# OPERATION and MAINTENANCE MANUAL

**for**

# MODEL PV-10208

## 10 KW Grid-Tied Photovoltaic Inverter

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**SAVE THESE INSTRUCTIONS** - THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS FOR TRACE TECHNOLOGIES PV-10208 GRID TIED PHOTO-VOLTAIC INVERTER THAT SHALL BE FOLLOWED DURING INSTALLA-TION AND MAINTENANCE OF THE PV-10208.

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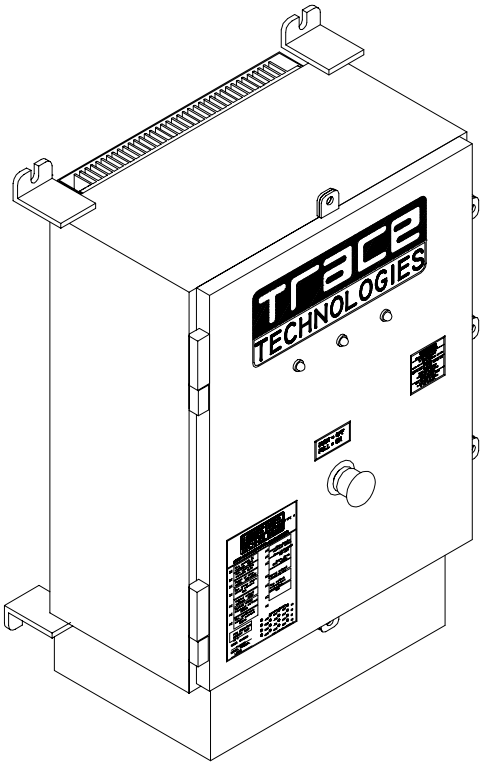


## INTRODUCTION

The Trace Technologies Model PV-10208 is a 10 KW Grid Tied Photovoltaic Inverter. It utilizes advanced power electronics to allow interface of a photovoltaic array with a utility grid. The PV-10208 is a highly integrated assembly, consisting of an inverter bridge and associated control electronics all on a single board. The PV-10208 control software provides for complete overall system control with a variety of protective and safety features.

## MAJOR COMPONENTS

The major components of the PV-10208 are identified in drawing no. 150660.

**Main Enclosure**

The enclosure (**shown in Figure 1-1**) is NEMA-4 rated. The PV-10208 enclosure contains the Integrated Bus Board, output line filter (insuring that the PV-10208 line currents and voltages to meet IEEE-519 harmonic distortion requirements), control power transformers, and A/C contactor (PV-10208 A/C output to the grid). Also found within the enclosure are the system protection devices (control power circuit fuses). The front door of the enclosure contains the operator interface panel (three LED's and an E-STOP switch).

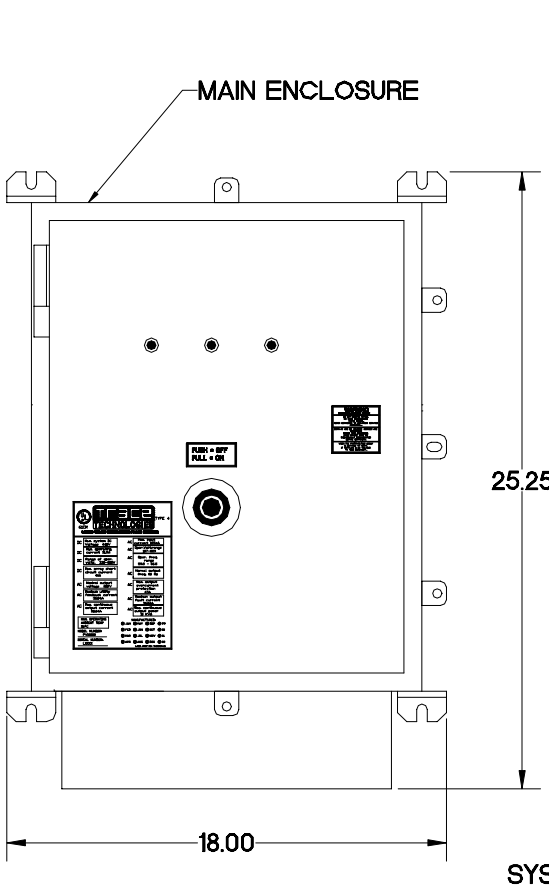



Figure 1-1

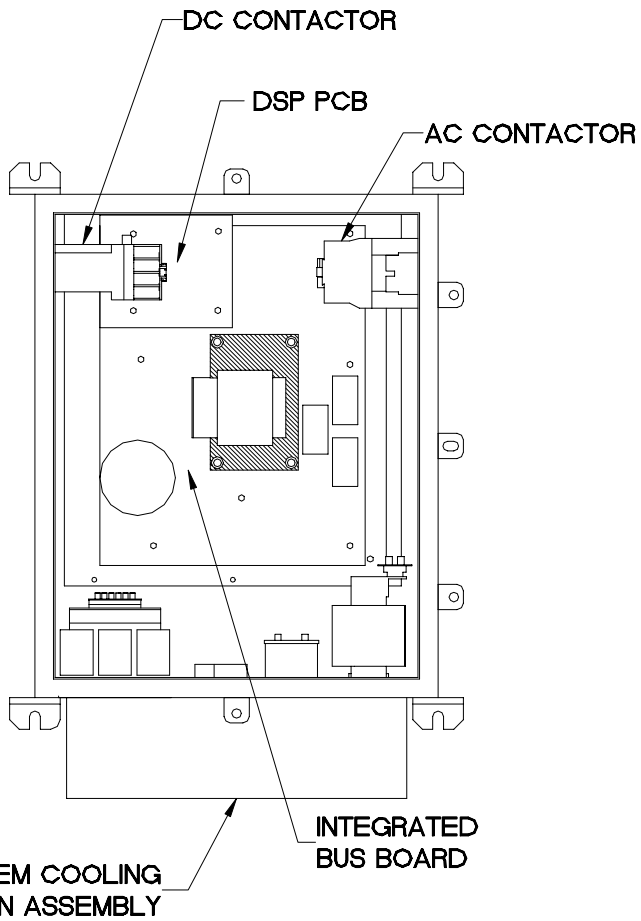



Figure 1-2

| CAUTION |
| --- |
| The fuses within the PV-10208 are intended for protecting the PV-10208 control circuitry only. They are not intended to provide protection for the PV array or external cabling. |

