Trace™ SUNTIE™ XR

with SUNSWEEP™ MPPT Technology

Installation & Operator's Manual

STXR1000, STXR1500, STXR2000 and STXR2500

XANTREX
Smart Choice For Power

Sun Tie XR Inverter
STXR1000, STXR1500, STXR2000 and STXR2500

Table of Contents

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 Xantrex Technology Inc., the company 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.

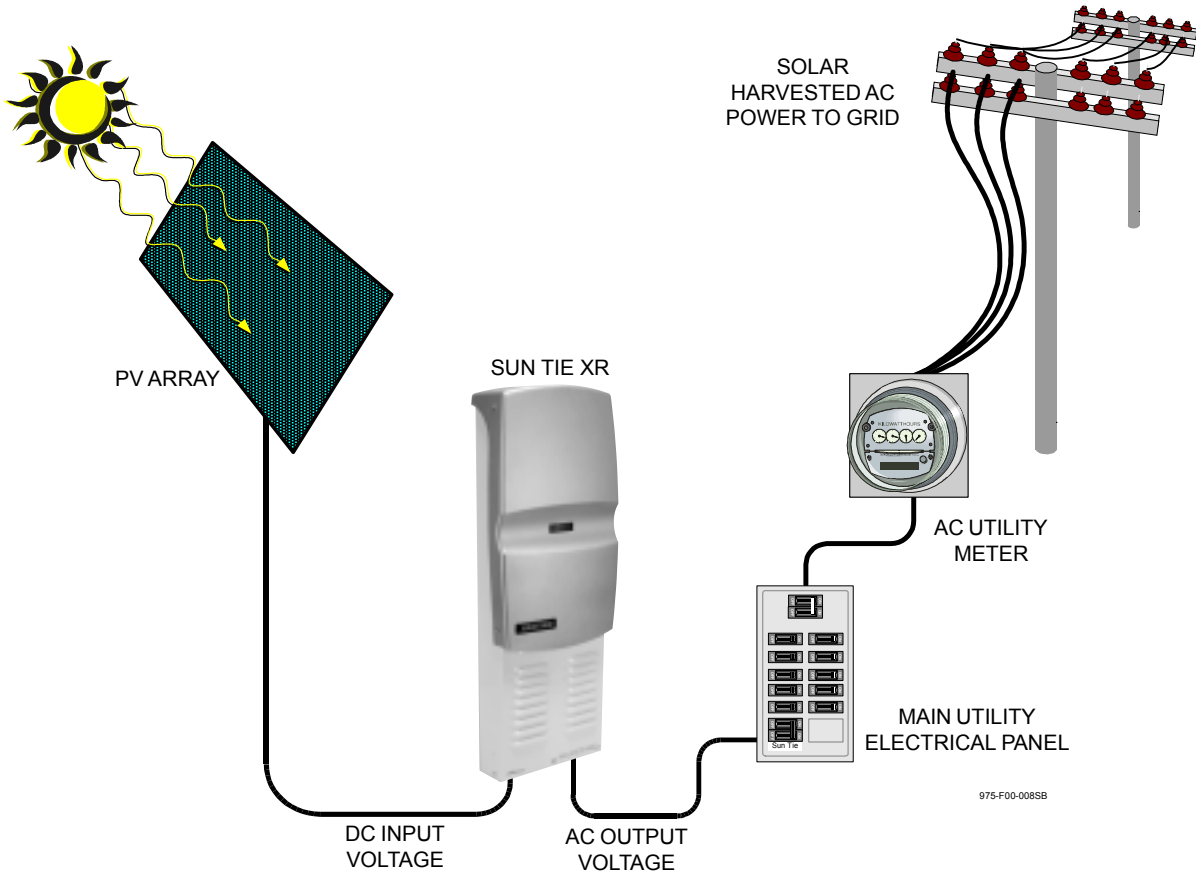
ATTENTION - Cette procédure est essentielle à l'installation ou l'utilisation de l'unité en toute sécurité. Suivre ces instructions de près.

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 STXR 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., prior to 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 Xantrex 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 a qualified electrician.
- 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 included.

The Sun Tie solar power conversion center is designed to convert a home or business into a "green" power generating station. The Sun Tie unit converts solar electric (PV) power into utility-grade electricity which can be used by the home or sold to the power company. Installing a Sun Tie 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 Sun Tie'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 Sun Tie is designed to take advantage of most types of solar electric technologies. The inverter allows up to 120 VDC open circuit PV modules to be used so both crystalline and thin film PV modules can be used.

