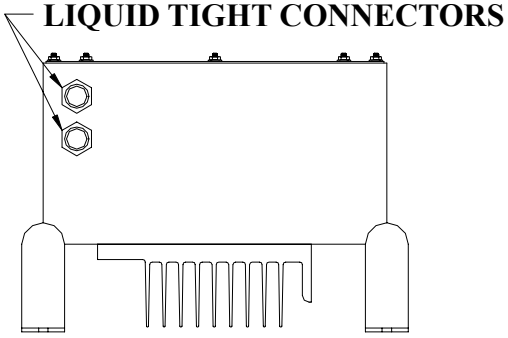


Figure 3-3

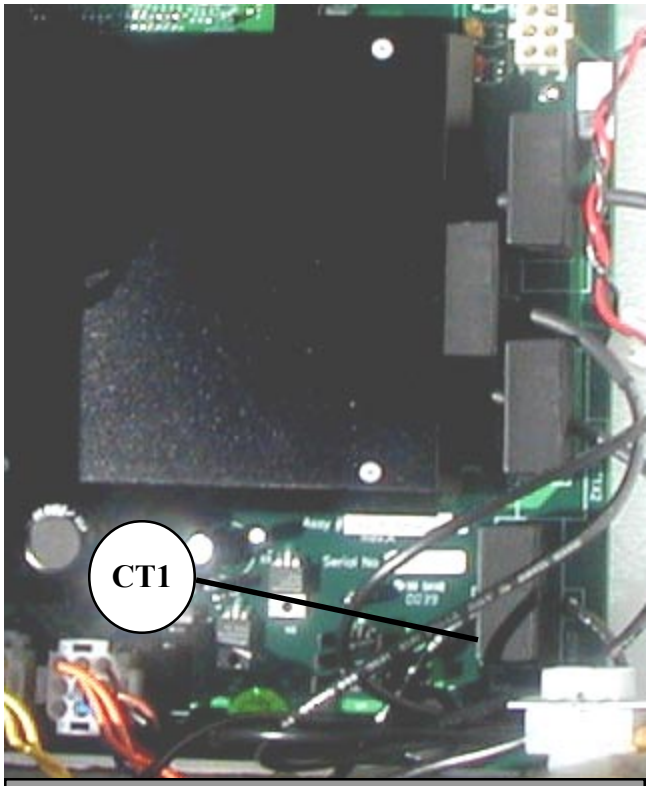
Array Grounding

NEC 690-41/42 requires the PV array to be earth grounded. The PV-5208 is shipped with a ground bond for installation between the PV negative terminal block to the PV safety ground terminal block. The PV-5208 chassis is also bonded to the PV safety ground terminal block. This ground bond is clearly marked with a warning label which must be read before installation. **For floating PV array configurations, the factory installed PV negative ground bond must not be installed.** Installation of this ground bond will cause irreparable damage to the PV-5208. For bipolar PV array configurations, the installer must move the ground bond between the PV array midpoint and the safety ground terminal block. Refer to the system schematic in the appendix for further wiring configuration.

Ground Fault Detection

The PV-5208 is equipped with a ground fault detection circuit and current transducer. This circuit is active when the PV array is grounded as described in the previous section. In the event of a 10 amp ground fault, the PV-5208 will execute an orderly shutdown and annunciates a ground fault at the operator interface. The PV-5208 will remain faulted until the ground fault is remedied and cleared at the operator interface (see section 5, Troubleshooting).

CAUTION
The input and output circuits are isolated from the enclosure, and that system grounding, if required by sections 690-41 and 690-42 of the National Electric Code, ANSI/NFPA 70, is the responsibility of the installer.



CONTROL BOARD & CT1

Phase-Sequencing

The PV-5208 is equipped with an automatic sequence-phase-detection control algorithm. This allows the utility interface conductors to be connected in any sequence convenient at the time of installation. Upon system initialization at power-up, the PV-5208 determines the phase sequence of the utility connection and configures the modulator drivers accordingly.

INTERCONNECTION WIRING

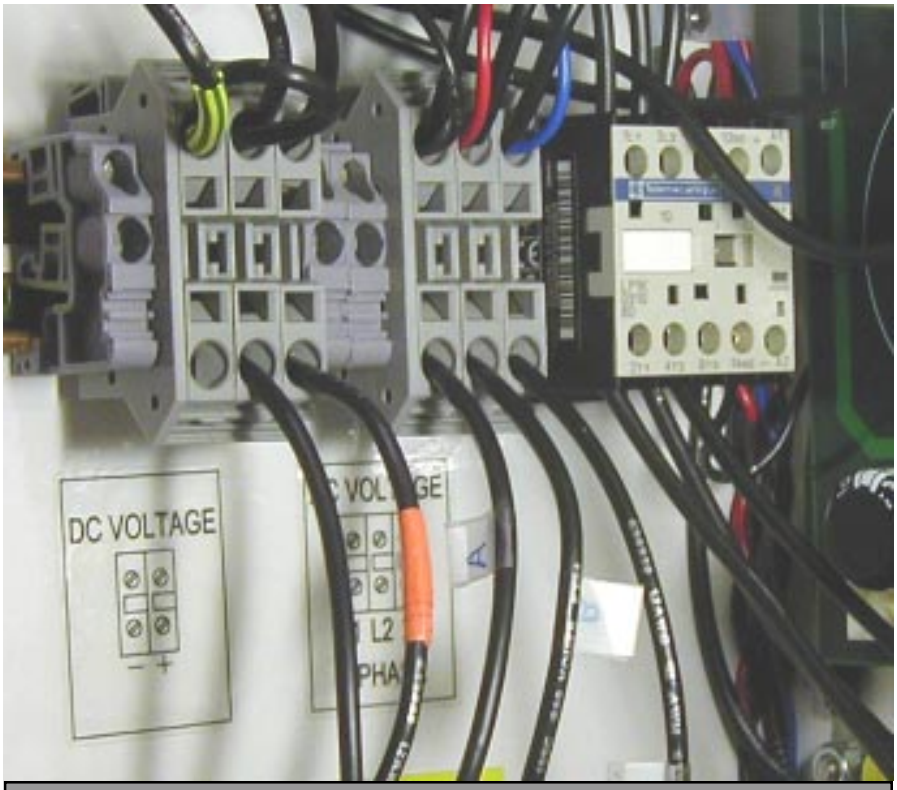
CAUTION
To reduce the risk of fire, connect only to a circuit provided with 20 amperes maximum branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.

The following wires for connecting the PV-5208 to external devices are not provided by Xantrex Technology: (See wiring diagram on page 3-7.)

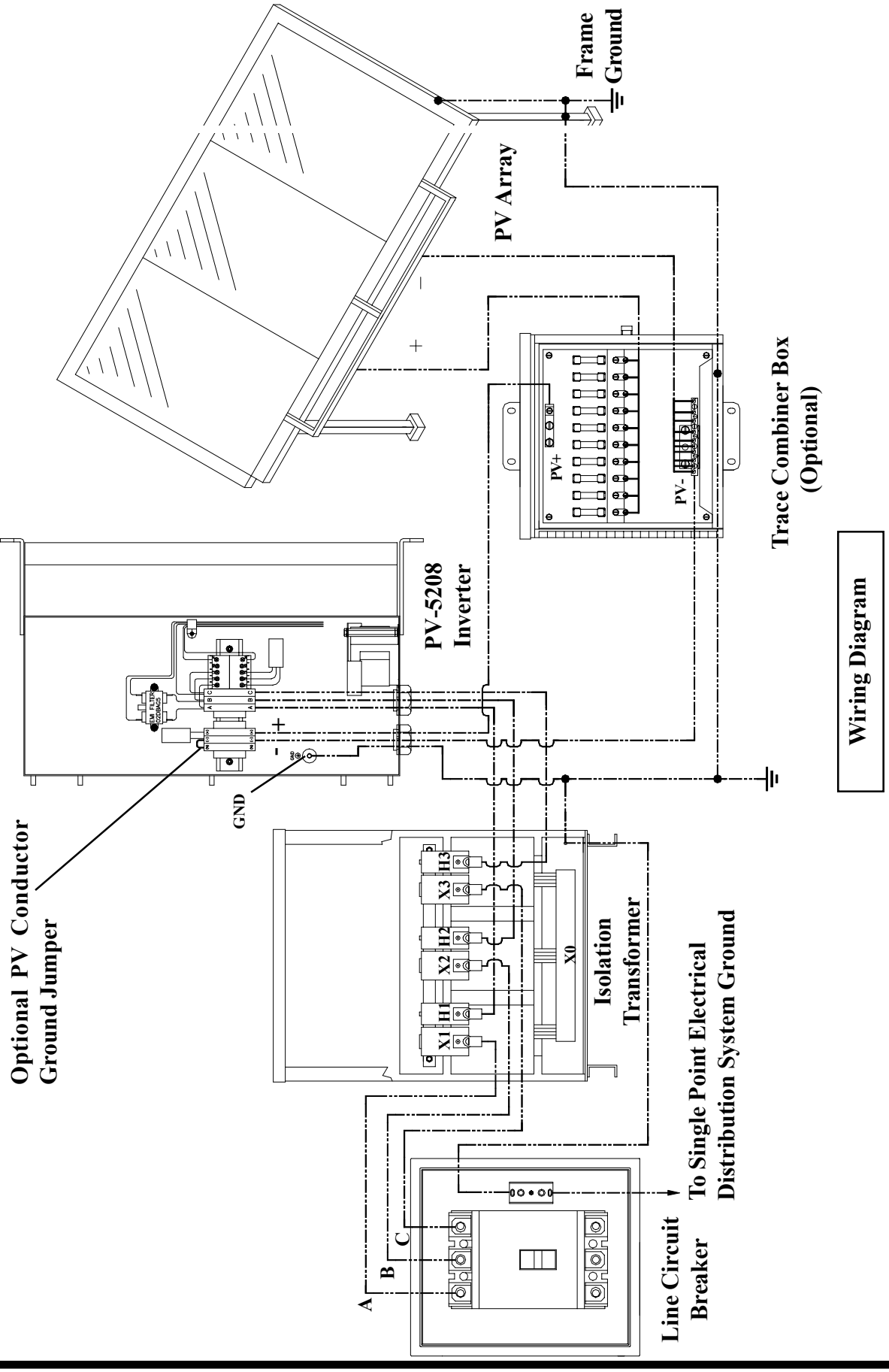
- 3-Phase 208 VAC inverter output (AC terminal block, see picture on following page) to terminals of the 208 VAC delta side of isolation transformer. **If the inverter side of the isolation transformer is configured WYE and the PV array is grounded, the neutral must be left floating. Ground loops will exist when the inverter starts switching, which will cause the inverter to shut down due to phase over-currents and may result in damage to the PV-5208. Also, insure that this neutral is not bonded to the isolation transformer frame.**
- System ground to the isolation transformer chassis ground.