**DC Contactor (Optional)**

The PV-10208 may incorporate an optional DC contactor within the main enclosure. This serves as the connection point between the PV array and the PV-10208. The contactor is controlled by the inverter DSP and is closed only when the inverter is processing power. The contactor remains open when the inverter is not processing power or is shut down due to a fault.

**Integrated Bus Board**

The PV-10208 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 IGBTs), A/C and D/C high voltage measurement, A/C and ground current measurements, contactor and indicator controls, discrete input sensing (E-Stop), 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-10208 electromechanical components and power electronics converters, signal conditioning (digital filtering and transformations), and communication with the operator interface panel 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.

## SPECIFICATIONS

The PV-10208 has been designed for photovoltaic power systems, which operate within the following specifications. Application of the PV-10208 in a manner inconsistent with these specifications may cause damage to the PV-10208 and other system components, and is a violation of the terms of the warranty.

| | |
|---|---|
| Nominal AC Line Voltage | 208vAC, ± 10% |
| Maximum AC Line Current | 30.84a RMS (at low line voltage) |
| Nominal Line Frequency | 60 Hz, ± 0.5 Hz |
| Continuous AC Load | 10.0 KW @ 208 vAC |
| PV Voltage Range | 330-600 VDC |
| PV Maximum Current | 31.9a DC |
| 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) | 25.25 X 18 X 10.5 |
| Weight | 103 lbs. |
| Enclosure Type | NEMA 4 |
| UL Listed | E199356 |

## EQUIPMENT SYMBOL

Chassis ground –Customer supplied system ground connection point

## SAFETY FEATURES

| WARNING |
| --- |
| **The PV-10208 enclosure contains exposed high voltage conductors. The enclosure door 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 open the cabinet door if extreme moisture is present (rain or heavy dew).** |

### Front Panel Indicators

The PV-10208 incorporates three colored LED indicators, used to show the current operating state of the inverter. 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 Emergency Stop Button (see below).
- **Yellow:** 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.

### Emergency Stop Button

The PV-10208 incorporates a maintained position red emergency stop button (E-Stop) located on the front door of the enclosure. Under normal conditions, the E-Stop is in the extended (out) position. Depressing the E-Stop will initiate a controlled shutdown of the PV-10208 and open the main contactor within the unit. The PV-10208 is prevented from being restarted until the E-Stop is returned to the extended position.

### Main Enclosure Door

The front door of the PV-10208 main enclosure is pad lockable. It is recommended that the PV-10208 enclosure door be padlocked during normal operation.

| WARNING |
| --- |
| **The PV-10208 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 door. (Allow 5 minutes for any stored potentials to be discharged, prior to opening the unit). The front door of the PV-10208 main enclosure is pad lockable. It is recommended that the PV-10208 enclosure door be padlocked during normal operation.** |

### Fault Reporting

Any fault conditions reported will illuminate the red indicator light on the front door. Refer to Section 5, Troubleshooting, for detailed descriptions of system fault conditions.

**PV Ground Fault Detection**

The PV-10208 is equipped with ground fault detection circuitry and control. The single point of PV system ground must be routed through CT1 on the main control board (see section 3, installation and section 7, system schematic for further detail). Upon detection of 1.5 amps of ground fault current, the PV-10208 executes an orderly shutdown, and annunciates a ground fault at the operator interface. The PV-10208 will remain faulted until the ground fault is remedied and cleared at the operater interface (see section 5, troubleshooting).

If the optional DC contactor is installed, the contactor will remain opened until the ground fault is cleared.

| WARNING |
| --- |
| **PV current carrying conductors routed through the DC contactor will remain floating when the contactor is open. See contactor on system schematic in Section 7.** |

## ISOLATION PROCEDURE

The following procedure should be followed to de-energize the PV-10208 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-10208.** |

1. Push in the E-stop button.
2. Open the PV array disconnect switch (if present).
3. Open the AC interface disconnect (if present).
4. Open the isolation transformer circuit breaker.
5. Install lockout devices on the isolation transformer circuit breaker and PV disconnect switch (if present).

## ANTI ISLAND PROTECTION

A digital phase-shift-loop (PSL) circuit is implemented in the DSP inverter controller to prevent "Islanding"of the PV-10208.

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-10208 then performs an orderly shutdown.

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

## TORQUE SPECIFICATIONS

The following torque specifications are to be used on all electrical interfaces made during installation of the PV-10208.

| Terminal Block or Bolt Size | Torque Setting (inch lbs.) |
|---|---|
| 1/4-20 | 80 |
| Entrelec M16/12 | 10.6-12.3 |

## 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-10208 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. Use No. 8 AWG, 105 degrees C, minimum, copper wire for all connections with the PV-10208.**

**CAUTION**

**The input and output circuits are isolated from the enclosure. When required, Sections 690-41 and 690-42 of the NEC, ANSI/NFPA 70-1999, is the responsibility of the installer.**

### Ventilation Considerations

1. Maintain a minimum 6”clearance above and below the PV-10208 for proper cooling fan operation.
2. Maintain a minimum 1”clearance to the left and right of the PV-10208.

