Sun Tie Inverter

ST1000, ST1500, ST2000 and ST2500

Installation and Operator's Manual

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Sun Tie Inverter
ST1000, ST1500, ST2000 and ST2500
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Disclaimer of Liability

Since the use of this manual and the conditions or methods of installation, operation, use and maintenance of the unit are beyond the control of Trace Engineering, Trace Engineering does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or any way connected with such installation, operation, use, or maintenance.

IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of this product.

To reduce the risk of electrical shock, and to ensure the safe installation and operation of this product,the following safety symbols have been placed throughout this manual to indicate dangerous conditions and important safety instructions.

WARNING - A dangerous voltage or condition exists in this area.
Use extreme caution when performing these tasks.

AVERTISSEMENT - Une tension ou condition dangereuse existe dans cette zone.
Faire preuve d'extrême prudence lors de la réalisation de ces tâches.

CAUTION - This procedure is critical to the safe installation or operation of the unit. Follow these instructions closely.

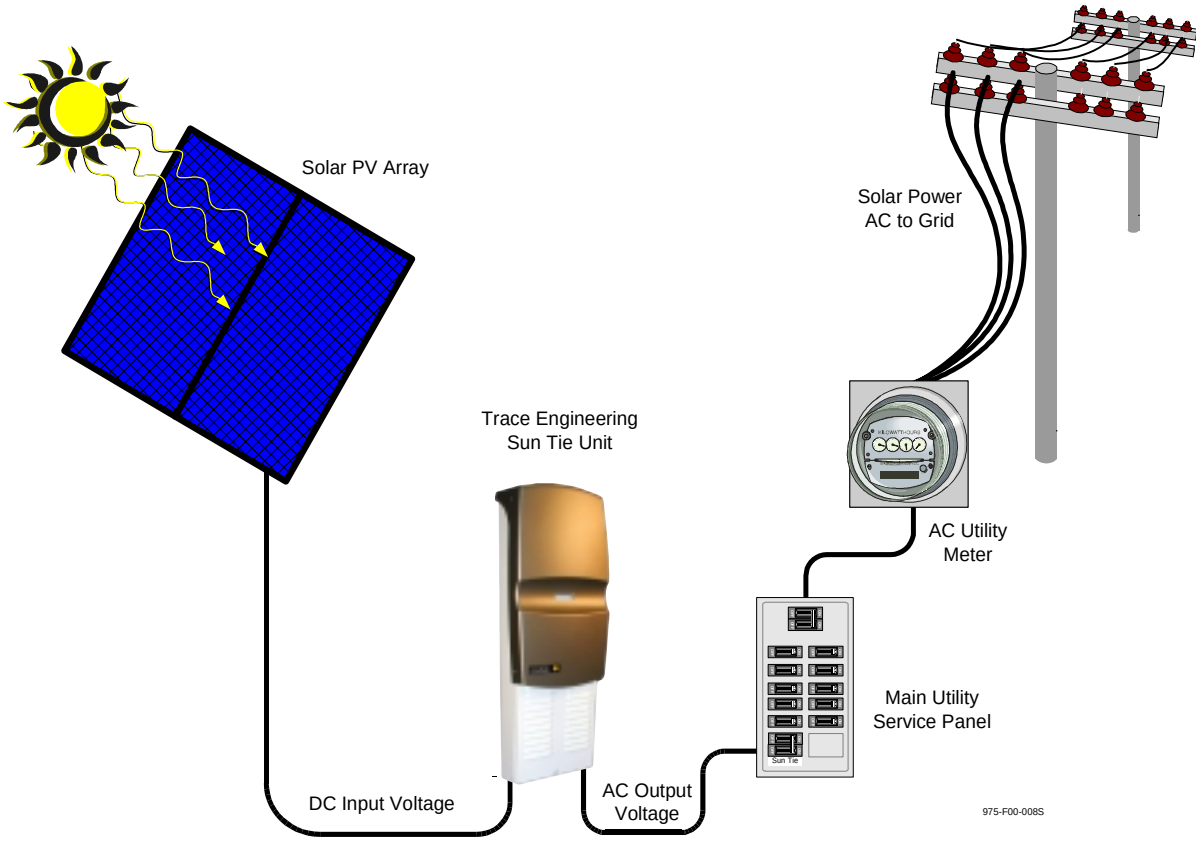
ATTENTION - Cette procédure est essentielle à l'installation ou l'utilisation de l'unité en toute sécurité. Suivre ces instructions de près.

NOTE - This statement is important. Follow instructions closely.

NOTE - Cette déclaration est importante. Suivre les instructions de près.

- All electrical work must be done in accordance with local and national electrical codes.
- Before installing or using this device, read all instructions and cautionary markings located in (or on) the manual, the inverter and the PV array.
- Do not expose this unit to rain, snow or liquids of any type without the rain/weather shield hood installed (optional on some models).
- To reduce the chance of short-circuits when installing or working with the inverter or the PV array, use insulated tools.
- Remove all jewelry such as rings, bracelets, necklaces, etc., while installing this system. This will greatly reduce the chance of accidental exposure to live circuits.
- The ST unit contains more than one live circuit (PV array and AC line). Power may be present at more than one source even when the circuit breakers are off.
- This product contains no user serviceable parts. Return the unit to a Trace Authorized Service Center for maintenance.
- Wiring to the utility should only be done after receiving prior approval from the utility company and performed only by qualified personnel.
- Completely cover the surface of all PV arrays with an opaque (dark) material BEFORE wiring them. PV arrays produce electrical energy when exposed to light, and could create a hazardous condition.

SAVE THESE INSTRUCTIONS



NOTE: This is a one line drawing intended as a system overview only. System grounding and other electrical details are not incluced.

1.0 INTRODUCTION

The Trace Engineering Sun Tie (ST) solar power conversion center is designed to convert a home or business into a “green” power generating station. The ST unit converts solar electric (PV) power into utility grade electricity which can be used by the home, or sold to the power company. Installing an ST unit is as simple as mounting it to the wall and connecting a DC source (PV array), and the AC output to the utility.

Standard Features

All-in-one Design

All necessary DC input and AC output connections, disconnects and circuit breakers are housed within the ST’s easily installed, compact enclosure. A built-in LCD panel provides easy-to-read system status and daily cumulative energy production information.

Uses Most Types of PV Technology

The ST is designed to take advantage of all types of solar electric technologies. The inverter allows up to 120 VDC open circuit PV modules to be used so both conventional crystalline and newer thin film PV modules can be used.

Maximum Power Point Tracking

The inverter performs a “power sweep” every minute adjusting array voltage and current, maximizing PV power generation. Maximum Power Point Tracking (MPPT) ensures the system produces as much AC power as possible under any light condition. MPPT operates between 52-85 volts DC for full rated output power.

High Efficiency and Long Life

The high frequency, solid-state design of the ST inverter is extremely efficient. When array output is over 500 watts, the inversion process is over 90% efficient (peak efficiencies of 94% can be reached). The ST inverter has a design life of over twenty years (the life of a PV array).

Expandable

ST inverters may be connected in a parallel configuration for increasing net metering capacity. The modular expendability of the ST Series allows for system growth.

UL Listed

The ST has complete on-board islanding protection and meets safety operating standards and code requirements world wide. In the North Americia, it is UL listed (UL 1741-1999) and cUL listed to CSA C22.2 No. 107.1-95. NEC 690 building code requirements for PV may be met with the optional ground fault protection (GFP).

Options

These features are included on some models:

- PV array combiner board with six PV 20 amp max. protected inputs
- PV array Ground Fault Protection PV-GFP
- SOV type surge/lightning arrestor for AC/DC surge protection

2.0 INSTALLATION

Pre-Installation

Before installing the Trace ST unit, read all instructions and cautionary markings located in this manual, on the PV array and on the main service panel.

NOTE: The Trace ST weighs approximately 35 pounds (depending upon configuration and model). Always use proper lifting techniques during installation to prevent personal injury.

Mounting:

The Trace ST unit can be mounted outdoors with the optional rainshield (**STRS**).

Tools required:

Phillips screw drivers	Level
Slotted screw drivers	Wire strippers
open-end wrenches	Torque wrench
Socket wrench and fittings	Electrical tape
Multimeter (true rms)	Pencil
Frequency counter (optional)	Utility knife

Hardware/Materials required:

Wood screws and washers (supplied)
Conduit and appropriate fittings
Anchors for screws (material dependent)

AC Connections:

The inverter's AC output breakers accept wire sizes from #1-14 AWG. Refer to the table below for minimum recommended wire size.