- Isolation transformer grid side terminals to line circuit breaker (or the AC disconnect switch if present).
- PV frame ground to PV-5208 enclosure chassis ground stud.
- PV-5208 enclosure chassis ground stud to the electrical distribution system ground.
- PV+ to the inverter enclosure terminal block TB1-1.
- PV- to the inverter enclosure terminal block TB1-2.
- PV neutral if connecting a bipolar PV array.

Install all wires listed above. Refer to the system schematics in Section 7 for more detailed terminal locations.



DC TERMINAL, AC TERMINAL & CONTACTOR



INITIAL TURN ON PROCEDURE

The following procedures are intended to verify correct installation and proper operation of the PV-5208. These steps are to be followed sequentially. Do not continue if any of the steps or results are unclear. Refer to Section 4 for a detailed description of system operation. Refer to Section 5 for fault condition descriptions and troubleshooting. Refer to Section 7 for detailed system schematics.

Visual Inspection, Isolation Transformer

- Verify the isolation transformer circuit breaker is open.
- Remove the isolation transformer access panel.
- If the inverter side of the isolation transformer is configured WYE, the neutral must be left floating. The transformer neutral must not be connected to the utility side neutral, the transformer chassis, or ground.
- Verify the inverter 208 VAC conductors are connected to the isolation transformer.
- Verify the utility conductors are properly connected to the isolation transformer.

Visual Inspection, PV-5208

- Insure AC and DC disconnect are opened (if present).
- Insure PV array string disconnect switches are opened (if present).
- Open the enclosure access panel.
- Verify all wire connections are tight.
- Inspect the cables between the terminal blocks and the matrix driver board. All wire harnesses should be snap-locked into their respective PCB headers.

Visual Inspection, PV Array Wiring

- Verify the PV+, PV-, PV neutral (if array is bipolar), and PV safety ground are isolated from each other. Refer to system schematic in Section 7.
- Verify PV array is properly grounded. Refer to previous section on PV array grounding.
- Verify all PV fuses are installed (if present).
- Verify PV string diodes are wired properly (if present).
- Verify proper PV voltage polarity at the PV string disconnect/combiner boxes.

Initial Power

- Close the isolation transformer circuit breaker.
- Verify 208 VAC voltage across the AC disconnect.
- Close the AC disconnect (if present).
- With the DC disconnect switch opened (if present), close one of the PV array string disconnect devices.
- Carefully measure VDC at the PV disconnect switch. The value should be the same as at the PV array string disconnect device. It should also be positive.
- Close the PV disconnect switch (if present).
- Carefully measure VDC across TB1-1 and TB1-2 (PV +/-) terminal block. The value should be the same as at the PV array string disconnect device. It should also be positive.
- Open the PV disconnect switch. The matrix capacitor bank voltage should slowly degrade to near zero over a 5-minute period.
- Open all PV string disconnect switches.

System Verification

- Upon applying 208 VAC power to the PV-5208, observe the three LED indicator lights located on the bus board. The LED's should be switching on and off in a sequenced pattern. The LED's may be difficult to see depending on external light conditions. After approximately 15 seconds, the panel should finish initialization.
- Remedy any faults reported. If the fault indicator does not change, the fault condition is still present (see Section 5). Cycling the AC disconnect switch will reset the PV-5208 and attempt to clear any system faults. When cycling the AC disconnect switch, wait a few seconds before closing the switch. Once all faults are cleared, the amber indicator light will come on indicating the PV-5208 is in standby.
- Close all PV array string disconnect switches (if present).
- Close the main PV disconnect switch (if present).
- If the PV voltage is above the PV Start Voltage setpoint, and the PV Start Time is exceeded, the PV-5208 should transition to "Power Tracking" (see Section 4, Operation).
- Depending upon solar conditions, the PV-5208 may not operate at full power. If the PV array is not experiencing full sun, the PV maximum power tracker will regulate the PV voltage to maintain maximum PV power output. (See section 4 for further description of the peak power tracker).
- The PV-5208 is now fully operational.

Fine Tuning

- All PV-5208 operating parameters have been set at the factory, based upon prior experience with various PV arrays. Parameters may be modified using an optional graphical user interface. Contact your Xantrex Technology distributor for further information.
- It is recommended that the PV-5208 be watched during Wake-Up and Sleep Test. If the PV-5208 cycles between operating and sleeping at either of these times, the operating setpoints may not be set properly. (Refer to Section 4 for a detailed description of PV-5208 operating states). The PV-5208 should not cycle if the setpoints are set properly.

DESCRIPTION OF SYSTEM OPERATION

Overview

The PV-5208 is a fully automated grid-tied photovoltaic inverter. Manual interaction or control of the inverter is necessary only in the event of a system fault. The following conditions govern PV-5208 operation:

- Stable utility voltage and frequency must be present for all states of operation.
- Fault states are automatic from any state of operation. A fault will cause the PV-5208 to immediately stop processing all power. The fault condition will be reported to the operator interface.
- Cycling the AC disconnect switch attempts to clear any system faults and return the PV-5208 to normal operation. When cycling the AC disconnect switch, hesitate a few seconds before closing the switch.

Operating States

Control software governs the operation of the PV-5208. There are five main operating states. The following descriptions depict the LED interface. Inverters configured with LCD displays will indicate operating states on the display.

- **Standby:** The amber LED is illuminated. The PCU monitors the status of the PV array and utility grid, waiting until the PV array voltage is sufficient to export power to the utility.
- **Wake-Up:** The amber LED is illuminated. Once the PV voltage is sufficient to export power to the utility grid, the PV-5208 will wait 5 minutes before starting to insure the voltage is not transient in nature. This keeps the system from cycling during unstable irradiance conditions.
- **Power Tracking:** The green LED will illuminate while the PV-5208 delivers power to the utility. This is the standard operating state of the PV-5208. The PV-5208 maximum power tracker will optimize power output from the PV array. If available PV power is above the maximum power rating of the PV-5208, the inverter will current limit, which will cause the PV voltage to rise above the array peak power voltage. The minimum operating voltage of the PV-5208 is 330 VDC. The power tracker will not track voltage below this point, regardless of the actual peak power voltage of the PV array.
- **Sleep Test:** The control system will begin a 5 minute sleep test. This normally indicates the PV irradiance is declining as the sun sets. If the output power remains below 200 watts during the 5 minute sleep test, the system will transition to standby. The time delay allows the inverter to ride through any temporary irradiance reductions.
- **Fault:** The PV-5208 has encountered a fault condition. When this happens, regardless of the PV-5208 state-of-operation, the PV-5208 will stop processing all power and execute an orderly system shutdown. The red LED will illuminate while the yellow and green LED's flash the fault code (See section 5, Troubleshooting).

OPERATION FEATURES

Automatic Frequency Configuration

During system power-up, the PV-5208 control software measures the utility frequency, and then configures the inverter for North American (60Hz) or European (50Hz) operation. The North American

configuration is compliant with UL-1741, IEEE-929-2000, as well as applicable regional utility requirements, while the European software is compliant with CE and applicable regional utility requirements. This is most noticeable in the user settable parameter list viewable with the graphical user interface program. The list contains all parameters for both North American and European configurations. Changing parameters not applicable to the region of operation will not affect inverter performance.

Automatic Phase Sequence Detection

During system power-up, the PV-5208 detects the phase rotation of the three-phase utility voltage as seen at the inverter output terminals. The control software then determines the proper switching sequence for the output power stage. It is not necessary to maintain a particular phase sequence convention between the inverter and the utility point of interconnection.

Fixed Unity Power Factor Operation

The Xantrex family of grid tied PV inverters maintains unity power factor during operation. The control software constantly senses utility voltage, and constructs the output current waveform to match the utility voltage. The PV line of inverters is not capable of operation without the presence of normal utility voltage, nor is it capable of varying the output power factor off unity.

Transformerless Operation

WARNING
Xantrex Technology strongly recommends installing an isolation transformer between the PV-5208 inverter and the point of utility interconnection. Make sure you fully understand the issues associated with transformerless operation prior to installation. Failure to do so could result in catastrophic damage to the PV-5208 as well as the utility distribution system and will void the product warranty.

The PV-5208 is capable of transformerless operation and has been certified under UL1741 for operation with or without an isolation transformer; however, **all of the following requirements must be met to avoid catastrophic damage to the inverter and possibly the utility distribution system. If you have any concerns or uncertainty, we strongly recommend installing an isolation transformer between the inverter and the utility point of interconnection (see Section 3, Installation for further information on isolation transformer requirements). Contact Xantrex Technology if you have any questions regarding transformerless operation.**

- The utility interconnection voltage must be a 3 wire delta, **ungrounded** system.
- The nominal utility voltage must be 208Vac.
- The PV array must be configured as a floating monopole or bipolar.

Be aware: The primary reason to install an isolation transformer is for isolation between the PV DC power source from the utility AC power source. If a ground path exists at the PV array and at the utility, a direct short will exist across utility phases during inverter operation, resulting in destruction of the inverter output power stage. Even when the utility and PV array are installed ungrounded, if the PV array and utility AC system become unintentionally grounded, the same destructive condition will

exist. Most North American PV installations must ground the PV array to be in compliance with NEC 690-41 & 42. If this is a requirement for your installation, an isolation transformer is mandatory.

Variable Minimum DC Input Voltage Level

The minimum DC input voltage limit for the PV-5208 is a function of the utility AC line voltage. The PV-5208 control software periodically changes the minimum allowable DC input voltage based upon the actual line voltage during operation.

For monopolar PV array configurations: Minimum DC voltage will vary between 282 and 320Vdc for line voltage fluctuations between factory set minimum and maximum line voltage limits. For example: At the factory set high line voltage limit of 220.5, the minimum required DC input voltage is approximately 320Vdc. At the factory set low line voltage limit of 196Vac, the minimum required DC input voltage is approximately 282Vdc. At nominal 208Vac, the minimum DC input voltage is 300Vdc.

For bipolar array configurations: Minimum DC voltage will vary between approximately 340 and 380Vdc.

Utility Voltage/Frequency Fault Automatic Reset

In the event of a utility voltage or frequency excursion outside of preset limits, the PV-5208 will stop operation and annunciate a fault at the operator interface. Once the utility voltage has stabilized within acceptable limits for a period of at least five minutes, the PV-5208 will automatically clear the fault and resume normal operation. Voltage and frequency fault setpoints are detailed later in this section.

Active Island Detection

Much concern has been given to the possibility of an inverter causing a 'utility island' condition during a utility power outage. An island condition is defined as grid tied inverter maintaining operation and supporting a load that has been isolated from the utility power source. This requires the load to be closely balanced to the output power of the inverter as well having a resonant frequency close to 60Hz. Needless to say, this is a extremely remote possibility. To insure this condition does not occur, the PV-5208 control software contains an active phase-shift-loop algorithm, which destabilizes a balanced load, which may otherwise be capable of maintaining inverter operation in the absence of utility voltage. This feature has been extensively tested and proven to exceed the safety requirements of UL-1741 and IEEE-929-2000.