### 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-10208. Lag bolts should be horizontally level with each other. Leave a minimum of 1”of bolt protruding from the wall.
3. Place the PV-10208 bottom mounting ears (shown in **Figure 3-1a and Figure 3-1b**) onto installed lag bolts.
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 1”liquid tight conduit within shaded areas, shown in **Figure 3-1c**. (See following page.)

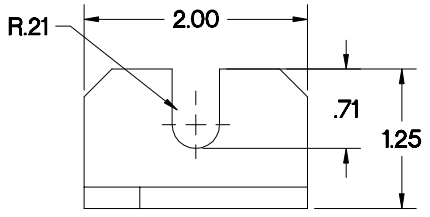



**Figure 3-1a**

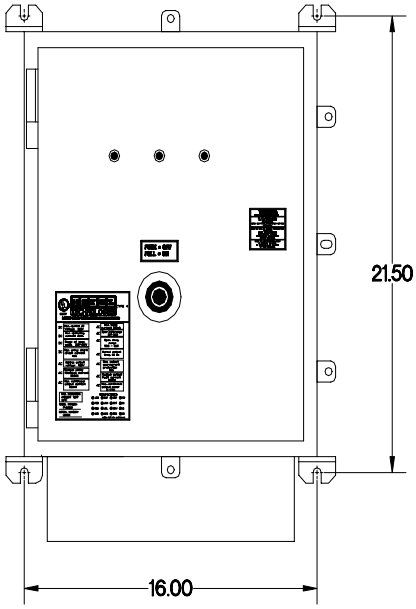



Figure 3-1b

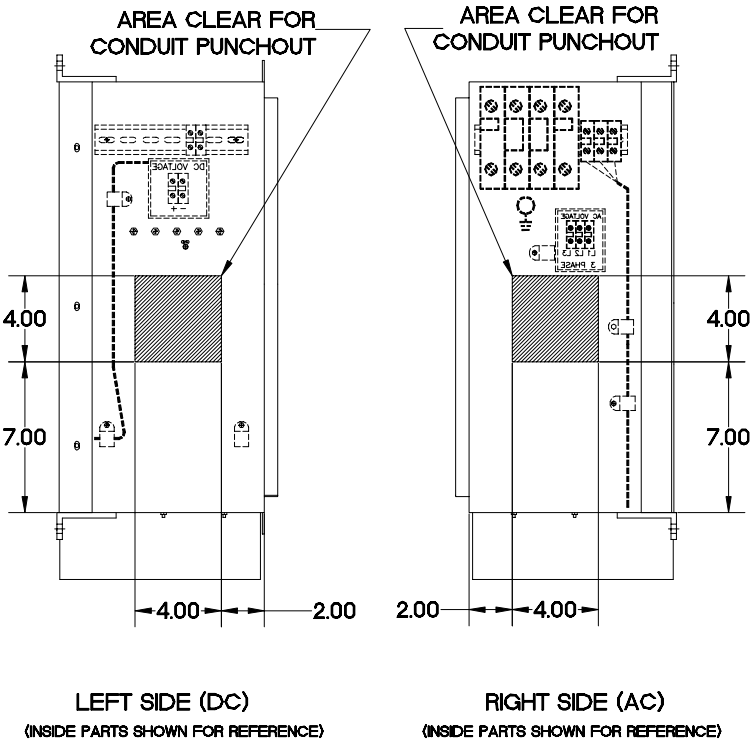



Figure 3-1c

**Isolation Transformer Requirements**

The PV-10208 is required to have an isolation transformer wired between the inverter AC output and the utility interconnection. Any standard dry-type isolation transformer is acceptable as long as the inverter side is rated for 208 VAC and the transformer is rated for a minimum of 10 KVA. **If the inverter is to be connected to the WYE side of an isolation transformer, the neutral must be left floating**. If the neutral is tied to ground the inverter will not function properly. The utility side of the transformer should be rated for the voltage at the point of utility interconnection.

Contact Trace Technologies if you have any questions regarding isolation transformer requirements.

## INTERCONNECTION WIRING

| CAUTION |
| --- |
| **To reduce the risk of fire, connect only to a circuit provided with 45 amperes maximum branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.** |

The following wires for connecting the PV-10208 to external devices are not provided by Trace Technologies:

- 3-Phase 208 VAC inverter output to terminals 1, 2, and 3 to the 208 side of isolation transformer. **If the inverter side of the isolation transformer is configured WYE, the neutral must be left floating. If the inverter side neutral is tied to ground, the inverter will not function properly. Also, insure that this neutral is not bonded to the isolation transformer frame.** Be sure to maintain positive phase sequencing as shown in the system schematic found in Section 7.
- System ground to the isolation transformer chassis ground.
- Isolation transformer grid side terminals 1, 2, and 3 to line circuit breaker (or the AC disconnect switch if present). Be sure to maintain positive phase sequencing as shown in the system schematic found in Section 7.
- PV safety ground to PV enclosure chassis ground stud.
- PV+ to the inverter enclosure terminal block TB1.
- PV- to the inverter enclosure terminal block TB2.

### Array Grounding and Ground Fault Detection

If grounding the PV array is required for monopolar or bipolar arrays, jumper TB2 to a cabinet ground stud. If ground fault detection is required, route through CT1 located on the lower right hand corner of the control board (see the system schematic for further detail). This must be the only point of PV current carrying conductor grounding for the PV-10208 to function properly, and the ground fault detection system to function properly.