Inverter Model	AC Amps Output per leg	NEC Amps per Leg (Amps *125%)	Minimum Wire Size for Specified Distance		
			0–50 Ft One Way	50–100 Ft One Way	100–200 Ft One Way
ST1000	4.2	5.3	14 AWG	12 AWG	10 AWG
ST1500	6.3	7.9	14 AWG	10 AWG	8 AWG
ST2000	8.3	10.4	14 AWG	10 AWG	6 AWG
ST2500	10.4	13.0	12 AWG	8 AWG	6 AWG

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Table 1
Recommended Minimum AC Wire Sizes

NOTE: These are the minimum recommended wire sizes in conduit. Installing a large number of wires in conduit or enclosed locations may require larger wire sizes. Consult your local/national electrical code for the proper wire size in enclosed locations.

DC Connections:

DC connections are made on the terminal block on the combiner board or at the DC terminal block on models without the combiner board. The terminal block accepts wire sizes from #6–14 AWG. Refer to the table below for minimum recommended wire sizes.

DC Amps (from PV array)	NEC Amp (Amps x 156%)	Minimum Wire Size for Specified Distance		
		0–25 Ft One Way	25–50 Ft One Way	50–100 Ft One Way
1.0	1.6	14 AWG	14 AWG	14 AWG
3.0	4.7	14 AWG	12 AWG	10 AWG
5.0	7.8	12 AWG	10 AWG	6 AWG
7.0	10.9	12 AWG	8 AWG	6 AWG
9.0	14.0	10 AWG	8 AWG	Not Recommended
11.0	17.2	10 AWG	6 AWG	Not Recommended

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Table 2
Recommended Minimum DC Wire Sizes

NOTE: These are the minimum recommended wire sizes. Installing a large number of wires in conduit or enclosed locations may require larger wire sizes. Consult your local/national electrical code for the proper wire size in enclosed locations.

Grounding:

AC Grounding

The Trace ST unit should be connected to a grounded, permanent wiring system.

DC Grounding

The negative PV conductor should be bonded to the grounding system at only one point in the system. The size for the conductor is usually based on the size of the largest conductor in the DC system. Negative/ground bonding is accomplished by factory wired PVGFP breakers (when this option is installed) or a factory installed grounding block (when PVGFP is not installed).

PV Arrays:

The ST unit is optimized to work with 4-each, 12 volt nominal crystalline PV modules in series, or a various combinations of amorphous, thin film PV modules. Ensure the PV array used in the system operates within the MPPT operational window.

The solar array connected to the ST Series inverter should have a minimum of 70 volts DC open-circuit in full sunlight conditions. Polycrystalline solar arrays configured for 48 volts DC nominal will have a open-circuit voltage in the area of 84 volts DC in full sunlight. The maximum peak power tracking (MPPT) software controls the output of the solar modules, under loaded conditions, in the 52-85 volts DC range. Other array voltage will either not operate the inverter or will not allow maximum harvest of the sun's energy.

WARNING: WHENEVER A PV ARRAY IS EXPOSED TO SUNLIGHT, A SHOCK HAZARD EXISTS AT THE OUTPUT CABLES OR EXPOSED TERMINALS. TO REDUCE THE RISK OF SHOCK DURING INSTALLATION, COVER THE ARRAY WITH AN OPAQUE (DARK) MATERIAL BEFORE MAKING ANY CONNECTIONS.

2.0 INSTALLATION

AC Circuit Breakers:

The main service panel must dedicate a 15 amp minimum, double pole breaker (120/240 volts AC) to operate the ST unit.

Wire Routing:

Determine all wire routes both to and from the Sun Tie. Possible routing considerations include:

- AC input wiring from the main service panel to the ST
- DC input wiring from the PV array to the ST
- DC ground from the PV array to an external ground rod
- All wiring and installation methods should conform to applicable electrical and building codes.
- Pre-plan the wire and conduit runs. The DC terminal blocks accept up to a #6 AWG wire; the AC circuit disconnects accept cable sizes up to #1 AWG.
- For maximum safety, run both AC and DC wires/cables in (separate) conduits.

WARNING: CHECK FOR EXISTING ELECTRICAL OR PLUMBING PRIOR TO DRILLING HOLES IN THE WALLS!

Mounting:

The ST unit must be mounted to a flat, vertical surface such as wallboard or wood siding. Installation onto wallboard or concrete requires the use of anchors to properly hold the screws. Outdoor installation requires the use of the optional rain shield (STRS) to prevent water from entering the unit.

WARNING: DO NOT INSTALL THE SUN TIE UNIT OUTDOORS WITHOUT THE RAINSHIELD HOOD. WATER ENTERING THE UNIT COULD CAUSE A DANGEROUS CONDITION AND CAUSE THE UNIT TO FAIL. FAILURES DUE TO IMPROPER INSTALLATION WILL VOID THE WARRANTY.

Procedure

WARNING: BEFORE DRILLING HOLES TO MOUNT THE SUN TIE, ENSURE THERE ARE NO ELECTRICAL WIRES OR PLUMBING IN THIS AREA. SINCE THIS UNIT IS INSTALLED CLOSE TO THE UTILITY ENTRANCE OR METER, THERE MAY BE A HIGH CONCENTRATION OF ELECTRICAL WIRES IN THE AREA.

1. Locate the area where the ST is to be installed. It should be as close to the utility service panel as possible. The bottom of the unit must be at least 36 inches from the floor or ground when mounted.

2. Using a level, place the mounting bracket up to the wall (in a horizontal position) and mark the area for the three screws (Figure 1A).

3. If required, remove the bracket and drill the holes using a #10 (0.193 inch diameter) drill bit. Drill appropriately sized holes for anchors when installing on non-wood surfaces.

4. Mount the bracket to the wall using the screws and washers provided. If mounting to other than a wood wall or surface, use appropriate screws and anchors if required.

5. Place the Sun Tie's rear lip, located on the back top of the enclosure, over the bracket and ensure it is seated properly (Figure 1B).

6. Remove the lower external cover to access the internal circuit breaker panel by removing the screw on each side of the cover (Figure 2).

7. Remove the internal breaker panel by removing the screws in the breakers and two screws from the underside of the unit, then lifting until the lower locking tabs are free, then gently pull the inner cover outward (Figure 3). Save the screws for reinstallation.

8. After the unit is correctly seated on the upper bracket, locate the two screw holes on the bottom (back) area of the enclosure and mark these locations on the wall (Figures 1B and 4). Remove the ST (if required).

9. Drill two pilot holes (as above, if required).

10. Reinstall the ST, to the bracket and secure the bottom of the unit with the wood screws and washers provided (or appropriate screws and anchors for non-wood surfaces) and tighten (Figures 1B and 4).

NOTE: Mounting hardware for surfaces other than wood is not supplied.

Mounting: (continued)