Ground Fault Detection

The PV-5208 is capable of detecting PV array ground fault current. This feature is not enabled at the time of shipment due to the variety of possible PV array wiring configurations. To enable this feature a wire must be installed between ground and the desired ground reference point on the PV array. For bipolar PV array configurations, the ground wire must be connected between the PV array neutral point and TB-NEUT terminal block. For grounded monopolar PV array configurations, the ground wire must be connected between TB1-2 (-) and TB-NEUT terminal blocks (see the following diagram for clarification and the system schematic in Section 7). A jumper wire is included separately with the PV-5208.

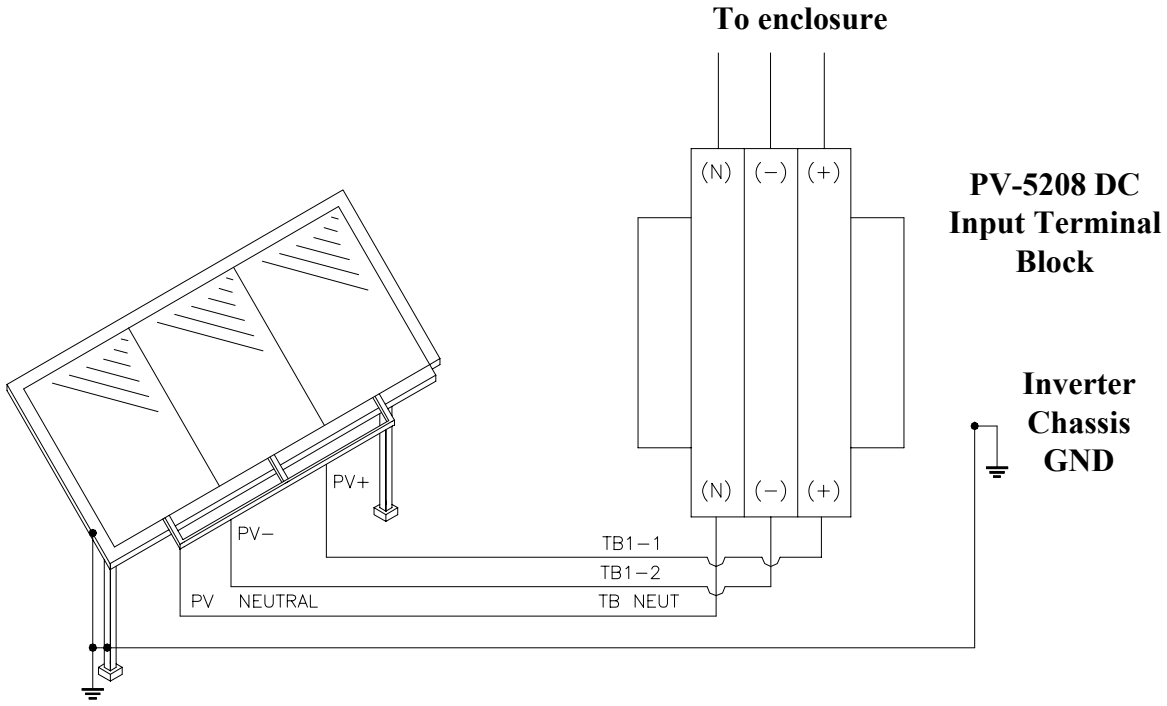


Diagram Of Bipolar Ground Fault Detection Configuration

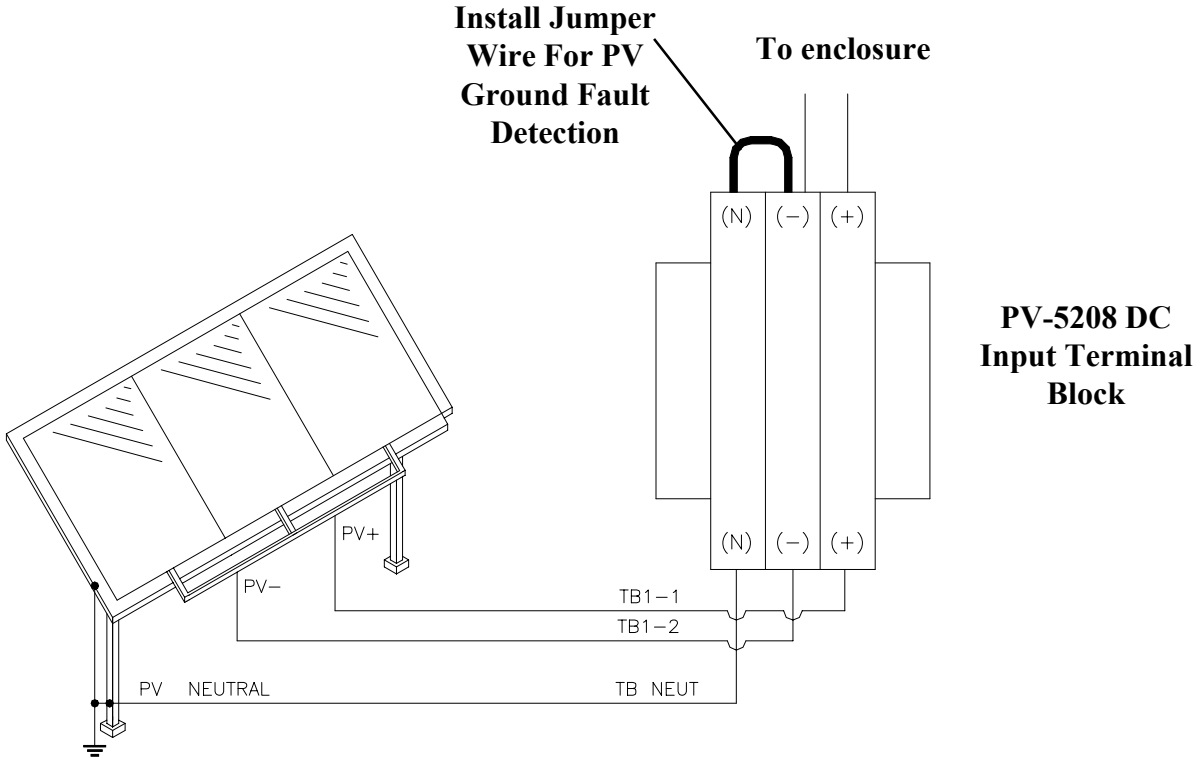


Diagram Of Monopolar Configuration

Current Imbalance Detection

In the event of phase-to-phase current imbalance of 20% between phases, the inverter will execute an orderly shutdown, and annunciate a fault at the operator interface. See Section 5, Troubleshooting, for further information on this fault condition.

DC Overvoltage Detection

In the event of DC voltage greater than 600Vdc, the PV-5208 will execute an orderly shutdown and annunciate a fault to the operator interface. If DC voltage remains greater than 600Vdc, the PV-5208 may be irreparably damaged. See Section 5, troubleshooting for further information on this fault condition.

Peak Power Tracking

The PV-5208 control software employs an active PV peak power tracker, designed to maintain maximum power output from the PV array at all times of operation. The peak power voltage point varies primarily depending upon the temperature of the PV cells. The PV-5208 constantly seeks the optimum voltage and current operating points of the PV array to maintain maximum PV power output.

Automatic Wake Up PV Voltage Optimization

Every day the PV-5208 wakes up and starts producing power, the control software determines if it is necessary to make adjustments to the start voltage setpoint. If the PV-5208 wakes up and determines that there is insufficient PV array power to support inverter operation, the start voltage setpoint is shifted slightly higher. This assumes that once the voltage on the array has risen, there will be greater PV power as the PV array is exposed to higher irradiance. Conversely, if the PV-5208 wakes up and determines that there is more power than is necessary to support inverter operation, the PV start voltage setpoint is lowered. The PV start voltage setpoint will usually be optimized over the period of one week. This value may be manually adjusted via the graphical user interface program to expedite the optimization process. There is also a user settable timer that determines the time required for the PV start voltage to exceed the start voltage setpoint. This timer may also be manually adjusted via the graphical user interface to help compensate for poorly placed PV arrays. The default wake-up time delay is factory set at five minutes.

Automatic Sleep Test

Toward the end of every solar day, the PV-5208 automatically determines when to stop producing power dependent upon the output power of the inverter. As the net output power of the PV-5208 nears zero, a timer is started to allow the inverter to ride through any brief irradiance reductions. This timer may be manually adjusted via the graphical user interface to help compensate for poorly placed PV arrays. The default sleep time delay is factory set at five minutes.

OPERATOR INTERFACE (LED)

The operator interface on the PV-5208 consists of 3 system status indicator LED's. The LED's indicate the following states of operation:

- **Red LED:** Indicates the system is faulted. The inverter will not function while this LED is illuminated. Cycling the AC disconnect switch will attempt to clear the fault condition and allow the

inverter to resume normal operation. When cycling the AC disconnect switch, hesitate a few seconds before closing the switch.

- **Amber LED:** Indicates the inverter is in standby, waiting for sufficient DC voltage to begin peak power tracking. This LED will turn off once the PV-5208 begins producing power. In the event of a fault condition, the amber LED will flash, indicating the beginning of the fault code sequence (See section 5, Troubleshooting).
- **Green LED:** Indicates the inverter is on-line and outputting power. In the event of a fault, the green LED will flash a sequence indicating the fault code (See section 5, Troubleshooting).

EXAMPLE OF NORMAL SYSTEM OPERATION

Upon initial application of AC voltage, the LED's located on the front door will sequentially flash for approximately 15 seconds. Once the system has finished initializing, the PV-5208 will remain in standby until adequate PV voltage is available (amber LED is lit). 5 minutes after the PV start voltage has been reached, the PV-5208 will synchronize to the utility grid and begin peak power tracking the PV array. The time delay protects the inverter from excessive on/off cycling.

The PV-5208 will continue to process power until the AC output power approaches the operating losses of the inverter for a period of 5 minutes. The time delay protects the inverter from excessive on/off cycling.

SYSTEM OPERATING PARAMETERS

The PV-5208 contains a number of system operating parameters which may be field adjusted using an optional graphical user interface program (contact Xantrex Technology for further information). All operating parameters have been set at the factory during system test based upon prior experience with various PV arrays, or to be in compliance with UL1741. In general, the factory default settings allow for stable and efficient operation of the PV-5208 connected with any PV array configured for a 330-500 VDC peak power voltage point.

Below is a list of the PV-5208 operating parameters, showing valid ranges and the factory default settings. Many of these parameters are specific to domestic or European operation. Changing parameters not applicable to the region of operation will not affect inverter performance. Some field adjustable parameters are password protected and may only be changed by trained service technicians. In particular are parameters relating to utility protection setpoints. These have been set in the factory to the limits mandated by UL1741. Any changes to these setpoints should be agreed upon by the local utility and the equipment owner. The ability to adjust the voltage and frequency setpoints across the actual utility voltage and frequency has been provided as a simulation tool to verify the PV-5208 accurately detects and responds to a utility excursion. This test should only be performed by a trained service technician. It is possible to adjust the setpoints in a manner that will prevent the PV-5208 from functioning.