**WARNING**

**PV current carrying conductors routed through the DC contactor will remain floating when the contactor is open. See contactor on system schematic in Section 7.**

**CAUTION**

**When connecting external AC wires to the PV-10208, positive phasing sequence must be maintained throughout the installation process. Refer to the System Schematic in Section 7 of this manual for proper phasing convention.**

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

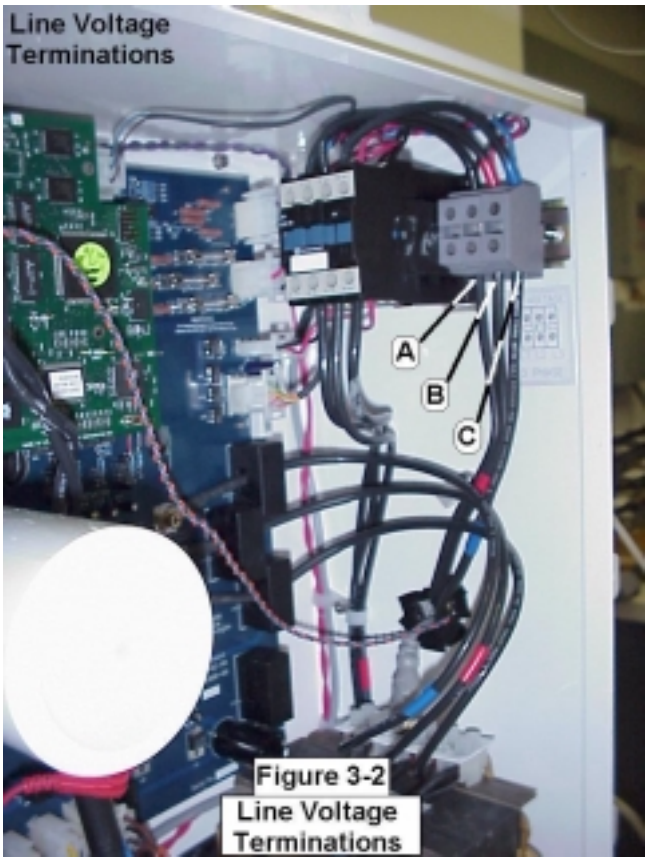



Figure 3-2
Line Voltage Terminations

## INITIAL TURN ON PROCEDURE

The following procedures are intended to verify correct installation and proper operation of the PV-10208. 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.
- If a phase rotation meter is available, verify positive phase rotation at the line side of the isolation transformer circuit breaker.
- 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 208 VAC neutral, the transformer chassis, or ground.
- Verify the inverter 208 VAC conductors are connected to the isolation transformer: phase A-black, phase B-red, and phase C-blue.
- If the wires are marked, verify they follow the sequence on the line side of the isolation transformer circuit breaker.
- Verify the utility conductors are properly connected to the isolation transformer.

**Visual Inspection, PV-10208**

- Insure AC and DC disconnect are opened (if present).
- Insure PV array string disconnect switches are opened (if present).
- Open the door of the enclosure, and inspect.
- 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.
- Verify color coding of the 208 VAC conductors landed at the matrix and AC terminal blocks.

**Visual Inspection, PV Array Wiring**

- Verify the PV+, PV-, PV neutral (if array is bipolar), and PV safety ground are isolated from each other. The PV safety ground should be bonded to the enclosure and separately run to the PV-10208 ground stud. Refer to system schematic in Section 7.
- Verify all PV fuses are installed.
- Verify PV string diodes are wired properly.
- 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).
- If a phase rotation meter is available, verify positive phase rotation at the AC line disconnect (clockwise).
- With the DC disconnect switch opened (if present), close one of the PV array string disconnect switches.

- Carefully measure VDC across the PV +/- terminal block. The value should be the same as at the PV array string disconnect switch. It should also be positive.
- Close the PV disconnect switch.
- Carefully measure VDC across the matrix + and –busses. The value should be the same as at the PV array string disconnect switch. 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.

Figure 3-3
PV Terminations

**System Verification**

- Ensure E-Stop is pulled out.
- Upon applying 208 VAC power to the PV-10208, observe the three indicator lights. The LED's on the front door 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). Once all faults are cleared, the yellow indicator light will come on. The PV-10208 will not operate properly unless there is positive phase rotation. The PV-10208 should not be operated with negative phase rotation.
- Close all PV array string disconnect switches, if present.
- Close the main DC disconnect switch if present.
- If the PV voltage is above the PV Start Voltage setpoint, and the PV Start Time is exceeded, the PV-10208 should transition to 'Power Tracking".
- Depending upon solar conditions, the PV-10208 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.
- The PV-10208 is now fully operational.

**Fine Tuning**

- All PV-10208 operating parameters have been set at the factory, based upon prior experience with PV arrays of various power levels.
- It is recommended that the PV-10208 be watched during Wake-Up and Sleep Test. If the PV-10208 cycles between operating and sleeping at either of these times, the condition setpoints are not set properly. (Refer to Section 4 for a detailed description of PV-10208 state transitions). The PV-10208 should not cycle if the setpoints are set properly.

# DESCRIPTION OF SYSTEM OPERATION

### Operating States

Control software governs the operation of the PV-10208. There are three steady-state operating states.

- **Sleeping:** The yellow light is on. The PCU monitors the status of the PV array and utility grid, waiting until the PV array is available to produce power to the grid.
- **Fault:** The PV-10208 has encountered a fault condition. When this happens, regardless of the PV-10208 state-of-operation, the PV-10208 will stop processing all power and execute an orderly system shutdown. The red light will come on.
- **Power Tracking:** This is the standard operating state of the PV-10208. The PV-10208 maximum power tracker will demand maximum power from the PV array, given sufficient PV irradiance. The green light will come on.

If available PV power is above the maximum allowable power level of the PV-10208, the power tracker will allow PV voltage to rise as needed to maintain output power at rated maximum AC current.