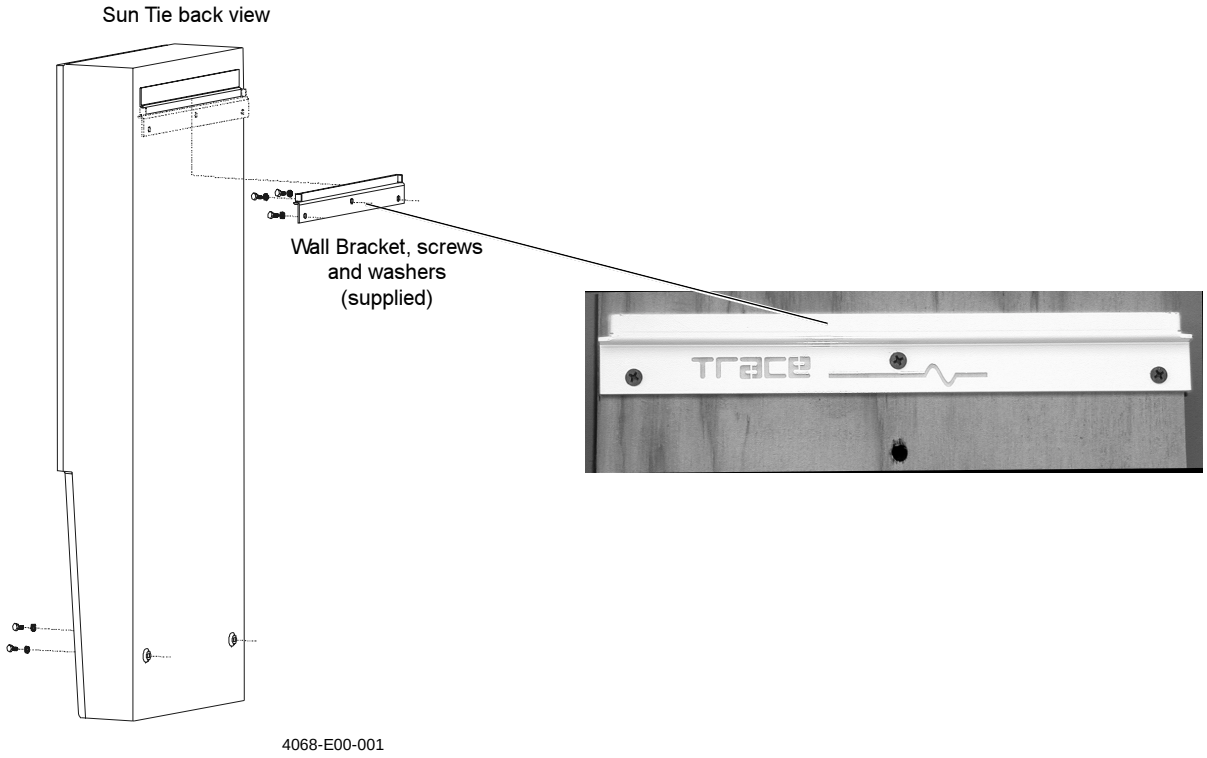

Figure 1A
Bracket Mounting

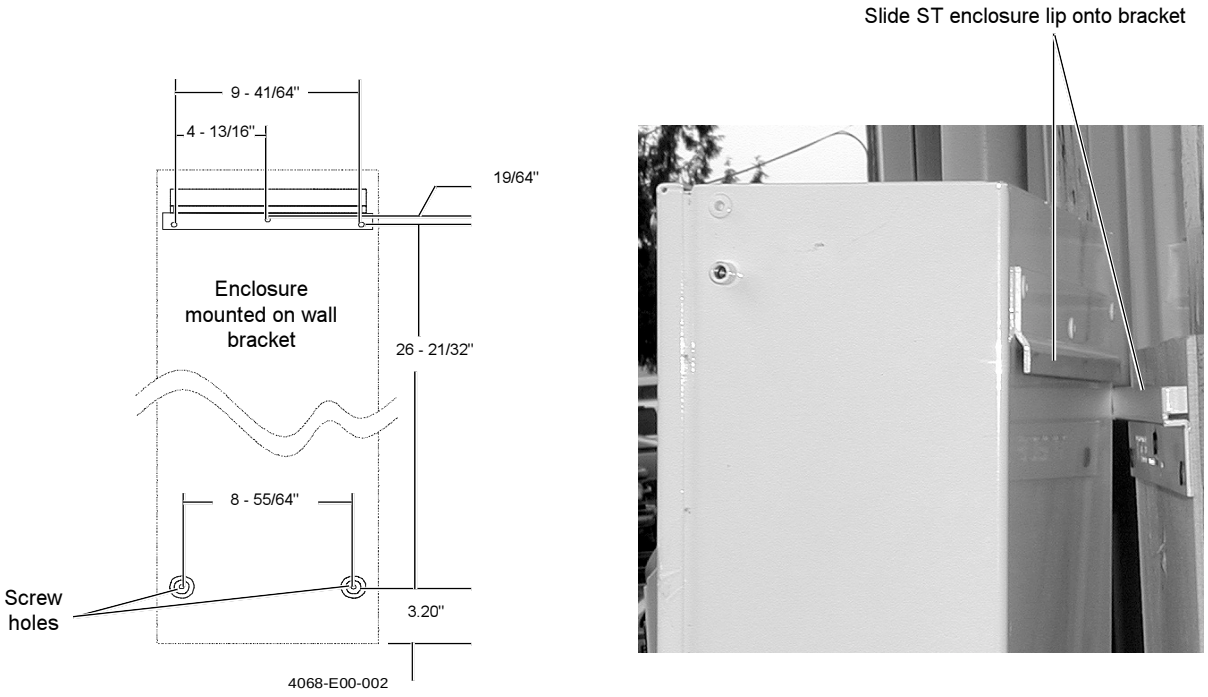

Figure 1B
Enclosure Mounting

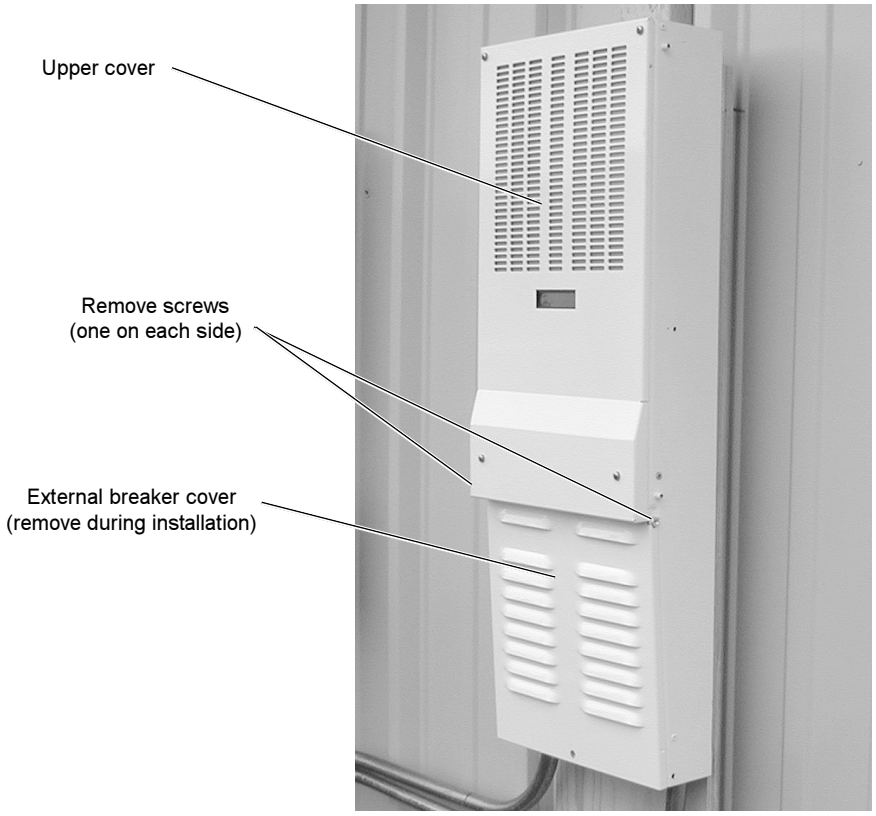

Figure 2
Outer Cover Components

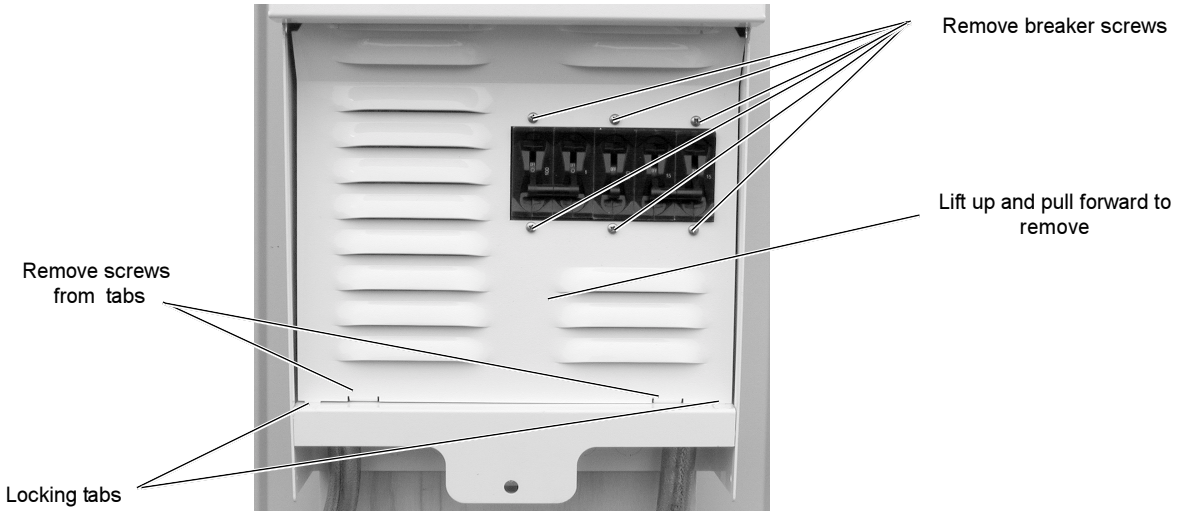

Figure 3
Inner Breaker Cover

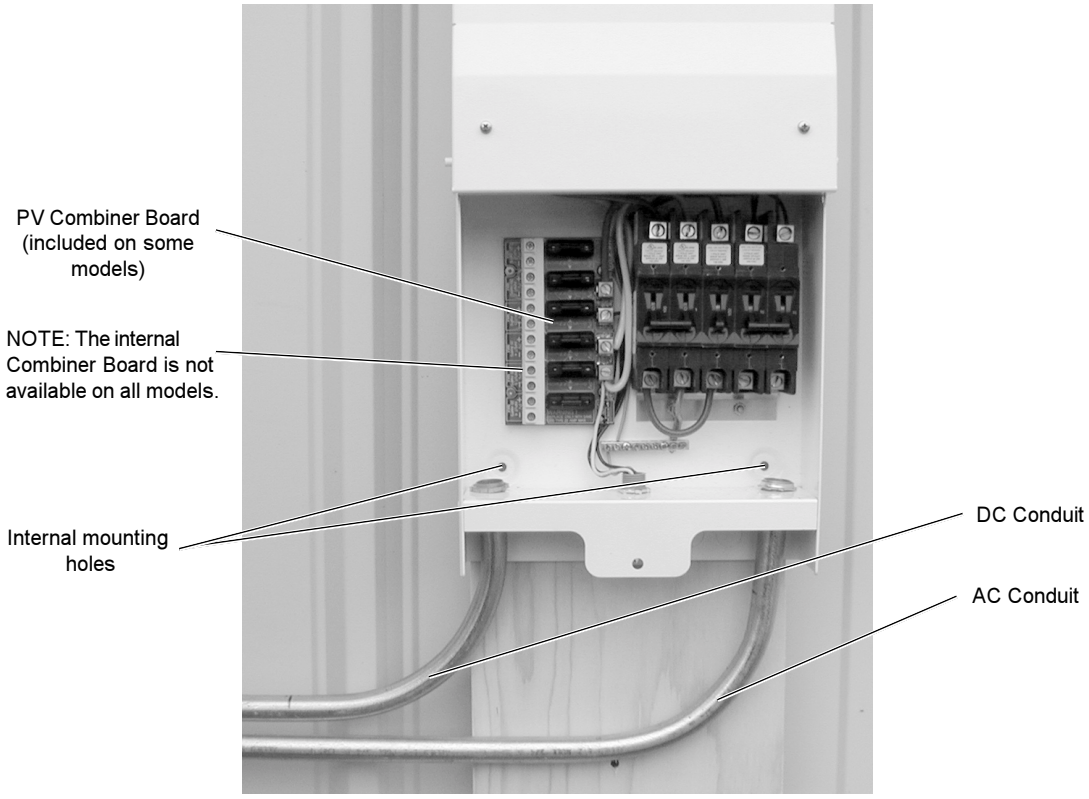

Figure 4
Mounting Holes and AC DC Conduit in Customer Access Area

Wiring:

DC Wiring

The combiner board (included on some models) in the ST accepts up to six individual PV array circuits (positive and negative wires). Each circuit on the combiner board contains a fuse to protect against over-current. Always replace this fuse with one of the same type and rating (GBB, 20 amp max.).

The combiner board PV array input connection block is located in the lower section of the ST unit.

PV Array

1. Install the DC conduit from the PV arrays to the bottom of the ST unit, via one of the knockout holes (Figure 4).

2. Route the wires from the PV array(s) through conduit and into the lower section of the ST enclosure (Figure 6).

NOTE: If more than one PV array is used, label the wire pairs (positive and negative) appropriately (i.e., PV 1, PV 2, etc.).