Parameter	Description	User Settable Range	Resolution	Factory Default Setting	Password Protected	Domestic/ European
Volts_Max	Maximum Allowable Utility Voltage	166.4-249.6	0.1 V	220.5	*	D/E
Cycle_Max	High Line Voltage Timer, Cycles	0-60	1 Cycle	5	*	D/E
Volts_Min	Minimum Allowable Utility Voltage	166.4-249.6	0.1 V	195.5	*	D/E
Cycles_Min	High Line Voltage Timer	0-60	1 Cycle		*	D/E
Freq_Max_Delta	High Line Frequency Level	-3.0-3.0	0.1 Hz	0.4	*	D/E
Freq_Min_Delta	Low Line Frequency Level	-3.0-3.0	0.1 Hz	0.4	*	D/E
Freq_Max_Delay	Maximum Allowable Time Response To A Utility High Frequency Excursion	0-60	1 Cycle	5	*	D/E
Freq_Min_Delay	Maximum Allowable Time Response To A Utility Low Frequency Excursion	0-60	1 Cycle	5	*	D/E

Parameter	Description	User Settable Range	Resolution	Factory Default Setting	Password Protected	Domestic/ European
Line_Fault_Reset_Delay	Line Fault Reset Delay Time	0-300	1 Second	300	*	D/E
PV_Start_V	PV Wake Up Voltage	269.7-600.0	0.1 V	380		D/E
PV_Decision_W	Maximum Start Up Power	32.0-3200.0	0.1 W	1280		D/E
PV_Start_Time	PV Wake Up Time	10-600	1 Second	300		D/E
PV_Sleep_Time	PV Sleep Time	10-600	1 Second	300		D/E
Gnd_Current_Max	Maximum Earth Fault Current Limit	1.0-20.0	0.1 A	10		Domestic Only
Earth_Volts_Max	Maximum Maximum Earth Voltage	0.0-300.0	01 VDC	50		European Only
Anti_Island_Method	Anti-Island Method	0=Off, 1=Up/Down Freq, 2=Up Freq, 3=Down Freq			*	D/E
PPT_Ramp_Time	PPT Ramp Time	1-60	1 Second	20		D/E
PPT_V_Step	PPT Voltage Step	0.1-10.0	0.1 VDC	1		D/E
PPT_Max_I_Percent	Commanded Output Power As A Percent Of Rated Power	0-100	1 A	100		D/E
Data_Log_Rate (Unsupported)	Data Logging Rate	1=15s, 2=1m,3=5m, 4=15m		4		D/E

GENERAL

In the event of a fault, the PV-5208 will annunciate the condition at the operator interface. The PV-5208 will execute an orderly shutdown and remain faulted until the fault is cleared (manually or automatically).

In general, the operator should respond to any PV-5208 fault as follows:
1. The source of the fault should be sought by referring to the following chart.
2. Rectify the fault condition and attempt to clear the fault by cycling AC disconnect switch.
3. If the problem cannot be corrected, contact your Xantrex Technology distributor for assistance or service.

FAULT CONDITIONS

Fault Code Annunciation

The PV-5208 will report faults by LED display blinking the amber and green LED's on the front door of the inverter. If a fault is detected, the red LED will light continuously and the amber and green LED's will blink the sequence of the fault. The amber LED will light once, indicating the beginning of the fault code sequence (first count). The green LED will blink X number of times, indicating the remainder of the fault count. For example: If the PV-5208 experiences a ground fault (fault #3), the yellow and green LED will flash once then the green LED will flash twice again. This sequence will repeat until the fault condition has been corrected and cleared.

Fault Clearing

Once the cause of the fault condition has been corrected, the fault can be cleared with the on/off switch. First turn the switch to the off position and then back to the on position in order to reset the inverter. If a fault is sustained the inverter will not reset, and will continue to report the fault. Once the fault clears, the red LED will turn off and the yellow LED will remain lit.

FAULT DESCRIPTIONS AND TROUBLESHOOTING

Fault Description	Number of LED Flashes	Fault Description	Number of LED Flashes
IPM Over Current	1	AC Line Over Frequency	6
IPM Over Termperature	2	AC Line Voltage Low	7
Ground Current	3	AC Line Voltage High	8
SW DC/PV Over Voltage	4	DC Bus Over Voltage	9
AC Line Under Frequency	5	Internal System Fault	10

(1) IPM Over Current Fault

The IPM module has detected a short circuit/over current condition, or low supply voltage.

Possible causes:

- Short circuit in output AC line.
- Low supply voltage to IPM control circuit.
- Shorted isolation transformer.

(2) IPM Over Temp Fault

The IPM module has exceeded its maximum allowable temperature.

Possible causes:

- Clogged inlet filter.
- Airflow on heat sink impeded due to accumulation of debris.
- Operation above rated ambient temperature for an extended period of time.
- Auxiliary contact block on contactor K1 inoperable. This is only possible if the fan does not operate when the contactor closes. Carefully check voltage at the K1-N.O. aux. contact to the ground bus when the contactor is closed. (See schematic in Section 7)

(3) Ground Current Fault

The earth safety ground current has exceeded the maximum-programmed value.

Possible causes:

- The negative wire from the PV array has been passed through CT1. Verify PV ground jumper is installed between TB1-2 and TB-NEUT.
- Inspect the PV array for actual ground faults.
- The PV array has been grounded in more than one location. If the PV array is grounded through CT1, it must not be grounded at any other location.
- CT1 defective: Contact your Xantrex Technology distributor for assistance or service.

(4) SW PV/DC Over Voltage Fault

The PV voltage has exceeded the maximum programmed limit. This limit is set to 600 VDC during system test.

Check the PV input voltage at the PV disconnect switch. If the voltage is below 600 VDC, restart the PV-5208.

Possible causes:

- The PV array open circuit voltage exceeded 600 VDC.
- There is a problem with the PV voltage sense wiring (see system schematic in Section 7).

(5) AC Line Under Frequency Fault

The AC utility frequency fell below the minimum programmed limit. This limit is set to 59.5 Hz and the system response time limit is set to 3 cycles to insure the PV-5208 disconnects from the utility within the time limit allowed by UL1741. Frequency setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local

utility and the equipment owner.

Possible causes:
- The utility frequency fell below the allowable limit (59.5 Hz by default). Verify the utility frequency is stable and within allowable operating limits.
- There is a problem with one or more of the AC sense wires (see system schematic in Section 7).

This fault is auto-resetting. The unit will automatically restart after line has stabilized within normal limits for 5 minutes. Frequency setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner.

(6) AC Line Over Frequency Fault

The AC frequency exceeded the maximum-programmed limit. This limit is set to 60.5 Hz and the system response time limit is set to 3 cycles to insure the PV-5208 disconnects from the utility within the time allowed by UL1741. Frequency setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner.

Possible causes:
- The utility frequency exceeded the allowable limit (60.5 Hz by default). Verify the utility frequency is stable and within allowable operating limits.
- There is a problem with one or more of the AC sense wires (see system schematic in Section 7).

This fault is auto-resetting. The unit will automatically restart after line has stabilized within normal limits for 5 minutes. Frequency setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner.

(7) AC Line Voltage Low Fault

The utility AC voltage fell below the minimum programmed limit. There are two levels of response to low line voltage conditions. The first level of response is set to 195.5 VAC with a time delay of 5 cycles. By default, the second level is set to 156 VAC with a time delay of 1 cycle. Voltage setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner. and is not field adjustable.

Possible causes:
- The utility voltage fell below the allowable limit (195.5 VAC by default). Verify the utility voltage is stable and within allowable operating limits.
- There is a problem with one or more of the AC sense wires (see system schematic in Section 7).

This fault is auto-resetting. The unit will automatically restart after line has stabilized within normal limits for 5 minutes.

(8) AC Line Voltage High Fault

The utility AC voltage exceeded the maximum-programmed limit. There are two levels of response to

high line voltage conditions. The first level of response is set to 220.5 VAC with a time delay of 5 cycles. By default, the second level is set to 247.5 VAC with a time delay of 1 cycle. Voltage setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner.

Possible causes:
- The utility voltage exceeded the allowable limit (220.5 VAC by default). Verify the utility voltage is stable and within allowable operating limits.
- There is a problem with one or more of the AC sense wires (see system schematic in Section 7).

The fault is auto-resetting. The unit will automatically restart after line has stabilized within normal limits for 5 minutes.

(9) DC Bus Over Voltage Fault - Hardware

The DC bus voltage has exceeded the maximum limit.

This is also the PV input voltage sense point. Check the PV input voltage at the PV disconnect switch. If the voltage is below 600 VDC, cycle the on/off switch and restart the PV-5208.

Possible causes for over temperature condition:
- Airflow on heat sink impeded due to accumulation of debris.
- Operation above rated ambient temperature for an extended period of time.
- Auxiliary contact block on contactor K1 inoperable. This is only possible if the fan does not operate when the contactor closes. Carefully check voltage at the K1-N.O. aux. contact to the ground bus when the contactor is closed. (See schematic in Section 7).

(10) Internal System Fault

There has been an internal system fault. Contact your Xantrex Technology distributor.

Possible cause:
- There is a problem with the integrated bus board or DSP control board.

Xantrex Technology recommends that the following preventative maintenance be carried out on the PV-5208:

Monthly intervals or as required:

Aluminum Extrusion Heatsink

Accumulation of dirt and debris on the aluminum extrusion heatsink and fan shroud will decrease the ability to transfer heat, which can cause the PV-5208 to shutdown on over-temperature alarms. Inspect the aluminum extrusion heatsink for accumulation of dirt and debris. Remove enclosure panel and clean if debris is present.

Six month intervals:

Enclosure Seals

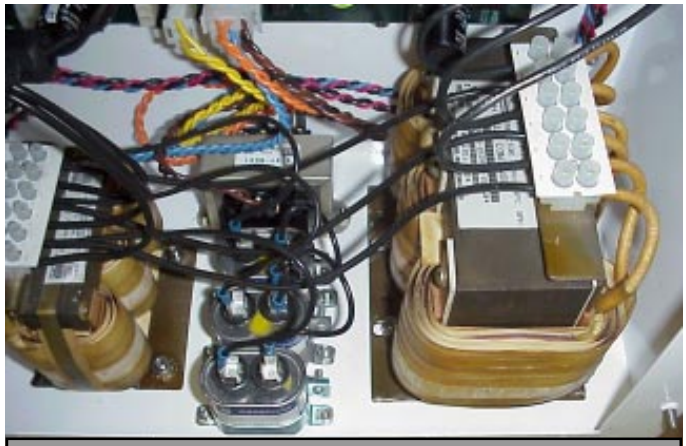
Inspect the enclosure access panel seal. If damaged, replace with equivalent closed cell foam gasket. Call your Xantrex Technology distributor for factory replacements or specifications.