Sun Sweep™–Maximum Power Point Tracking (MMPT)

Sun Sweep™ is Xantrex's proprietary Maximum Power Point Tracking technology that allows the Sun Tie XR to harvest the maximum amount of energy from your solar array. No matter what PV system you choose, single crystalline, polycrystalline or thin film, SunSweep™ learns your array's specific characteristics, maximizing its output, all day, all season, year after year.

High Efficiency and Long Life

The high frequency, solid-state design of the Sun Tie inverter is extremely efficient. Above 500 watts, the inversion process is 90% efficient (or greater) with a peak efficiency of 94%. The Sun Tie inverter has a design life of over twenty years.

Expandable

Sun Tie XR inverters may be connected in a parallel configuration for increasing net metering capacity. The modular expandability of the Sun Tie Series allows for system growth.

UL Listed

The Sun Tie XR has complete on-board islanding protection and meets U.S. and Canadian safety operating standards and code requirements. In North America, 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 (PVGFP).

Options

These features are included on some models:

- PV array combiner board with six 20 amp maximum protected inputs
- PV array Ground Fault Protection PVGFP

Accessories

- STRM–Sun Tie XR Remote Monitor
- STRS–Sun Tie XR Rain Shield

2.0 INSTALLATION

Pre-Installation

Before installing the Sun Tie XR, read all instructions and cautionary markings located in this manual, on the PV array and on the main service panel.

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

Tools required

Phillips screw drivers
slotted screw drivers
open-end wrenches
socket wrench and fittings
multimeter (true rms)
frequency counter (optional)
level
wire strippers
torque wrench
electrical tape
pencil
utility knife

Hardware/Materials required

wood screws and washers (supplied)
conduit and appropriate fittings
anchors for screws (material dependent)

Location

The Sun Tie XR unit can be mounted outdoors with the optional Rain Shield (STRS).

AC Connections

The inverter's AC output breakers accept wire sizes from #6–14 AWG. Refer to the table below for minimum recommended wire size.

Inverter Model	AC Amps Output per leg	NEC Amp (Amps x 125%)	Minimum Wire Size for Specified Distance		
			0–50 Ft One Way	50–100 Ft One Way	100–200 Ft One Way
STXR1000	4.2	5.2	14 AWG	14 AWG	12 AWG
STXR1500	6.3	7.8	14 AWG	12 AWG	10 AWG
STXR2000	8.3	10.4	14 AWG	12 AWG	10 AWG
STXR2500	10.4	13	14 AWG	12 AWG	8 AWG

975-000-001

Table 2-1
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 more information.

NOTE: The six-circuit combiner board is rated for 100 amps of maximum *real* current. Although the 20 amp fuses will theoretically allow 120 amps to be applied, always design for a maximum of 100 amps *maximum* current. With appropriate fuse deratings, per NEC code, the maximum allowed current is 16 amps for any of the six circuits.

Pre-Installation (continued)

DC Connections
STXR1500 and STXR2500

DC connections are made on the combiner board for models STXR1500 and STXR2500. The combiner board accepts wire sizes from #6–14 AWG. Refer to the table below for minimum recommended wire sizes.

DC Amps	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

975-000-002

Table 2-2
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 more information.

*NOTE: For installations requiring a two-wire run (positive and negative), the PV array wires can bypass the individual, fused combiner board terminals and connect directly to the input terminals (via an externally mounted DC fused combiner box) by using the positive and egative bypass terminals on the top of the combiner board. Refer to Figure 2-1 and Table 2-3 for connections and wire sizes.