3. Connect the positive (+) wire from the #1 array to the terminal strip labeled PV INPUT 1 POSITIVE terminal. Check that the wire is in the proper location and tighten the screw.

4. Connect the negative (–) wires from the PV array to the PV INPUT 1 NEGATIVE terminal. Check that the wire is in the proper location and tighten the screw.

5. Repeat this procedure for each PV array circuit, connecting the #2 PV Positive wire to the terminal labeled PV INPUT 2 POSITIVE, etc.

NOTE: The solar arrays do not have to connect in the order marked on the board (this is just for reference). All solar array positives on the combiner board are joined together AFTER the fuse.

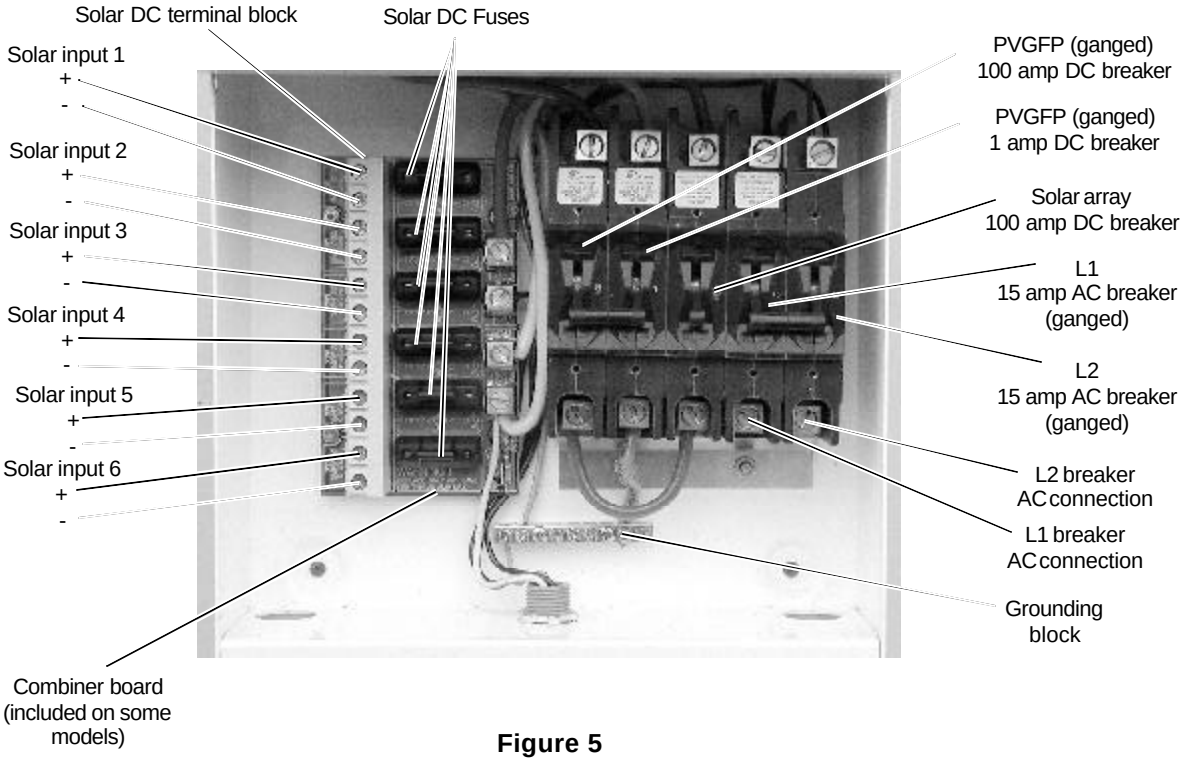

Figure 5
ST Electrical Component Location

Wiring: (continued)

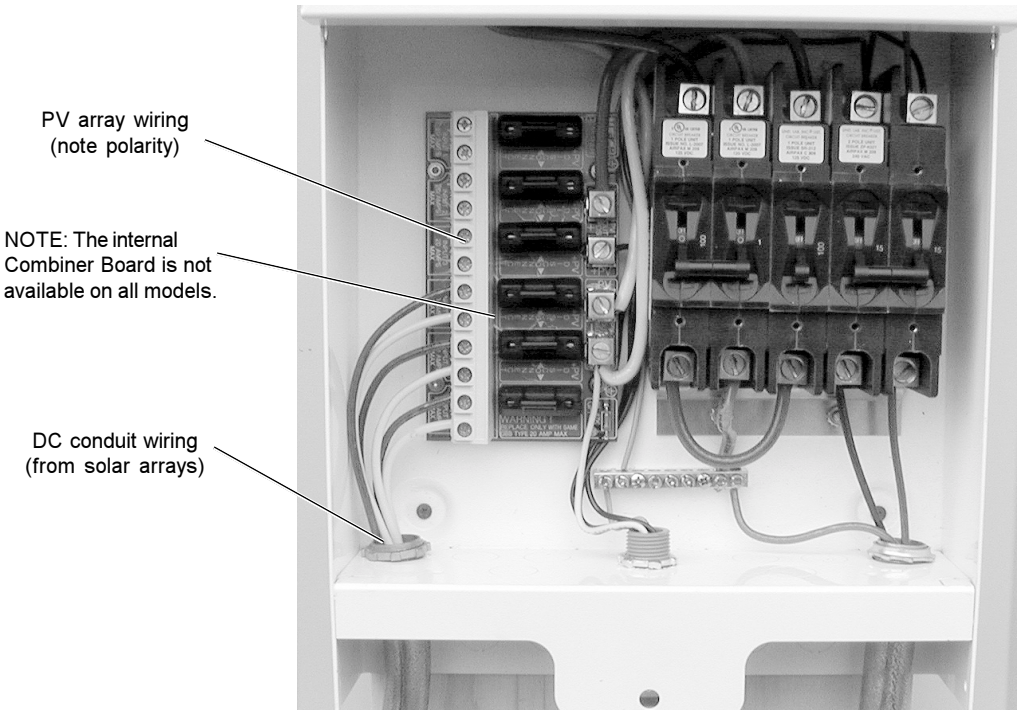

Figure 6
PV Array DC Connection Points

6. Repeat this procedure for each PV array circuit, connecting the #2 PV Negative wire to the terminal labeled PV INPUT 2 NEGATIVE, etc.

NOTE: The solar arrays do not have to connect in the order marked on the board (this is just for reference). All solar array negatives on the combiner board are common.