The minimum operating voltage of the PV-10208 is 330 VDC. The power tracker will not track voltage below this point, regardless of the reference voltage setpoint.

### State Descriptions

The user should be aware of the following conditions governing PV-10208 state transitions:

- Utility power must be present for all states of operation.
- Fault states are automatic from any state of operation. A fault will cause the PV-10208 to immediately stop processing all power. The fault condition will turn on the red indicator light.
- The E-stop switch, located on the front door of the PV-10208, must be in the out position for all operating states.

## FRONT PANEL (Standard)

The front panel consists of three indicator lights and an E-stop mushroom head push/pull switch. The E-Stop also serves as the PV-10208 on/off switch. Pushing the E-Stop in will shut the PV-10208 down. Pulling it out will attempt to clear any system faults and allow the inverter to resume normal operation.

## 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-10208 will remain in standby until adequate PV voltage is available. After 5 minutes the PV-10208 will synchronize to the utility grid and begin power tracking the PV array.

The PV-10208 will continue to process power until AC output power falls below the tare losses of the inverter for a period of 5 minutes. The time delay protects the inverter from excessive on/off cycling.

## GENERAL

The PV-10208 will display a fault condition with the red indicator light. All faults will immediately shut down the PV-10208 and await clearance before returning to operation.

In general, the operator should respond to any PV-10208 fault as follows:
1. The source of the fault should be sought by referring to the following specified chart.
2. If the problem cannot be rectified, contact Trace Technologies for assistance or service.

## FAULT CONDITIONS AND TROUBLESHOOTING

**Fault Code Display**

The PVCU can report any one of eight faults by the blinking of the yellow and green LED's on the front panel of the inverter. If a fault is detected, the red LED will light continuously along with the blinking sequence of the yellow and green LED's. The yellow LED will light once, indicating the beginning of the fault code sequence. The green LED will blink X number of times, indicating the type of fault. The following table indicates the fault, and number of blinks, of the green LED for each fault.

## FAULT CLEARING

Once the cause of the fault condition has been corrected, the fault can be cleared with the E-stop switch. First depress and then pull to extend the mushroom head in order to reset the inverter. If a fault is sustained the inverter will not reset, and will continue to report the fault. If a fault is sustained the inverter will not reset, and will continue to report the fault.

**(1) IPM 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) Matrix Over-Temperature**

Possible causes:
- Clogged inlet filter.
- External cooling fan inoperable.
- 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.

| | NUMBER OF FAULT |
|---|---|
| IPM Fault | 1 |
| Over Temperature Fault | 2 |
| Ground Fault | 3 |
| PV OV Fault | 4 |
| Line AC Freq. Low Fault | 5 |
| Line AC Freq. High Fault | 6 |
| AC Volts Low Fault | 7 |
| AC Volts High Fault | 8 |
| Bus OV, HDWR | 9 |
| System Fault | 10 |

**(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. Remove wire and connect to TB2. Run wire from TB2, through CT1, and land at one of the chassis ground studs.
- Inspect the PV array for ground faults.
- CT1 defective: Contact Trace Technologies for assistance or service.

**(4) PV Overvoltage**

The PV voltage has exceeded the maximum-programmed limit.

Check the PV input voltage at the PV disconnect switch. If the voltage is below 600 VDC, restart the PV-10208.

**(5) Line AC Frequency Too Low**

The AC line frequency fell below the minimum programmed limit.

The unit will automatically restart after line has returned to normal limits for 5 minutes.

**(6) Line AC Frequency Too High**

The AC frequency exceeded the maximum-programmed limit.

The unit will automatically restart after line has returned to normal limits for 5 minutes.

**(7) AC Voltage Too Low**

The AC Inverter voltage fell below the minimum programmed limit.

The unit will automatically restart after line has returned to normal limits for 5 minutes.

**(8) AC Voltage Too High**

The inverter controller voltage exceeded the maximum-programmed limit.

The unit will automatically restart after line has returned to normal limits for 5 minutes.

**(9) DC Bus OV Fault**

The DC bus voltage has exceeded the maximum limit.

This is also the PV array voltage if the DC contactor shown in the system schematic is not present. Check the PV input voltage at the PV disconnect switch. If the voltage is below 600 VDC, restart the PV-10208.

**(10) System Fault**

There has been an internal system fault.

Contact Trace Technologies.

### E-Stop Switch Engaged

The Emergency Stop Button, located on the front door of the enclosure is depressed. The contact block on the back of the switch must be open for the PCU to register a fault.

If the switch is extended and the red indicator light is still on, isolate the PV-10208 from external power, then:

- Verify continuity across the switch contact block.
- Verify continuity between P7-1 and P7-2.

Trace Technologies recommends that the following preventative maintenance be carried out on the PV-10208:

## *Monthly intervals or as required:*

**Aluminum Extrusion Heatsink**

Accumulation of dirt and debris on the aluminum extrusion heatsink decreases its ability to transfer heat, which can cause the PV-10208 to shutdown on over-temperature alarms. Inspect the aluminum extrusion heatsink for accumulation of dirt. Clean if debris is present.

**Fan Operation**

Verify proper operation of the heatsink cooling fan, located within the shroud below the enclosure. It operates when the K1 contactor is closed. Remove any debris from the fan and filter.

## *Six month intervals:*

**Enclosure Seals**

Inspect the enclosure door seal and replace if damaged.

**Electrical Connections**

Inspect the condition of all cables interfacing to the PV-10208. Inspect all wire crimps and connections for damage caused from high temperature. Check for corrosion. Replace any damaged wires. Verify all connections are sufficiently tightened.