Electrical Connections

Inspect the condition of all wiring within the PV-5208. Inspect all wire crimps and connections for damage caused from high temperature (see inductor torque table). Check for corrosion. Replace any damaged wires. Verify all mechanical connections are sufficiently tightened. Verify all conduction surfaces are clean and free of corrosion.

Mechanical electrical connections will loosen over time. This is caused primarily by thermal cycling during normal operation. As connections loosen, electrical impedance will increase at the connection, eventually leading to fire and component damage. It is critical to check all electrical connections every six months.

Inductor Terminal Torque Table	
Part Number	Torque Setting
M20039	10.3 to 12.3 in lbs./1.2 to 1.4 Nm
M9090	10.3 to 12.3 in lbs./1.2 to 1.4 Nm



INDUCTOR TERMINALS

Enclosure

Access the enclosure and remove any accumulated dirt and debris. Vacuum enclosure whenever dust or dirt is present.

ISOLATION PROCEDURE

The following procedure should be followed to de-energize the PV-5208 for maintenance:

WARNING
The terminals of the PV input may be energized if the arrays are energized. In addition, allow 5 minutes for all capacitors within the enclosure to discharge after shutting down the PV-5208.

1. Open the PV array disconnect switch (if present).
2. Open the AC disconnect (if present).
3. Open the isolation transformer circuit breaker.
4. Install lockout devices on the isolation transformer circuit breaker and PV disconnect switch.

TURN-ON PROCEDURE

Refer to Section 3 for a detailed first-time turn on procedure.

1. Remove any lockout devices from the isolation transformer circuit breaker and PV disconnect switch.
2. Close the isolation transformer circuit breaker.
3. Close the AC disconnect (if present).
4. Close the PV array disconnect switch (if present).

After a 15 second initialization period and a 5 minute wake up period, the PV-5208 will automatically begin power tracking, given the PV voltage is greater than the PV start voltage setpoint.

151400 Rev A : Schematic, System, Grid Tied PV Inverter, PV-5208

151324 Rev A : Envelope Drawing, Grid Tied Inverter, PV-5208

151325 Rev A : Assembly, Main Enclosure, Control Components, 5 KVA, PV-5208
Table of Components

Underwriters Laboratories Card, QIKH.E199356, February 14, 2001

Underwriters Laboratories QIKH Guide Information, February 26, 2001

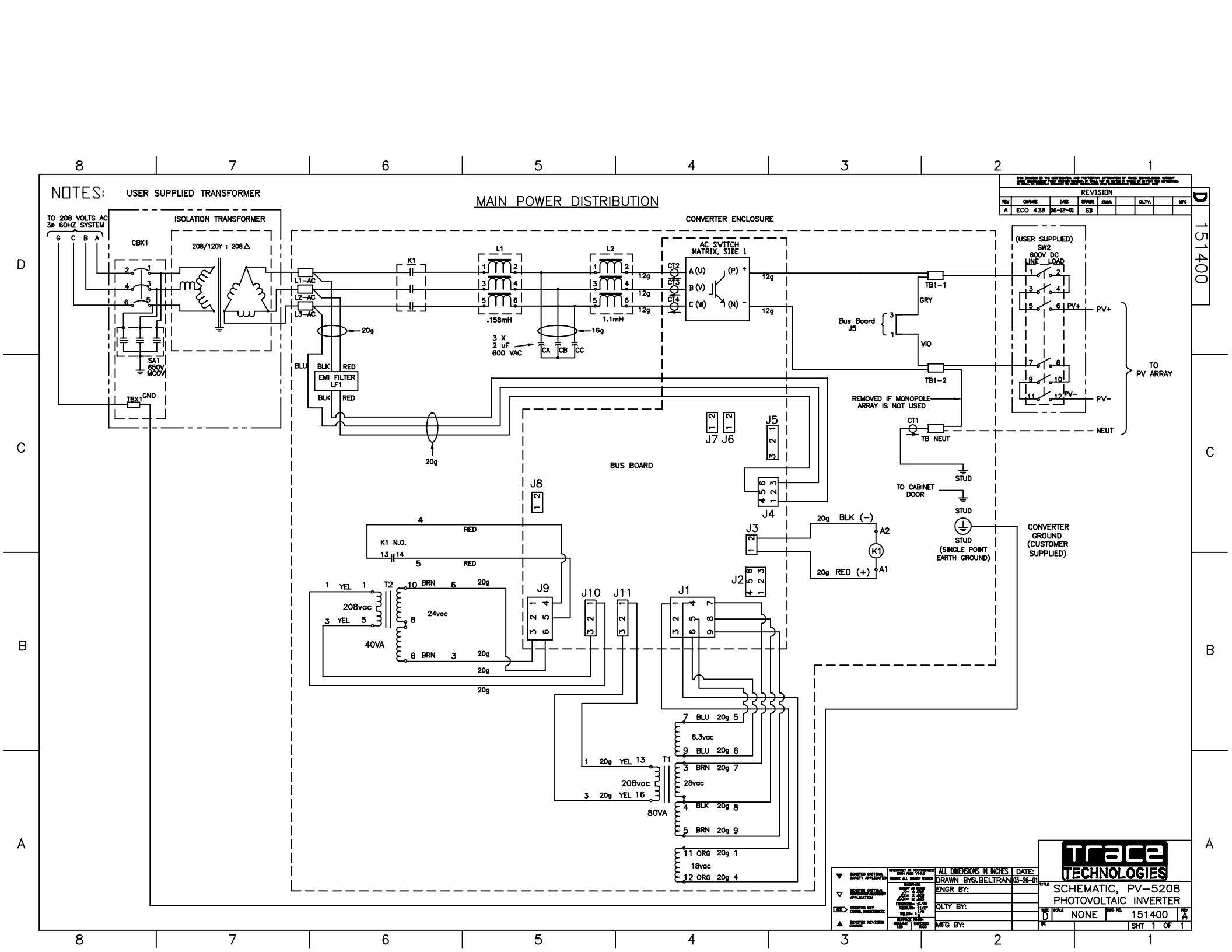
Underwriters Laboratories Document, UL 174, February 27, 2001

Accessories:

151258 - Combiner Box, 10 Pole, 600 VDC, Nema 3R

151260 - Combiner Box, 12 Pole, 600 VDC, Nema 3R

151266 - Transformer, 5 KVA, 3 Pole, 60 Hz, 208 Delta/WYE


NOTES:
USER SUPPLIED TRANSFORMER
MAIN POWER DISTRIBUTION
REVISION
REV | CHANGE | DATE | DRAWN | ENGR. | QLTY. | MFG
A | ECO 428 | 06-12-01 | GB
151400
TO 208 VOLTS AC 3ø 60HZ SYSTEM
G C B A
ISOLATION TRANSFORMER
CBX1
208/120Y : 208Δ
SA1 650V MCOV
TBX1 GND
L1-AC
L2-AC
L3-AC
K1
L1
.158mH
L2
1.1mH
3 X 2 uF 600 VAC
CA CB CC
20g
16g
12g
CONVERTER ENCLOSURE
AC SWITCH MATRIX, SIDE 1
CT2 CT3 CT4
A (U) B (V) C (W)
(P) + (N) -
BLU BLK RED
EMI FILTER LF1
BLK RED
BUS BOARD
J7 J6 J5 J8 J4 J3 J2 J1 J9 J10 J11
TB1-1
GRY
Bus Board J5
VIO
TB1-2
REMOVED IF MONOPOLE ARRAY IS NOT USED
CT1
TB NEUT
NEUT
(USER SUPPLIED)
SW2
600V DC
LINE LOAD
PV+
PV-
TO PV ARRAY
TO CABINET DOOR
STUD
STUD (SINGLE POINT EARTH GROUND)
CONVERTER GROUND (CUSTOMER SUPPLIED)
K1 N.O.
RED
20g BLK (-)
20g RED (+)
A2
A1
T2
208vac
24vac
40VA
T1
208vac
80VA
6.3vac
28vac
18vac
BLU
BRN
YEL
ORG
ALL DIMENSIONS IN INCHES
DRAWN BYG.BELTRAN 03-26-01
ENGR BY:
QLTY BY:
MFG BY:
TRACE TECHNOLOGIES
SCHEMATIC, PV-5208
PHOTOVOLTAIC INVERTER
SIZE D SCALE NONE DWG NO. 151400 REV A
SHT 1 OF 1

NOTES:

REVISION

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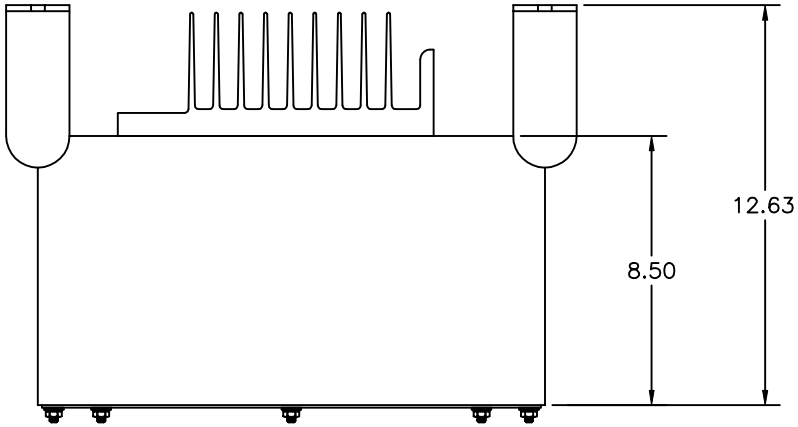
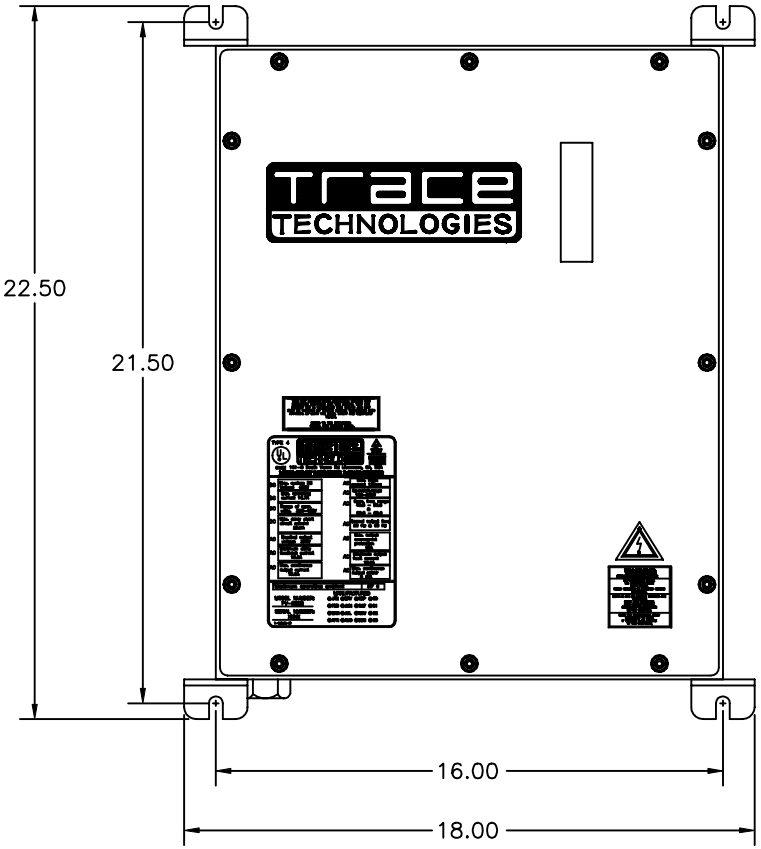
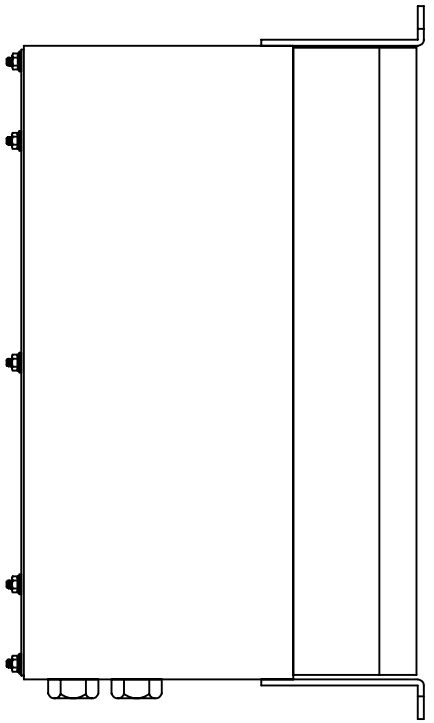