7. Torque wires according to the following table.

Wire Size	Torque (in-lb)
14-10 AWG	35
8 AWG	40
6 AWG	45

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Table 3
Wire Torque Values

Wiring: (continued)

AC Wiring

AC HOT wiring is connected to the ST unit's L1 and L2 breakers, the Ground wire connects to the Ground block. All AC wiring is located in the lower section of the ST unit.

WARNING: AC UTILITY WIRING TO THE ST UNIT IS PERFORMED DIRECTLY AT THE MAIN BREAKER PANEL. THIS SHOULD BE DONE ONLY BY A QUALIFIED UTILITY INSTALLER OR ELECTRICIAN WITH PRIOR UTILITY COMPANY APPROVAL.

NOTE: The ST unit can be connected to a single bidirectional meter, or to installations requiring a separate meter indicating "sold" power (power supplied back to the utility). The installer and utility must determine the proper components to install.

WARNING: BEFORE WIRING THE ST UNIT, ENSURE THE MAIN 120/240 VOLT BREAKER IN THE MAIN UTILITY BREAKER BOX IS SWITCHED OFF. SWITCH THIS BREAKER TO ON ONLY AFTER ALL WIRING IS COMPLETED AS INSTRUCTED IN THE PROCEDURES.

1. Run conduit from the main utility breaker panel to the lower section of the ST unit. Run the two HOT wires (L1 and L2) and ground through the conduit and into the ST unit's lower section.
2. Install a dual 15 amp, ganged circuit breaker in the main utility breaker panel.
3. Connect the L1 HOT wire (black) from the 15 amp, double-pole breaker installed in the main breaker panel, to the breaker labeled L1 in the ST unit.
4. Connect the L2 HOT wire (red) from the remaining 15 amp, double-pole breaker installed in the main breaker panel, to the breaker labeled L2 in the ST unit.
5. Connect the ground wire (green or bare copper) from the ground block in the main breaker panel, to the ground block in the lower section of the ST unit.
6. Ensure all connections are correctly wired and properly torqued.
7. Torque wires according to the following table.

Wire Size	Torque (in-lb)
14-10 AWG	35
8 AWG	40
6 AWG	45

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Table 4
Wire Torque Values

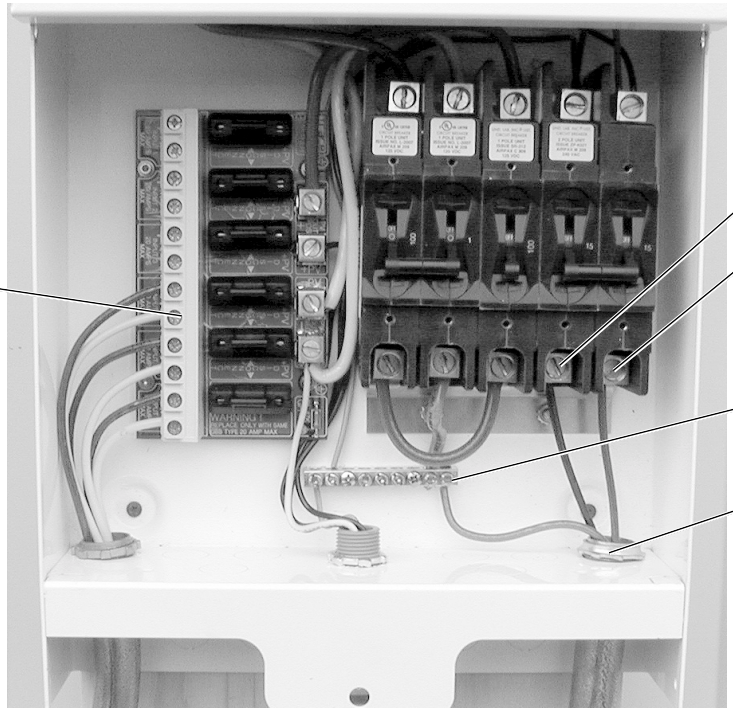

Figure 7
240 V AC Connection Points

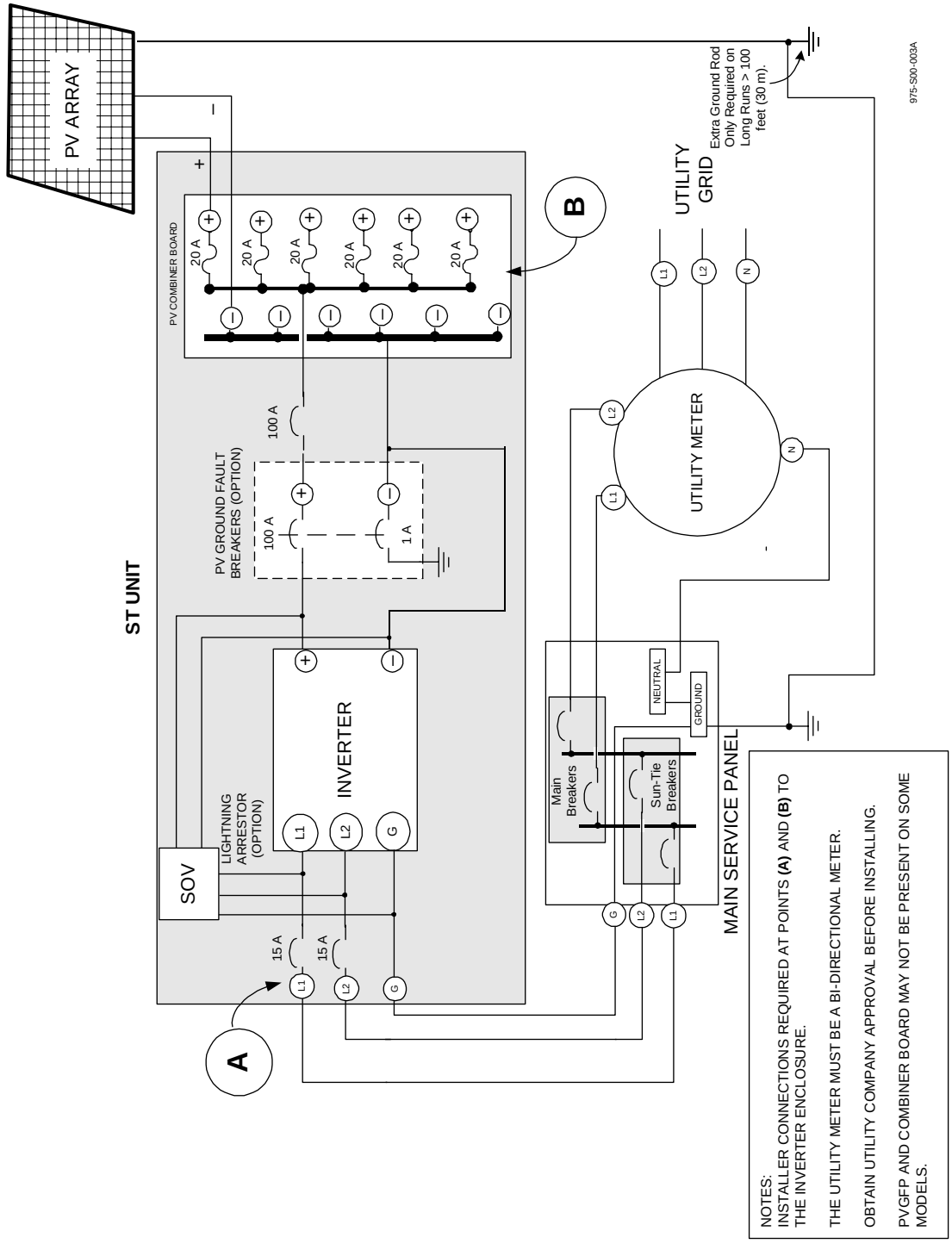

Figure 9
Simplified Electrical Wiring Diagram

Lightning Protection

To protect the equipment from lightning damage, a single point grounding system should be used. In this system, all ground lines terminate at the same point. This point normally is the main utility ground installed by the utility company to provide a ground for the house wiring. This ground usually consists of a copper rod driven 6 to 8 feet into the earth. Ground roof mounted solar array frames directly to the external utility ground rod (Figure 10).

If the solar array is located a considerable distance from the ST unit, then an additional ground rod must be installed close to the solar array for the most reliable lightning protection (Figure 11). The grounded frame of the solar array provides a direct route to dissipate lightning strikes via the close ground rod. Tie this ground rod to the main utility ground rod via a heavy gauge (#8–6 AWG) bare copper wire which can be buried underground. Tieing these grounds together constitutes a single point ground and provides the best protection from lightning damage. Refer also to the NEC for specific grounding requirements.