**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-10208 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-10208.** |

1. Push in the E-stop button.
2. Open the PV array disconnect switch (if present).
3. Open the AC disconnect (if present).
4. Open the isolation transformer circuit breaker.
5. 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).
5. Pull the E-stop switch out.

After a 15 second initialization period, the PV-10208 will automatically transition to "Waking Up", given the PV voltage is greater than the PV start volts setpoint.

150474 Rev C : Schematic, System, Grid Tied PV Inverter, PV Series

150660 Rev A : Assembly, Main Enclosure, Control Components, 10 KVA, PV-10208
Table of Components

150661 Rev A : Envelope Drawing, Grid Tied Inverter, PV-10208

Underwriters Laboratories Listing Document, October 26, 1999

Accessories

NOTES:

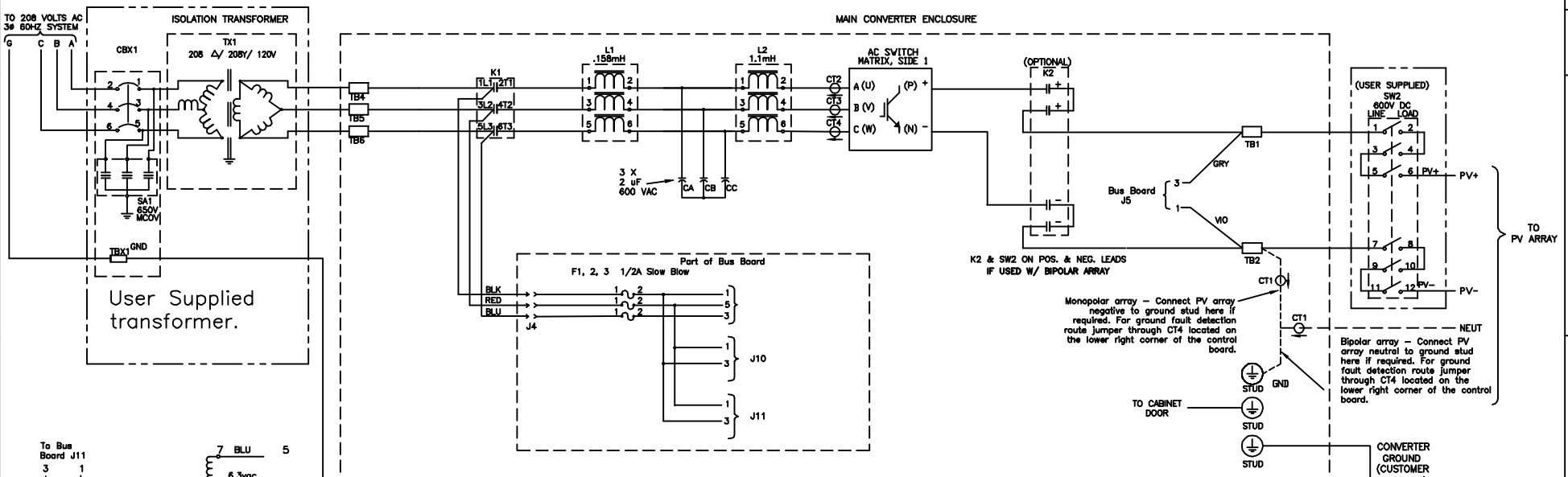


REVISION

| REV | ECO NUMBER | DATE | DRAWN | CHKD | ISSUED | MECH | ELEC | QUALITY | MFG | STRESS |
|---|---|---|---|---|---|---|---|---|---|---|
| A | ECO-134 | 8/4/99 | CRF | | | | | | | |
| B | ECO-170 | 11/4/99 | KGS | | | | | | | |
| C | ECO-176 | 1/17/00 | GB | | | | | | | |

D 150474

## MAIN POWER DISTRIBUTION




| | | | |
|---|---|---|---|
| ▼ | DENOTES CRITICAL SAFETY APPLICATION | ALL DIMENSIONS IN INCHES | DATE: |
| ▽ | DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION | DRAWN: MED | 3/31/99 |
| KEY | DENOTES KEY CHARACTERISTIC | CHECKED: | |
| ⚠ | DENOTES REVISION CHANGE | ISSUED: | |
| | | MECH: | |
| | | ELEC: | |
| | | Q.C.: | |
| | | MFG: | |
| | | STRESS: | |

TRACE TECHNOLOGIES

TITLE: DOC, SCHEMATIC, PV 208 SERIES

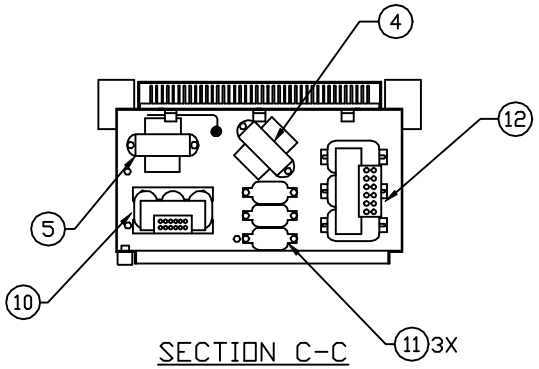
SIZE D | SCALE NONE | DWG NO. 150474 | REV C