▼ DENOTES CRITICAL SAFETY APPLICATION

▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION

KCC DENOTES KEY CONTROL CHARACTERISTIC

△ DENOTES REVISION CHANGE

INTERPRET IN ACCORDANCE WITH ANSI Y14.5
BREAK ALL SHARP EDGES

TOLERANCES
EXCEPT AS NOTED
.X= ± .060
.XX= ± .020
.XXX= ± .005
FRACTIONS= ± 1/16
ANGULAR= ± 1/2°
WELDS= ± 1/8

SURFACE FINISH
MACHINE 125 | EXPOSED 1000

ALL DIMENSIONS IN INCHES

DRAWN: G. BELTRAN 04-04-01

ENGR:

QLTY:

MFG:

DATE:

TRACE TECHNOLOGIES

TITLE: ENVELOPE DRAWING, GRID TIED INVERTER, PV5208

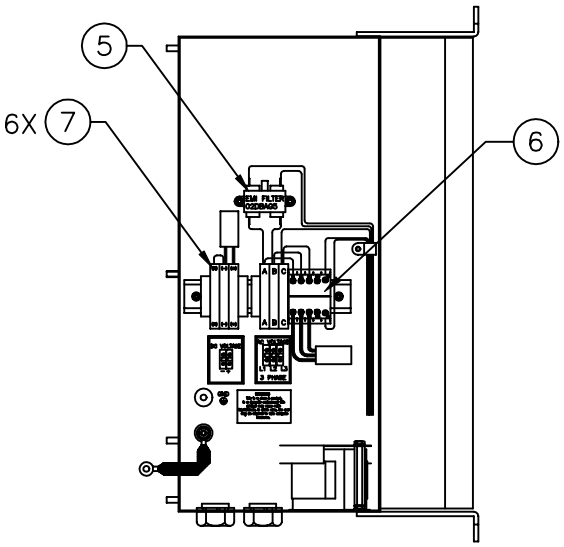
SIZE	SCALE	DWG NO.	REV
C	NONE	151324	A

WT. | SHT 1 OF 1

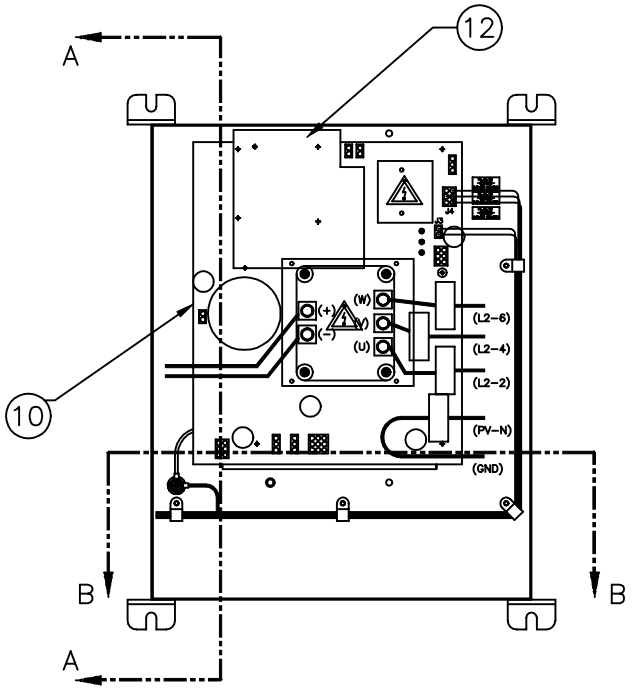
151324

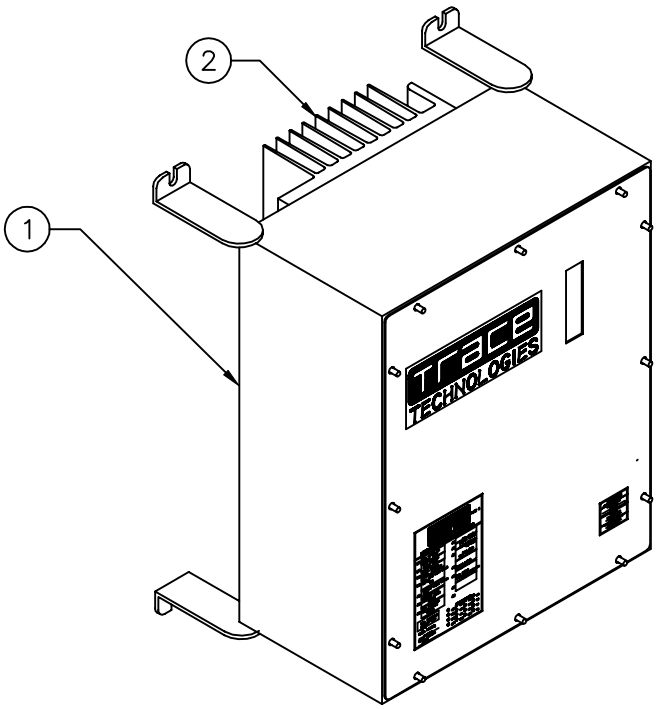
REVISION

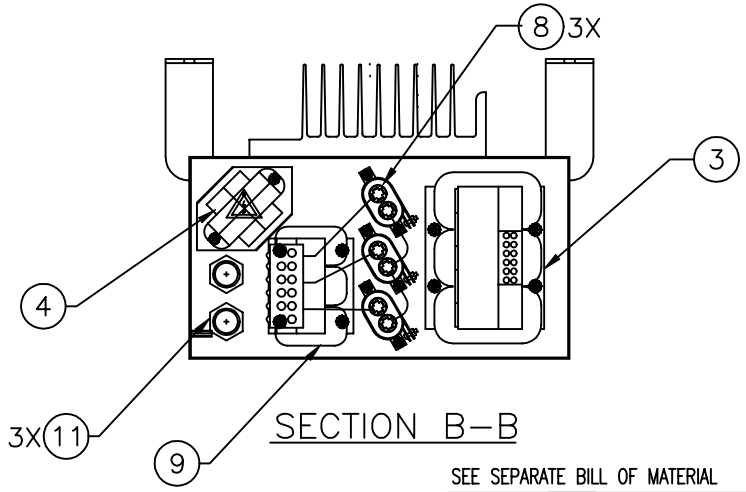
REV	CHANGE	DATE	DRAWN	ENGR.		QLTY.		MFG.
A	ECO-428	06-12-01	GB					



SECTION A–A







SECTION B–B

SEE SEPARATE BILL OF MATERIAL

▼ DENOTES CRITICAL SAFETY APPLICATION
▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION
KCC DENOTES KEY CONTROL CHARACTERISTIC
△ DENOTES REVISION CHANGE

INTERPRET IN ACCORDANCE WITH ANSI Y14.5
BREAK ALL SHARP EDGES
TOLERANCES
EXCEPT AS NOTED
.X= ± .060
.XX= ± .020
.XXX= ± .005
FRACTIONS= ± 1/16
ANGULAR= ± 1/2°
WELDS= ± 1/8
SURFACE FINISH
MACHINE 125 | EXPOSED 1000

ALL DIMENSIONS IN INCHES
DRAWN: G. BELTRAN
DATE: 04-04-01
ENGR:
QLTY:
MFG:

TRACE TECHNOLOGIES

TITLE: ENCLOSURE, CONTROL COMPONENTS, PV-5208

SIZE	SCALE	DWG NO.	REV
C	NONE	151325	A

WT. | SHT 1 OF 1

151325

Trace Technologies PV-20208
Photovoltaic Inverter
Major Parts List

Assembly Description: Main Enclosure, Control Components, PV-5208
Trace Technologies Assembly # 151325

Item #	Qty	Reference Designator	Trace Technologies Part #	Description
1	1		1-151236-01	**Fab, Enclosure**
2	1		1-151237-01	**Assy, Heatsink, 339.88 X 387.35**
3	1	L2	1-150418-01	**Inductor, 1.1MH, 208VAC, 32A**
4	1	T1	1-150437-01	**Transformer, 80VA**
5	1		1-150684-01	**Filter, EMI, 115/250VAC, 2A**
6	1	K1	1-150668-65	**Contactor, 3P, 24VDC Coil, 65A**
7	6		1-151241-01	**Terminal Block, 1P, 24-8 AWG**
8	3	CA, CB, CC	1-150403-01	**Capacitor, NP, 2UF, 600VAC, 6%**
9	1	L1	1-150407-01	**Inductor, .158MH, 240V, 35A**
10	1		1-151320-02	**Assy, PCB**
11	2		1-151199-06	**Conduit, Liquid Tight Connector, Zinc**
12			1-150378-02	**Assy, DSP**

QIKH.E199356

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Photovoltaic Static Inverters

TRACE TECHNOLOGIES CORP
PO BOX 5049
LIVERMORE, CA 94551 USA

February 14, 2001

E199356 (NBK)

Cutoff

Single phase wind turbine converters, Models BWT10240, Gridtec 10.