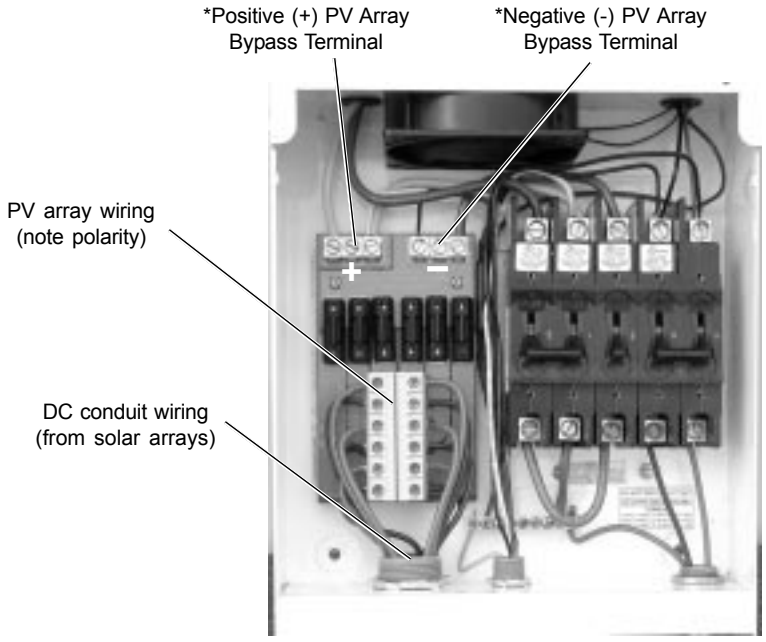


Figure 2-1
Combiner Board Indicating DC PV Array Wire Connection Points

NOTE: The National Electrical Code (NEC) places restrictions on minimum DC wire bending radius. A #6 AWG wire is the largest that may be used on the STXR1500 and STXR2500 inverters when connecting to the individual fused circuits of the combiner board.

Pre-Installation (continued)

DC Connections
STXR1000 and STXR2000

DC connections are made at the 100 amp DC circuit breaker and the DC negative terminal block for models STXR1000 and STXR2000. 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
10	15.6	10 AWG	6 AWG	4 AWG
15	23.4	8 AWG	4 AWG	*2 AWG
20	31.2	6 AWG	4 AWG	*1 AWG
30	46.8	4 AWG	*2 AWG	Not Recommended
40	62.4	4 AWG	*1 AWG	Not Recommended
60	93.6	*2 AWG	Not Recommended	Not Recommended

975-000-004

Table 2-3
Recommended Minimum DC Wire Sizes

*NOTE: The National Electrical Code (NEC) places restrictions on minimum DC wire bending radius. If the enclosure's side is used for routing the wires to the DC terminals, then the wires must be bent to make the appropriate connections. A #3 AWG wire is the largest that may be used on the STXR1000 and STXR2000 inverters if the side panel is used. Side knockouts are NOT provided on the unit.

Figure 2-2
DC PV Array Wire Connection Points
(with no combiner board)

Pre-Installation (continued)

Grounding

AC Grounding

The Sun Tie 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 Sun Tie is optimized to work with 4-each, 12 volt nominal crystalline PV modules in series (48 VDC nominal), or 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 Sun Tie Series inverter should have a minimum of 50 volts DC open-circuit in full sunlight conditions. Crystalline 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 42-85 volts DC range (full inverter output power occurs between 52–85 VDC). Other array voltage will either not operate the inverter, may cause damage 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.

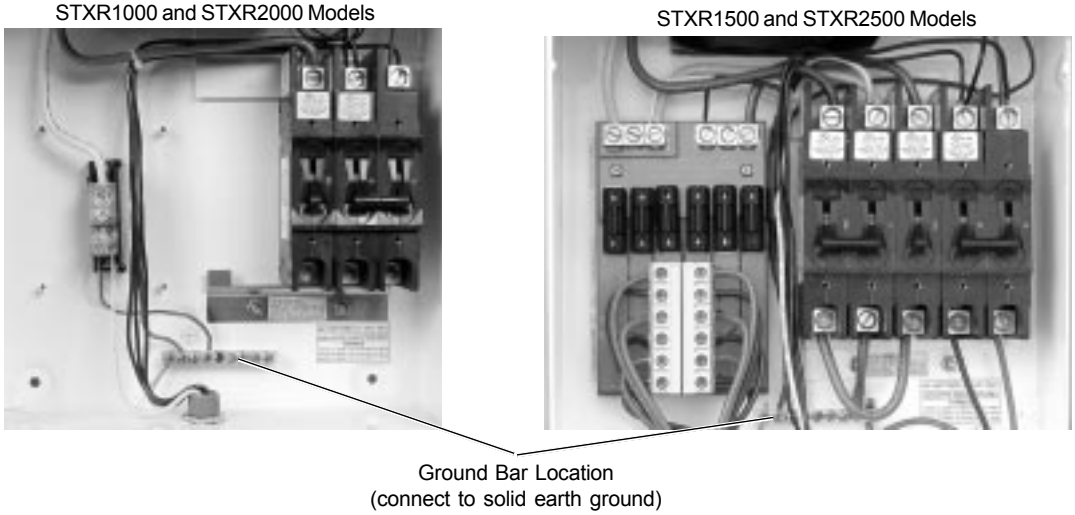


Figure 2-3
Ground Bar Location

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 Sun Tie XR.