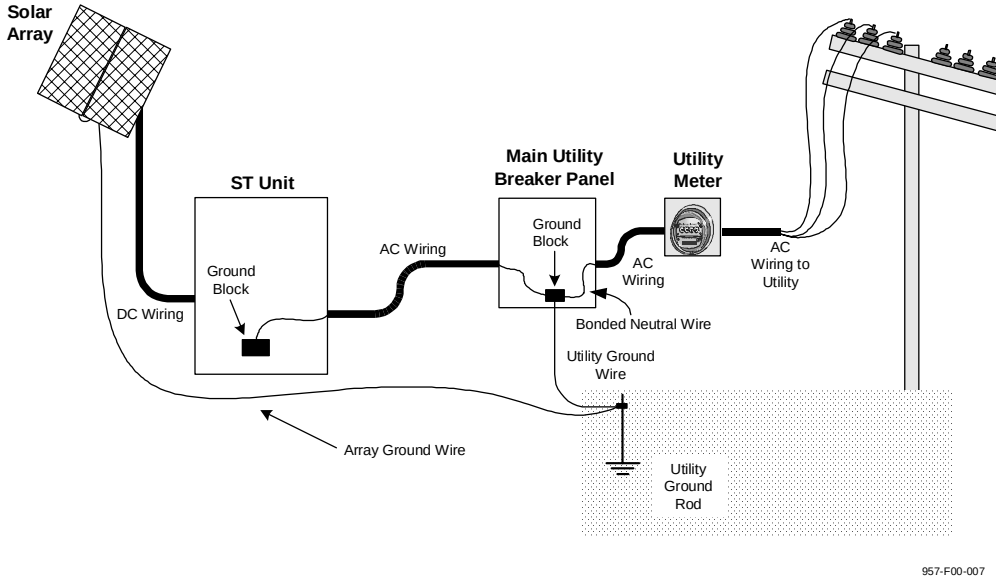

Figure 10
Typical Roof Mount Installation Grounding

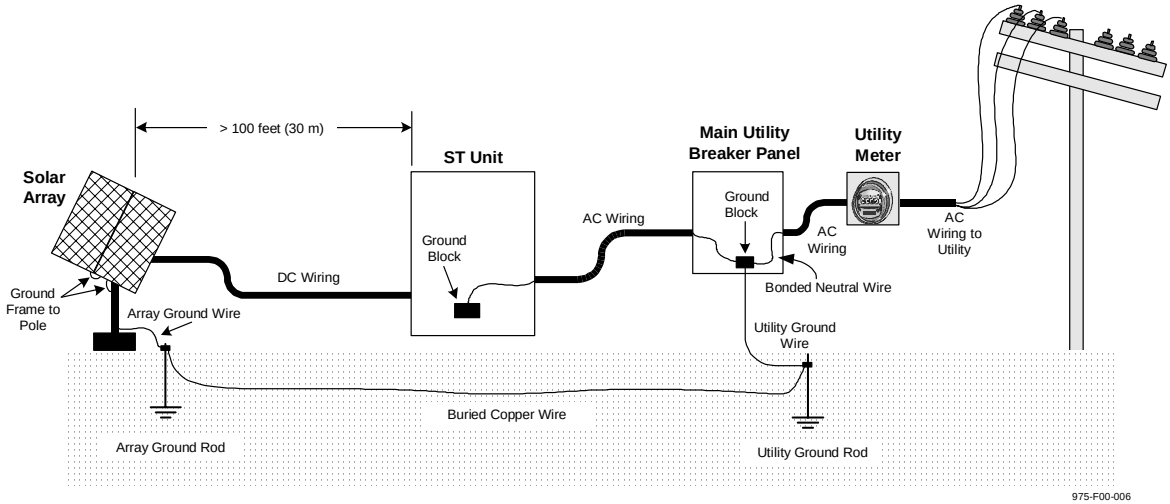

Figure 11
Long Distance Grounding

Start-up Procedure

Required Equipment

- True rms reading AC voltmeter (or true rms multimeter)
- DC voltmeter (or multimeter)
- Frequency counter (optional)

NOTE: Before applying power to the ST unit, ensure all AC and DC wiring is correct.

AC Utility Voltage Check

1. Switch ON the MAIN 240 V breakers in the main breaker service panel.

2. Ensure all circuit breakers located in the ST unit are in the OFF (down) position.

3. Switch ON the ganged 15 amp ST circuit breakers located in the main breaker service panel. This applies the utility supplied 240 volts AC to the ST unit.

4. Measure the AC open circuit utility voltage between L1 and L2. Ensure this voltage is approximately 240 volts AC. The inverter operates with a line-to-line voltage (L1 to L2) ranging from 211–254 volts AC.

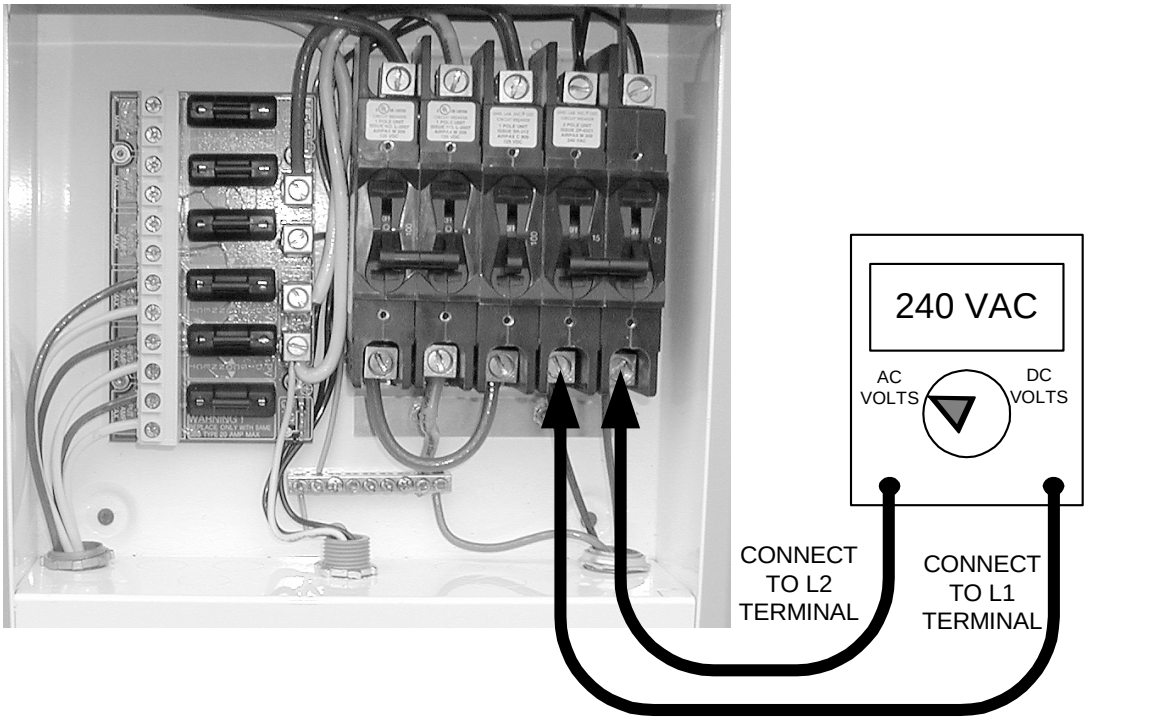

Figure 6
Utility 240 Volts AC Test

Start-up Procedure (continued)

Solar Array DC Voltage Check

1. Uncover the solar arrays and expose them to full sunlight. This test can not be done during dark or stormy weather where the available sunlight may not be intense enough to produce the required output voltage.

2. Measure the solar array open circuit DC voltage on the combiner board (or DC input breaker). This voltage must be greater than 50 volts DC for 5 minutes minimum to start the inverter.

NOTE: Some thin film modules or comparable amorphous modules may produce an open circuit voltages 100-120 volts. Crystalline solar modules will produce open circuit voltages at 75-85 volts. An open circuit voltage 50 volts or greater is required for 5 minutes to start the inverter. The 5-minute time delay is required by safety standards.