Three phase utility interactive photovoltaic inverters, Models BP-12U, BP-15U, BP-18U, *PV-5208,* PV-10208, PV-15208, PV-20208.

LOOK FOR LISTING MARK ON PRODUCT

331210004

Page Top LIS Home Page DMS (NK) RTDLS MEDLS SCDLS CADLS

QIKH.GuideInfo
Photovoltaic Static Inverters

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[Photovoltaic Power Systems Equipment] Photovoltaic Static Inverters

Guide Information

This category covers permanently connected static inverters which change dc electric power from photovoltaic arrays to 50/60 Hz ac electric power. They are intended for use in parallel (interactive) with a single-phase electric utility supply or as a stand-alone system.

The static inverters covered by this category are rated up to 600 V dc, input; 10 kW, 120/240 v or less, single-phase output and are intended to be installed in accordance with the National Electrical Code, including Article 690. Static inverters are either provided with dc isolation between the input and output circuits or are marked indicating that the installer is to provide an isolation transformer in the output circuit of the inverters.

The proposed standard "Static Inverters and Charge Controllers for use in Photovoltaic Power Systems" , UL 1741, is used to investigate products in this category.

The Listing Mark of Underwriters Laboratories Inc. on the product is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the name and/or symbol of Underwriters Laboratories Inc. together with the word "LISTED" , a control number and one of the following product names: "Power Conditioning Unit" , "Static Inverter" , "Utility Interactive Inverter" or other appropriate product name.

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333 Pfingsten Road
Northbrook, Illinois 60062-2096
United States Country Code (1)
(847) 272-8800
FAX No. (847) 272-8129
http://www.ul.com

Underwriters Laboratories Inc.®

February 27, 2001

Xantrex / Trace Technologies
Attn: Mr. Kent Sheldon
161-G South Vasco Rd.
Livermore, CA 94550

Our Reference: E199356.

Subject: Models UL Listed to Published First Edition of UL 1741 Standard with January 17, 2001 Revisions.

Dear Mr. Sheldon:

This letter is in regard to the Models BWT10240, Gridtec 10, PV-5208, PV-10208, PV-15208, PV-20208, BP-12U, BP-15U and BP-18U as covered under file E199356, Volume 1, Section 1.

The above models have been evaluated in accordance with and UL Listed to the Standard for Safety for Inverters, Converters, and Controllers for Use in Independent Power Systems, UL1741 including revisions through and including January 17, 2001.

Please contact us with any further questions or concerns.

Sincerely,

Stephen T Gardner
Sr. Project Engineer
Conformity Assessment Services
E-mail: Stephen.T.Gardner@us.ul.com

Reviewed by,

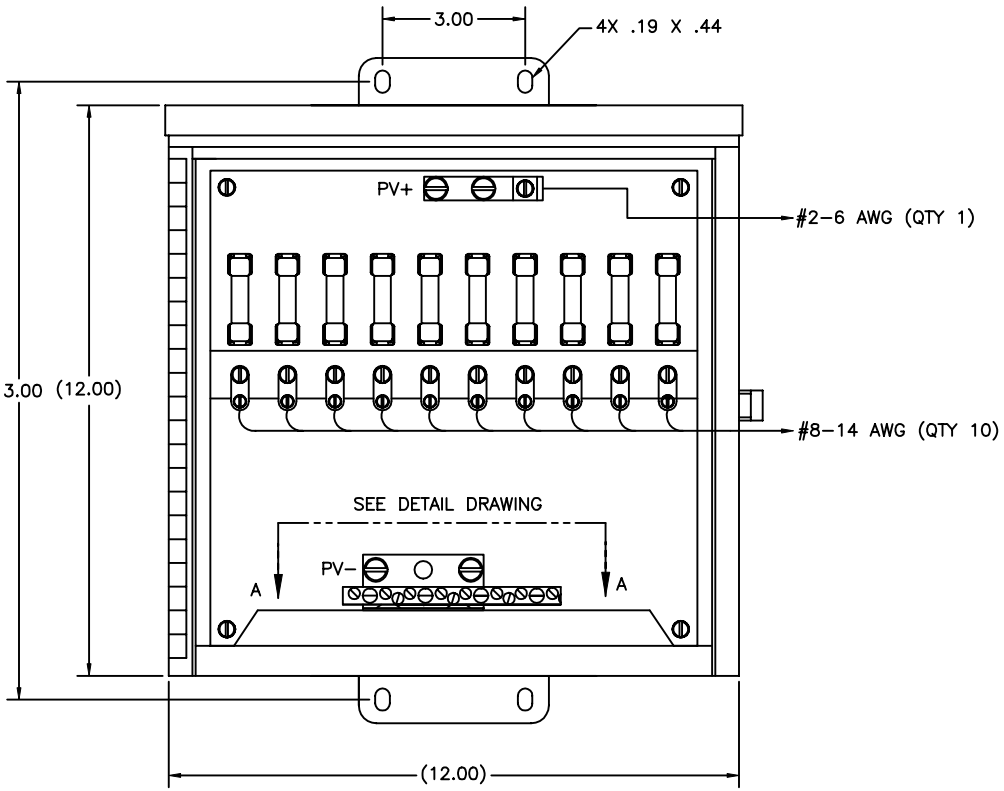
Timothy P. Zgonena
Sr. Project Engineer
Conformity Assessment Services
E-mail: Timothy.P.Zgonena@us.ul.com

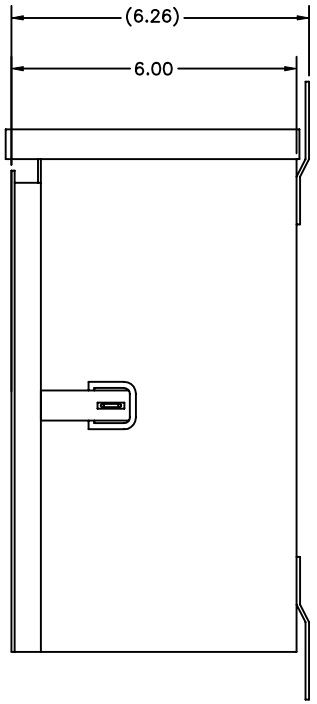
REVISION

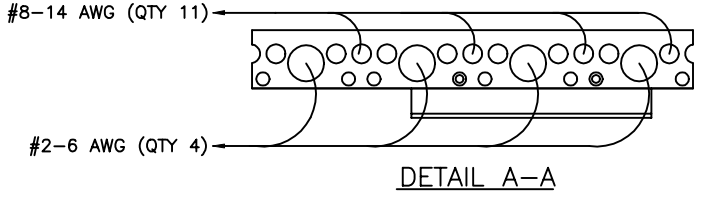
REV	CHANGE	DATE	DRAWN	ENGR.		QLTY.		MFG.
A	ECO-314	09-11-00	GB					
B	ECO-400	04-09-01	GB					

NOTES:

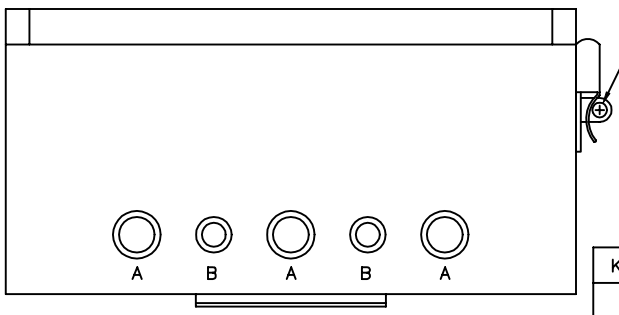
1. ENCLOSURE AND DOOR ARE FABRICATED FROM CODE GAUGE GALVANIAL STEEL. 16 GAUGE (.0598)
2. STANDARDS: UL 50 LISTED, CSA C22.2 NO. 40 CERTIFIED, TYPE 3R CONFORMS TO NEMA STANDARD FOR TYPE 3R, IEC 529, IP32
3. RATINGS: MAX. VOLTAGE RATING – 600 VDC, MAX FUSE SIZE – 20 AMPS
4. WIRE RANGE: SOURCE #8–14 AWG, OUTPUT #2–6 AWG.
5. SUPPLIER: TRACE TECHNOLOGIES, SAN LUIS OBISPO.







DETAIL A–A



KNOCKOUTS	CONDUIT SIZE
A	3/4 OR 1
B	1/2 OR 3/4

▼ DENOTES CRITICAL SAFETY APPLICATION
▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION
KCC DENOTES KEY CONTROL CHARACTERISTIC
⚠ DENOTES REVISION CHANGE

INTERPRET IN ACCORDANCE WITH ANSI Y14.5
BREAK ALL SHARP EDGES
TOLERANCES
EXCEPT AS NOTED
.X= ± .060
.XX= ± .020
.XXX= ± .005
FRACTIONS= ±1/16
ANGULAR= ±1/2°
WELDS= ± 1/8
SURFACE FINISH
MACHINE 125 | EXPOSED 1000

ALL DIMENSIONS IN INCHES

DRAWN:	G. BELTRAN	DATE: 09-11-00
ENGR:		
QLTY:		
MFG:		