SHT 1 OF 1

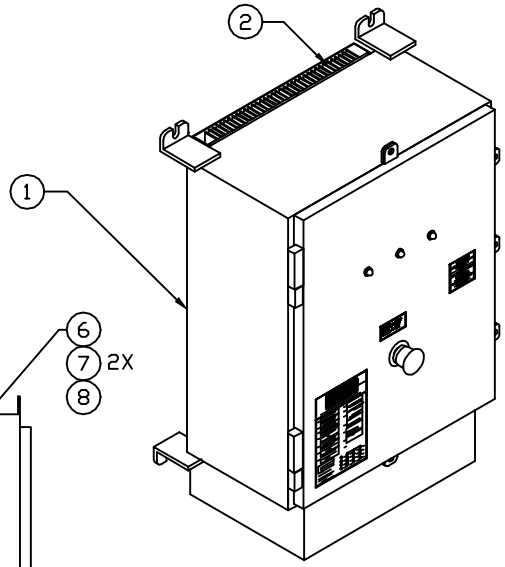
REVISION

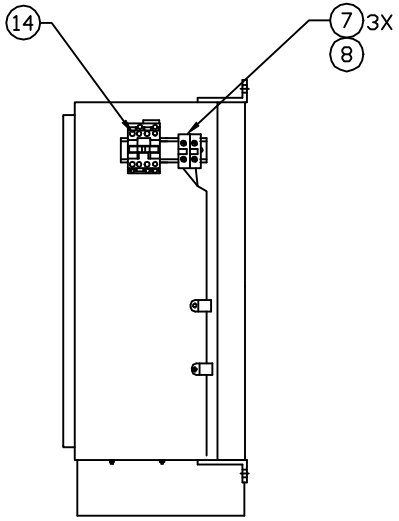
| REV | CHANGE | DATE | DRAWN | ENGR. | | QLTY. | | MFG. |
|---|---|---|---|---|---|---|---|---|
| A | ECO-159 | 9/1/99 | A | | | | | |

150660

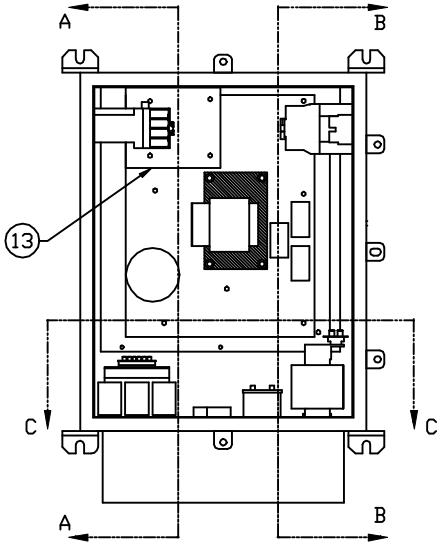


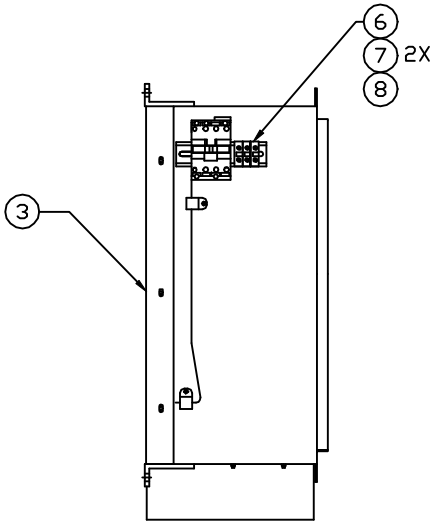

SECTION C-C



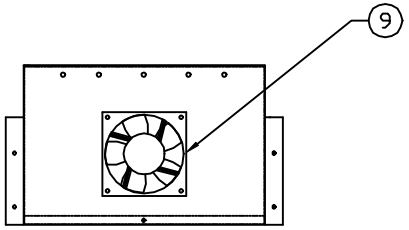




SECTION A-A




SECTION B-B




| | | | |
|---|---|---|---|
| ▼ DENOTES CRITICAL SAFETY APPLICATION | INTERPRET IN ACCORDANCE WITH ANSI Y14.5 | ALL DIMENSIONS IN INCHES | DATE: |
| ▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION | BREAK ALL SHARP EDGES | DRAWN: G. BELTRAN | 9/1/99 |
| KCC DENOTES KEY CONTROL CHARACTERISTIC | TOLERANCES EXCEPT AS NOTED .X= ± .050 .XX= ± .020 .XXX= ± .005 FRACTIONS= ±1/16 ANGULAR= ±1/2° WELDS= ±1/8 | ENGR: | |
| ⚠ DENOTES REVISION CHANGE | SURFACE FINISH MACHINE 125 EXPOSED 1000 | QLTY: | |
| | | MFG: | |