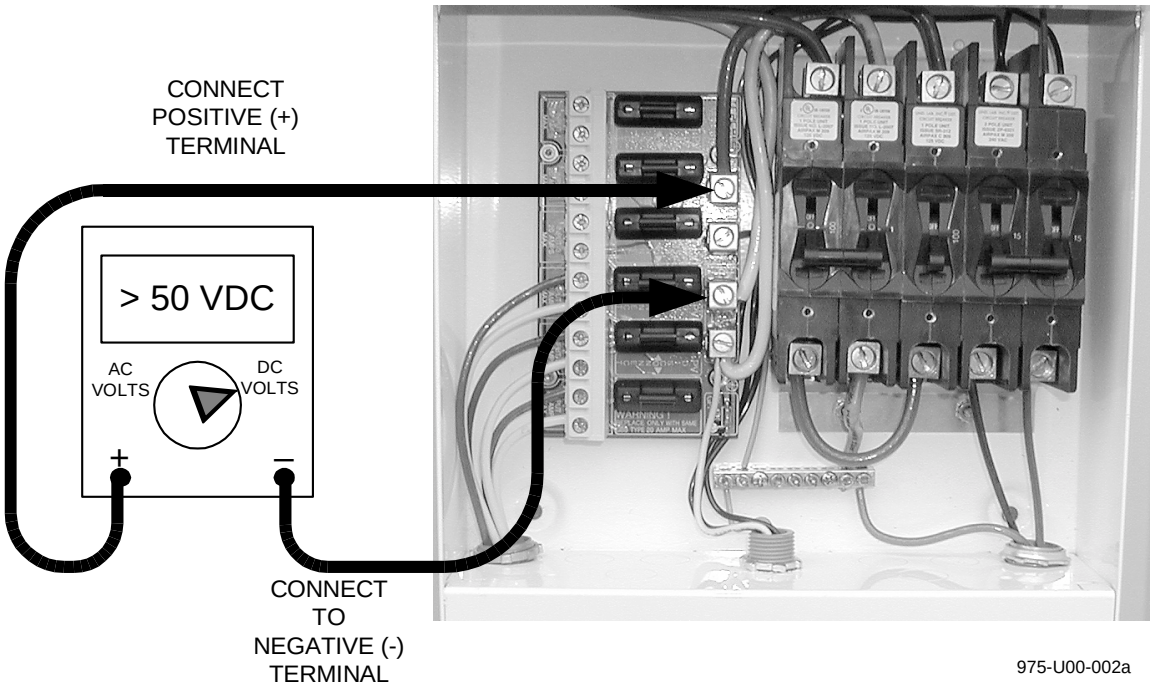

Figure 7
Solar Array DC Voltage Test

Start-up Procedure (continued)

Operational Test

1. Switch ON the double pole 15 amp AC circuit breakers located in the ST unit. These breakers provide the ST produced power to the utility and provides the necessary utility voltage and frequency to the inverter (the inverter will not produce an AC output if utility voltage is not present on its output).

2. Switch ON the 100 amp DC circuit breaker located in the ST unit. This breaker supplies the DC power from the PV array to the ST unit.

3. Switch the 1 and 100 amp (ganged) PVGFP breakers to ON (if installed). These breakers open when 1 amp or greater is detected in the DC negative to ground line; indicating a ground fault condition.

4. The inverter's microprocessor controller illuminates a flashing green LED, indicating the grid voltage has been sensed. This continues for 5 minutes to ensure the grid voltage is stable. The green LED turns ON solid after the 5 minute wait period.

5. The inverter's Liquid Crystal Display (LCD) displays the product name, software revision, Trace Engineering name, and finally the operational values during this sequence. During the 5-minute timer, AC voltage, frequency, and DC voltage appear on the display.

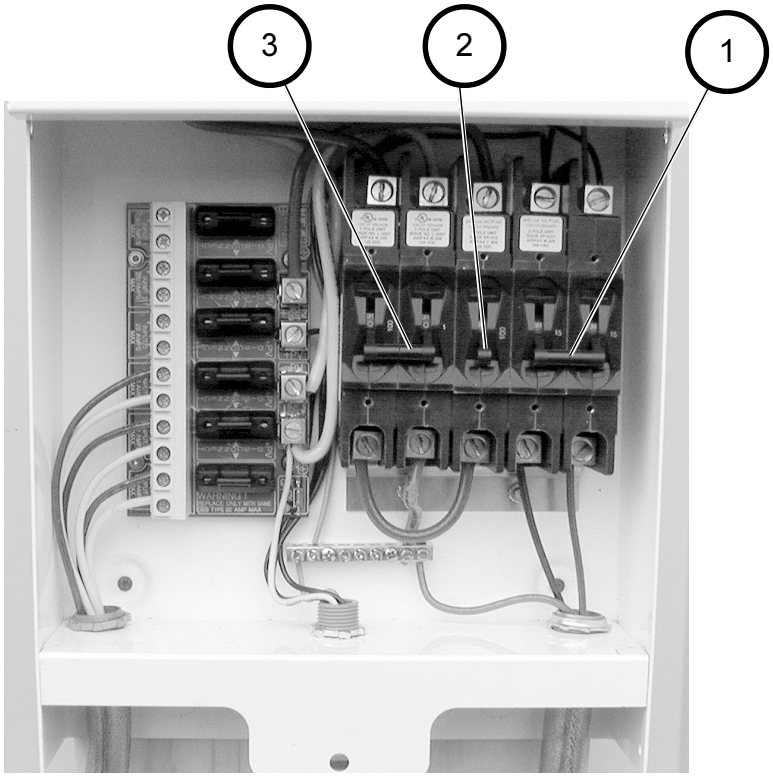

Figure 8
Turn-On Sequence

Start-up Procedure (continued)

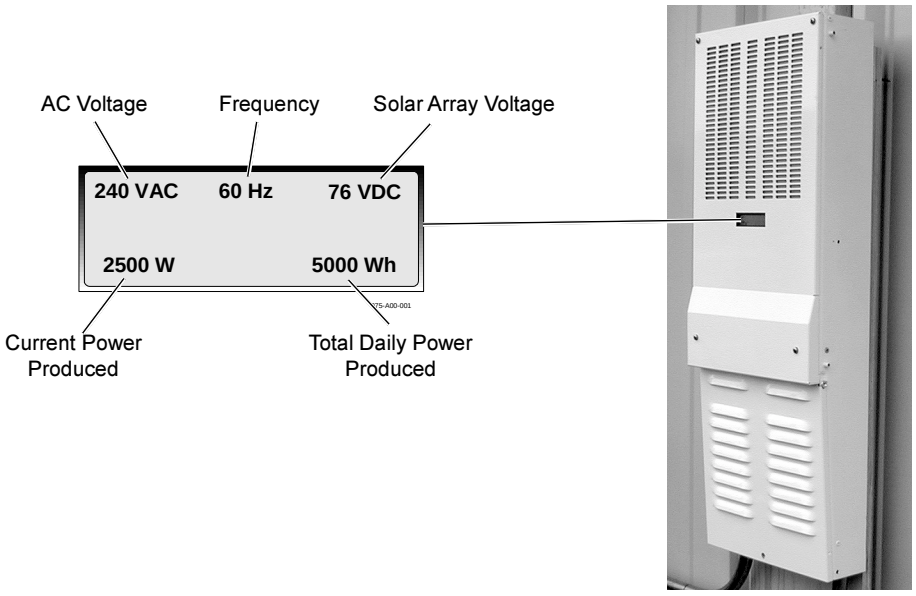

Figure 9
LCD Location and Indications

5. View the LCD status meter and monitor the DC voltage:

- The inverter quickly scales up the DC solar array voltage and attempts to locate the array's maximum power point. The DC voltage continues to increase until the CPU detects that the maximum power point was passed.

- DC voltage will be scaled down and begin increasing again to find the maximum power point. This routine may continue several times until the maximum power point is found. At this point the inverter will lock on to the array voltage and begin to sell the maximum amount of power possible under the conditions. This algorithm, known as maximum power point tracking (MPPT), operates an efficient "power sweep" once each minute throughout the day.

- Ensure the inverter begins searching for an operational DC voltage upon start-up and begins selling power (after completion of the 5 minute wait protection timer) by displaying the Watt (W) and advancing Watt-hour (WH) meters located on the LCD display.

Start-up Procedure (continued)

6. Replace the circuit breaker panel.

- Install the circuit breaker (inner) panel by sliding it in-place under the top cover and fitting its two locking tabs into the slots on the bottom of the ST unit.
- Re-install the two screws located on the bottom of the unit.
- Re-install the screws on the front of the panel that secure it to the circuit breaker.

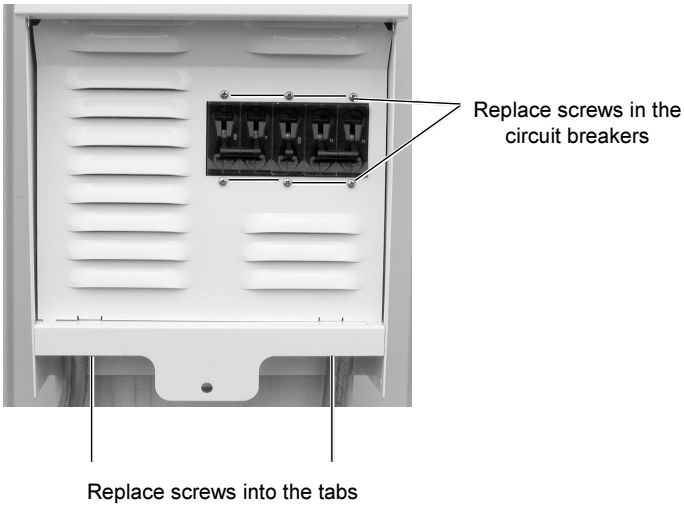

Figure 9
Replace Circuit Breaker Cover and Screws

7. Replace the external cover.

- Position the external cover in-place and install a screw in each side.