1-151258-01 | CB-10H15-3R
PART NUMBER

TRACE TECHNOLOGIES

TITLE: COMBINER BOX, 10 POLE, 600 VDC, NEMA 3R

SIZE	SCALE	DWG NO.	REV
A	NONE	151258	B

WT. | SHT 1 OF 1

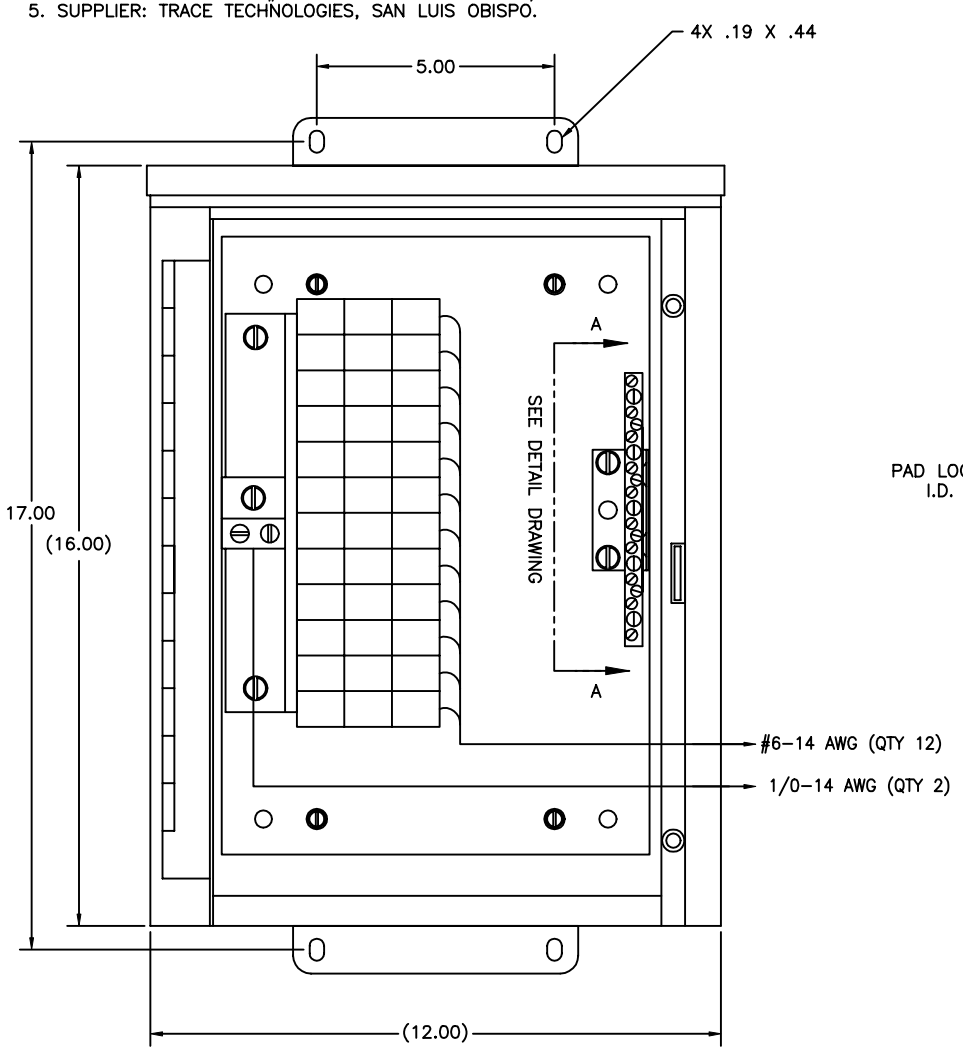
151258 A

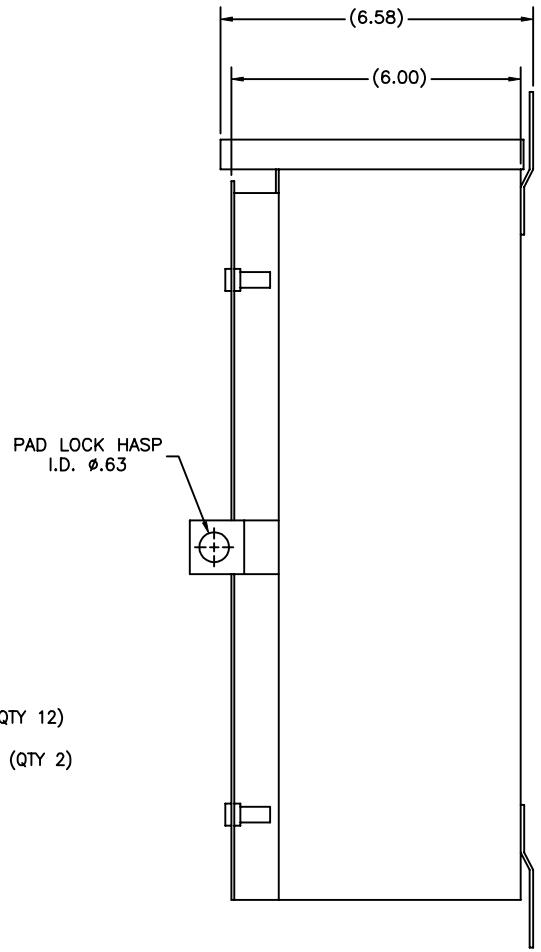
NOTES:

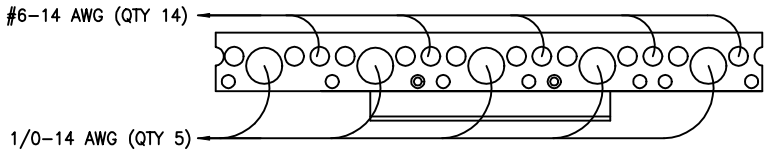
1. ENCLOSURE AND DOOR ARE FABRICATED FROM CODE GAUGE GALVANIAL STEEL. 16 GAUGE (.0598)
2. STANDARDS: UL 50 LISTED, CSA C22.2 NO. 40 CERTIFIED, TYPE 3R CONFORMS TO NEMA STANDARD FOR TYPE 3R, IEC 529, IP32
3. RATINGS: MAX. VOLTAGE RATING – 600 VDC, MAX FUSE SIZE – 20 AMPS
4. WIRE RANGE: SOURCE #6–14 AWG, OUTPUT TWO 1/0–14 AWG.
5. SUPPLIER: TRACE TECHNOLOGIES, SAN LUIS OBISPO.

REVISION

REV	CHANGE	DATE	DRAWN	ENGR.		QLTY.		MFG.
A	ECO–314	09–11–00	GB					
B	ECO–359	01–15–01	GB					







DETAIL A–A

▼ DENOTES CRITICAL SAFETY APPLICATION

▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION

KCC DENOTES KEY CONTROL CHARACTERISTIC

⚠ DENOTES REVISION CHANGE

INTERPRET IN ACCORDANCE WITH ANSI Y14.5
BREAK ALL SHARP EDGES

TOLERANCES
EXCEPT AS NOTED
.X= ± .060
.XX= ± .020
.XXX= ± .005
FRACTIONS= ±1/16
ANGULAR= ±1/2°
WELDS= ± 1/8

SURFACE FINISH
MACHINE 125 | EXPOSED 1000

ALL DIMENSIONS IN INCHES

	DATE:
DRAWN: G. BELTRAN	09–11–00
ENGR:	
QLTY:	
MFG:	

1–151260–01	CB–12H20–3R
	PART NUMBER

TRACE TECHNOLOGIES

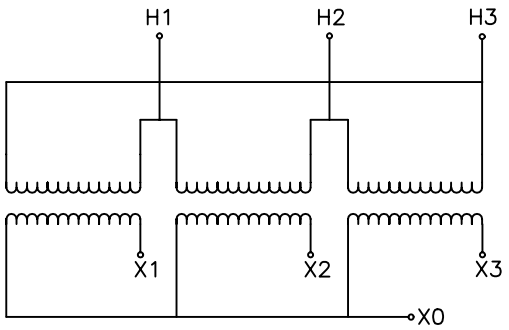
TITLE: COMBINER BOX, 12 POLE, 600 VDC, NEMA 3R

SIZE	SCALE	DWG NO.	REV
A	NONE	151260	B
WT.		SHT 1 OF 1	

A 151260

NOTES:

208 V DELTA PRIMARY

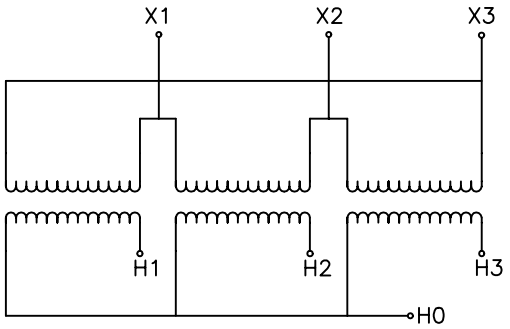


208–120 WYE SECONDARY
CONNECTION DIAGRAM

X1	X2	X3	X0	H1	H2	H3

7 POINTS TB

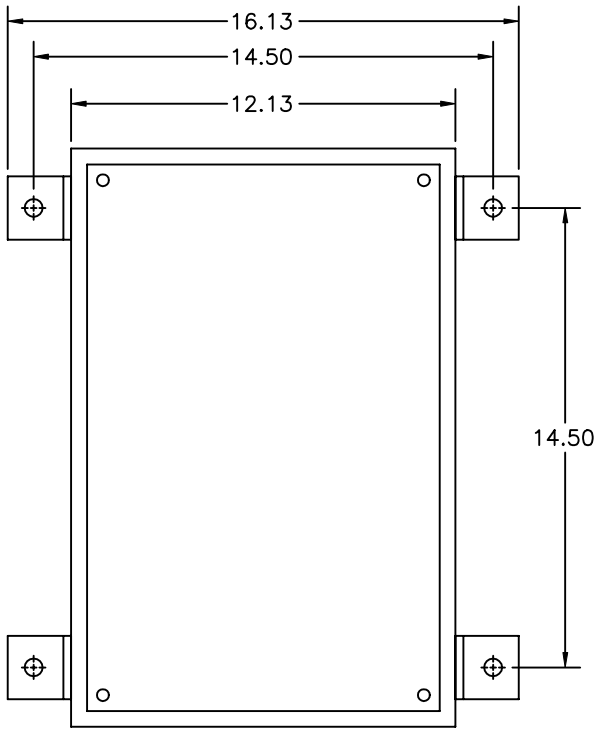
208 V DELTA PRIMARY

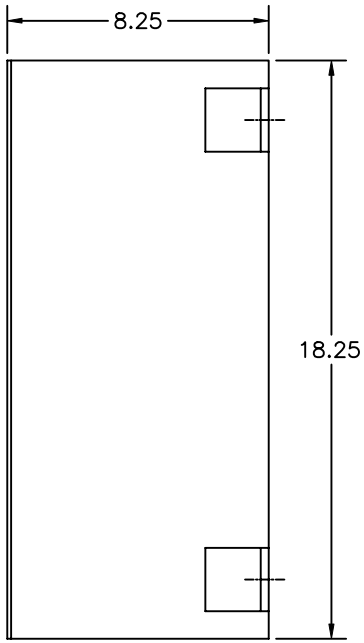


480–277 WYE SECONDARY
CONNECTION DIAGRAM

H1	H2	H3	H0	X1	X2	X3

7 POINTS TB





TYPE	3110		3111	
EFF.	98%		98%	
WEIGHT	130		130	
SECONDARY VOLTAGE	208/120		480/277	
	CORE	COIL	CORE	COIL
LOSSES @ 25% LOAD	50W	4W	50W	4W
LOSSES @ 50% LOAD	50W	13W	50W	13W
LOSSES @ 75% LOAD	50W	29W	50W	29W
LOSSES @ 100% LOAD	50W	50W	50W	50W

▼ DENOTES CRITICAL SAFETY APPLICATION
▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION
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.X= ± .060
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.XXX= ± .005
FRACTIONS= ±1/16
ANGULAR= ±1/2°
WELDS= ± 1/8
SURFACE FINISH
MACHINE 125 | EXPOSED 1000

ALL DIMENSIONS IN INCHES
DRAWN: G. BELTRAN 04-05-01
ENGR:
QLTY:
MFG:
DATE:

TRACE TECHNOLOGIES

TITLE: TRANSFORMER, 5KVA, 3 PHASE 60Hz, 208 DELTA/SECONDARY WYE

SIZE	SCALE	DWG NO.	REV
A	NONE	151266	A
WT.		SHT 2 OF 2	

A 151266