TRANE TECHNOLOGIES

TITLE: MAIN ENCLOSURE, CONTROL COMPONENTS, PV-10208

| SIZE | SCALE | DWG NO. | REV |
|---|---|---|---|
| C | NONE | 150660 | A |

WT. SHT 1 OF 2

**Trace Technologies PV-GTI**
**Photovoltaic Inverter**
**Major Parts List**

**Assembly Description: Main Enclosure, Control Components, PV-10208**
**Trace Technologies Assembly # 150660**

| Item # | Qty | Reference Designator | Trace Technologies Part # | Description | Manfacturer | Manufacturer Part # |
|---|---|---|---|---|---|---|
| **1** | 1 | | 1-150402-01 | **Fab, Enclosure** | | |
| **2** | 1 | | 1-150454-01 | **Heatsink, 13.312 X 15.25** | | |
| **3** | 1 | | 1-150441-01 | **Fab, Fan Shroud** | | |
| **4** | 1 | T1 | 1-150438-01 | **Transformer, 80VA** | MCI Trans. Corp. | 4-47-8618 |
| **5** | 1 | T2 | 1-150446-01 | **Transformer, 40VA** | MCI Trans. Corp. | 2-51-4024 |
| **6** | 1 | K1 | 1-150412-01 | **Contactor, 3P, 24VDC Coil** | Square D | LP1D1810 |
| **7** | 5 | TB1, 2, 4-6 | 1-150410-01 | **Terminal Block, 1P, 12-8 AWG** | Square D | 9080M1612G |
| **8** | 2 | | 1-150411-01 | **Barrier Block** | Square D | 9080MFEM12 |
| **9** | 1 | | 1-150442-01 | **Fan, 24VDC, 4", 118CFM, 44DB** | Nidec | B33534-10A |
| **10** | 1 | L2 | 1-150418-01 | **Inductor, 1.1mH, 208VAC, 32A, 15KHZ** | Marelco | M20039 |
| **11** | 3 | CA, CB, CC | 1-150403-01 | **Capacitor, NP, 2UF, 600VAC, 6%** | General Electric | 97F8241S |
| **12** | 1 | L1 | 1-150407-01 | **Inductor, 240V, .158mH, 35A** | Marelco | M-9090 |
| **13** | 1 | | 1-150421-01 | **Assy, PCB, DSP** | | |
| **14** | 1 | K2 | | **(Optional) DC Contactor** | | |

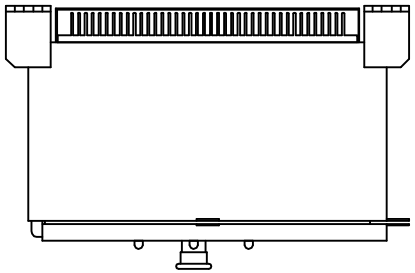
REVISION

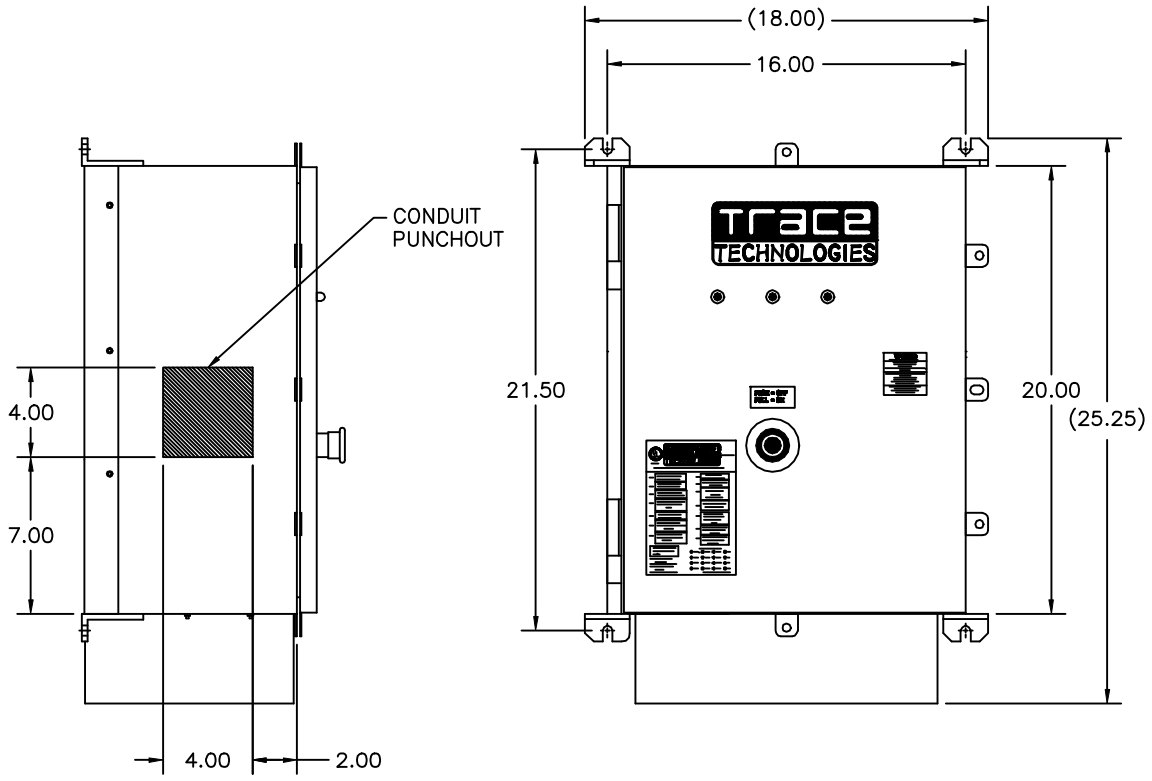
| REV | CHANGE | DATE | DRAWN | ENGR. | | QLTY. | | MFG. |
|---|---|---|---|---|---|---|---|---|
| A | ECO-159 | 9/29/99 | GB | | | | | |

150661

NOTES

WEIGHT: APPROX. 103 LBS






▼ 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= ± .050
.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 | 9/29/99 |
| ENGR: | |
| QLTY: | |
| MFG: | |

TRACE TECHNOLOGIES

TITLE: ENVELOPE, GRID TIED INVERTER, PV-10208

| SIZE | SCALE | DWG NO. | REV |
|---|---|---|---|
| C | NONE | 150661 | A |

WT. | SHT 1 OF 1

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FAX No. (847) 272-8129
http://www.ul.com



File E199356 Vol 1 Issued 06/22/1999
Revised 10/26/1999

**FOLLOW-UP SERVICE PROCEDURE**
**(TYPE R)**

PHOTOVOLTAIC STATIC INVERTERS
(QIKH)

Manufacturer: (331210-005)
TRACE TECHNOLOGIES CORP
161-G S VASCO RD
LIVERMORE CA 94550

Applicant: (331210-004)
TRACE TECHNOLOGIES CORP
PO BOX 5049
LIVERMORE CA 94551

Listee: (331210-004)
SAME AS APPLICANT

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Robert H. Levine
Sr. Vice President and
Chief U.S. Operations Officer

A