NOTE: A hole at the bottom front of this cover and the main chassis allow for installing a lock to prevent tampering or unauthorized access to the unit.

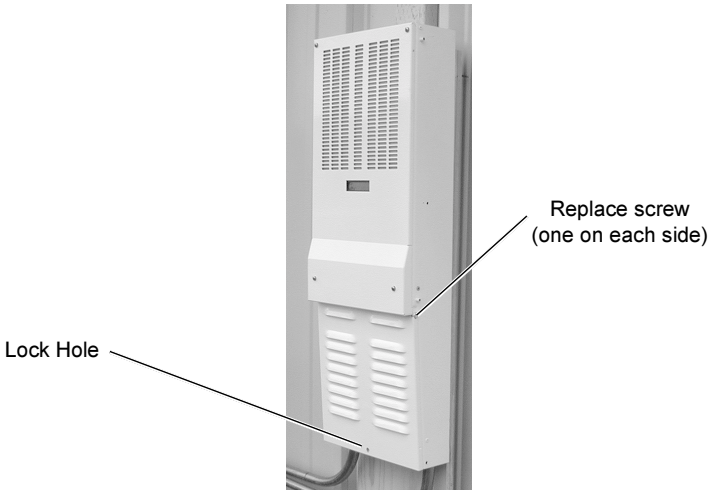

Figure 10
Replace Outer Cover and Screws

Start-up Procedure (continued)

8. Install rain shield hood if located outdoors.

- Use the hardware provided with the rain shield hood and install it onto the ST unit.

Figure 10
Replace Outer Cover and Screws

Problem	Cause	Remedy
1. Inverter CPU does not illuminate red or green LEDs and does not operate in sufficient sunlight	PVGFP, AC or DC breakers are switched OFF.	Turn appropriate breakers ON in the sequence described in the operations section.
	No AC grid or DC array voltage is present.	Check AC connections and ensure 240 VAC is present at the inverter's AC disconnect. Check DC connections and ensure 50-125 VDC is present at the inverter's DC disconnect.
	20 amp fuses in combiner board are missing or blown.	Install combiner board fuses. Check for PV array for short circuits or improper sizing for 20 amp fuses.
2. The inverter CPU only illuminates the red LED. The green LED never illuminates in a flashing nor solid mode.	Inverter does not recognize any AC input signal.	Ensure the inverter AC disconnect is ON. Check AC voltage at the inverter and ensure AC voltage is present. Check source of AC voltage.
	Inverter doe not recognize the appropriate DC input signal.	Check DC voltage input on the DC combiner board or circuit breaker. DC voltage must be 50 Volts open circuit or greater to initiate inverter operation. Tray again on a day with greater sunlight intensity or check for incorrectly wired PV arrays.
3. The inverter illuminates the red LED upon startup and goes into a flashing green LED mode. The flashing green LED continues for more than 5 minutes. The solid green LED never illuminates.	The inverter recognizes AC grid power is present, but grid voltage or frequency are not within the appropriate tolerances.	Check AC voltage and frequency with a multimeter. Wait for grid power to return to acceptable voltage and/or frequency. Notify your power company that voltage or frequency is outside of the appropriate boundaries.
4. The inverter CPU illuminates a solid green LED but does not produce any power, as indicated by the LCD Watt and Watt-hour meters.	The inverter recognizes the appropriate AC grid and DC array voltages are present.	Check DC input voltage at the inverter's DC disconnect. The inverter may not produce power because of insufficient sunlight or DC voltage is on the lower threshold of the maximum peak power tracking window. Wait for sunlight intensity to increase and ensure panels produce sufficient voltage for inverter initialization.
5. 100 A DC breaker trip	Current from the array exceeds the DC input breaker rating.	Check array size and ensure DC input does not exceed breaker rating.
	A lightning strike hit near the PV array.	Check lightning arrestor, breakers, panels, diodes, DC wire insulation and other components for damage. Replace any damaged components and reset the breaker.
6. Blown 20 A combiner board fuse(s)	A fault to ground exists in DC array wiring.	Check all DC array wiring for improper wiring or exposed wires.
	Array produces current excessive to the fuse rating.	Check array size and ensure DC input does not exceed fuse rating.
7. PVGFP breaker trips	A fault to ground exists in DC array wiring.	Check all DC array wiring for improper wiring or exposed wires.

5.0 SPECIFICATIONS

MODEL	ST1000	ST1500	ST2000	ST2500
AC voltage–nominal	240 VAC			
DC Input voltage nominal	52–75 VDC			
Minimum operational DC input	42 VDC			
Maximum power point tracking window	42 VDC minimum–85 VDC maximum			
Maximum PV open circuit voltage	120 VDC			
AC voltage–min/max	211–254 VAC			
AC output characteristics	Current source			
Nonimal frequency	60 Hz			
Frequency window–min/max	59.5/60.5 Hz Default			
Continuous ac output @ 25 °C	1.0 k VA	1.5 k VA	2.0 k VA	2.5 k VA
Efficiency–peak	92%		94%	
Efficiency–typical	Over 90% from 500 to 2500 watts AC			
AC output waveform	Sinewave, HF PWM controlled			
Total harmonic distortion	Less than 5% at rated power per IEEE 929 and UL 1741			
AC disconnect	Two pole 15 amp, 240 VAC branch circuited rated breaker			
DC disconnect	One pole 100 amp dc rated circuit breaker			
Islanding protection	Over/under AC voltage and frequency detection plus active islanding detection–meets IEEE 929 and UL 1741requirements			
User display	Backlight LCD display–AC amps, AC $volts_{rms}$, DC volts, AC frequency, output power (kW) and kWh produced.			
Specified temperature range	32–113 °F (0–45 °C)			
Enclosure Type	Outdoor, rainproof, powder coated aluminum enclosure, fully screened			
Dimensions (inverter only)	13.25"W x 33.25"H x 5.3"D (33.8 cm W x 83.1 cm H x 13.25 cm D)			
Dimensions (shipping)	15.75"W x 37.75"H x 9.5"D (39.4 cm W x 94.4 cm H x 23.8 cm D)			
Weight (inverter only)	35 lb. (15.9 kg)			
Weight (shipping)	40 lb. (18 kg)			
Mounting	Vertical wall mount only			
Listings	UL 1741, 1st Edition, CSA C22.2 No. 107.1-95 certified			
STANDARD FEATURES AND OPTIONS				
PV ground and fault protection system	–	Standard	–	Standard
PV combiner board with 6 fused inputs. 20 amps maximum per input	–	Standard	–	Standard
Surge arrestor–Combined AC/DC protection	Standard	Standard	Standard	Standard
Rain Shield (STRS) Protective rain shield (required for outdoor installation)	Optional	Optional	Optional	Optional

Specifications @ 25 °C. Subject to change without notice.

Trace Engineering makes every effort to ensure your unit fully meets your independent powering needs.

If your product needs repair, contact our Service department at: (360) 435-8826 to obtain an RMA# and shipping information; or fax this page with the following information to: (360) 474-0616.

Please provide:

ST Model: _____

Serial Number: _____

Purchase Date: _____

Dealer/Installer: _____

Phone: ( ) _____

Country: _____

Problem: _____

_____

_____

Include a telephone number where you can be reached during business hours and a complete return shipping address (P.O. Box numbers are not acceptable).

Name: _____

Address: _____

City: _____

State / Province: _____

Zip / Postal Code: _____

Phone: ( ) _____

Country: _____

Limited Warranty

Trace Engineering warrants its power products against defects in materials and workmanship for a period of two (2) years from the date of purchase and extends this warranty to all purchasers or owners of the product during the warranty period. Trace does not warrant its products from any and all defects:

(1) arising out of material or workmanship not provided by Trace Engineering;
(2) resulting from abnormal use of the product or use in violation of the instructions;
(3) in products repaired or serviced by other than Trace Engineering repair facilities;
(4) in components, parts, or products expressly warranted by another manufacturer.

Trace Engineering agrees to supply all parts and labor, or repair or replace defects covered by this warranty with parts or products of original or improved design, at its option, if the defective product is returned to any Trace Engineering authorized warranty repair facility or to the Trace Engineering factory in the original packaging, with all transportation costs and full insurance paid by the purchaser or owner.

All remedies and the measure of damages are limited to the above. Trace Engineering shall in no event be liable for consequential, incidental, contingent, or special damages, even if Trace Engineering has been advised of the possibility of such damages. Any and all other warranties, expressed or implied, arising by law, course of dealing, course of performance, usage of trade or otherwise, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose, are limited in duration for a period of two (2) years from the original date of purchase.

Some countries or states do not allow limitations on the term of an implied warranty, or the exclusion or limitation of incidental or consequential damage, which means the limitations and exclusions of this warranty may not apply to you. Even though this warranty gives you specific legal rights, you may also have other rights which vary from state to state.

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