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 Sun Tie
- DC input wiring from the PV array to the Sun Tie
- 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 (STXR1500 and STXR2500) and #2 AWG* wire (STXR1000 and STXR2000); the AC circuit disconnects accept cable sizes up to #6 AWG.
- For maximum safety, run AC and DC wires/cables in (separate) conduits.

*NOTE: #2 AWG wire can only be used if the bottom knockouts are used. If punching side walls for wire routing, the largest wire for acceptable wire bend radius is #3 AWG maximum.

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

Mounting

The Sun Tie 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 RAIN SHIELD HOOD. WATER ENTERING THE UNIT COULD CAUSE A DANGEROUS CONDITION AND CAUSE THE UNIT TO FAIL. FAILURE 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 Sun Tie 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 2-4). To achieve the 36 inch height from the bottom of the Sun Tie to the ground, mount the bracket 70 inches from the ground.

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 2-5).

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

7. Remove the internal breaker panel by removing the screws in the breakers. Lift the panel until the lower locking tabs are free, then gently pull the inner cover outward (Figure 2-7). Save the screws for reinstallation.

8. After the unit is correctly seated on the upper bracket, locate the two screw holes in the bottom (back) area of the enclosure and mark these locations on the wall (Figures 2-5 and 2-8). Remove the Sun Tie (if required).

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

10. Reinstall the Sun Tie 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 2-5 and 2-8).

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

Mounting (continued)

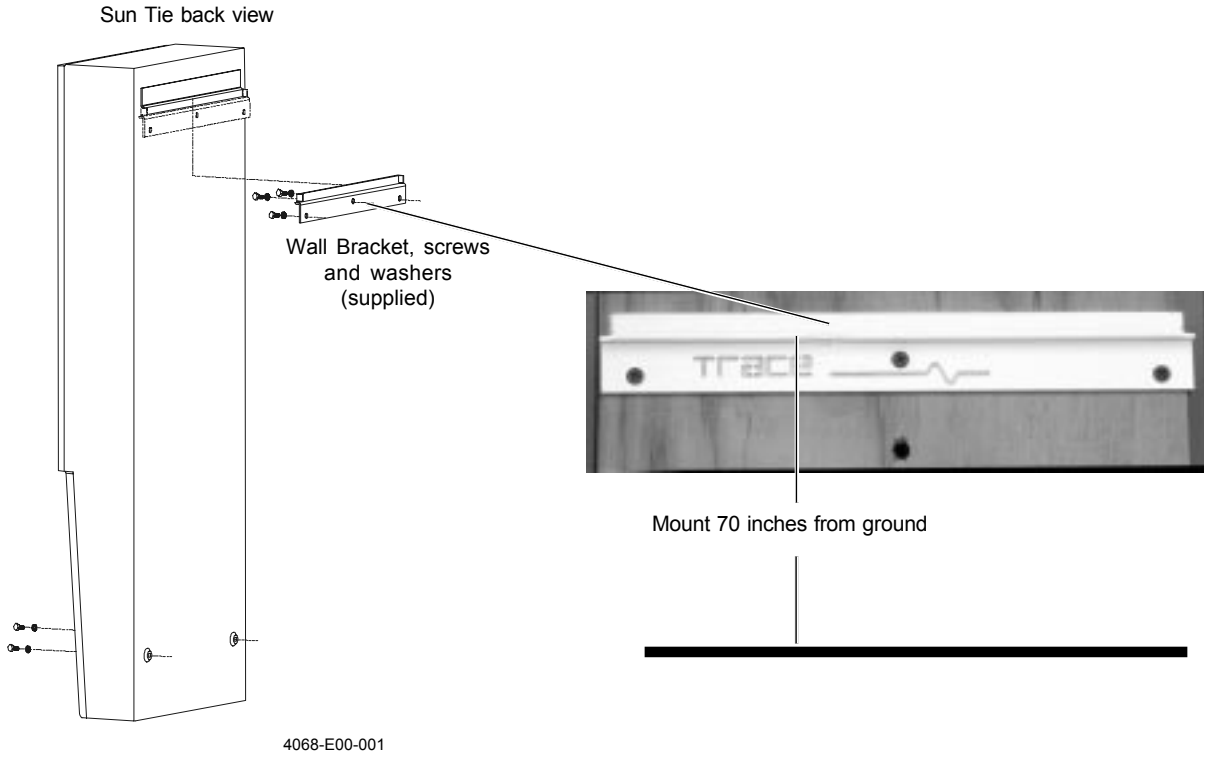


Figure 2-4
Bracket Mounting

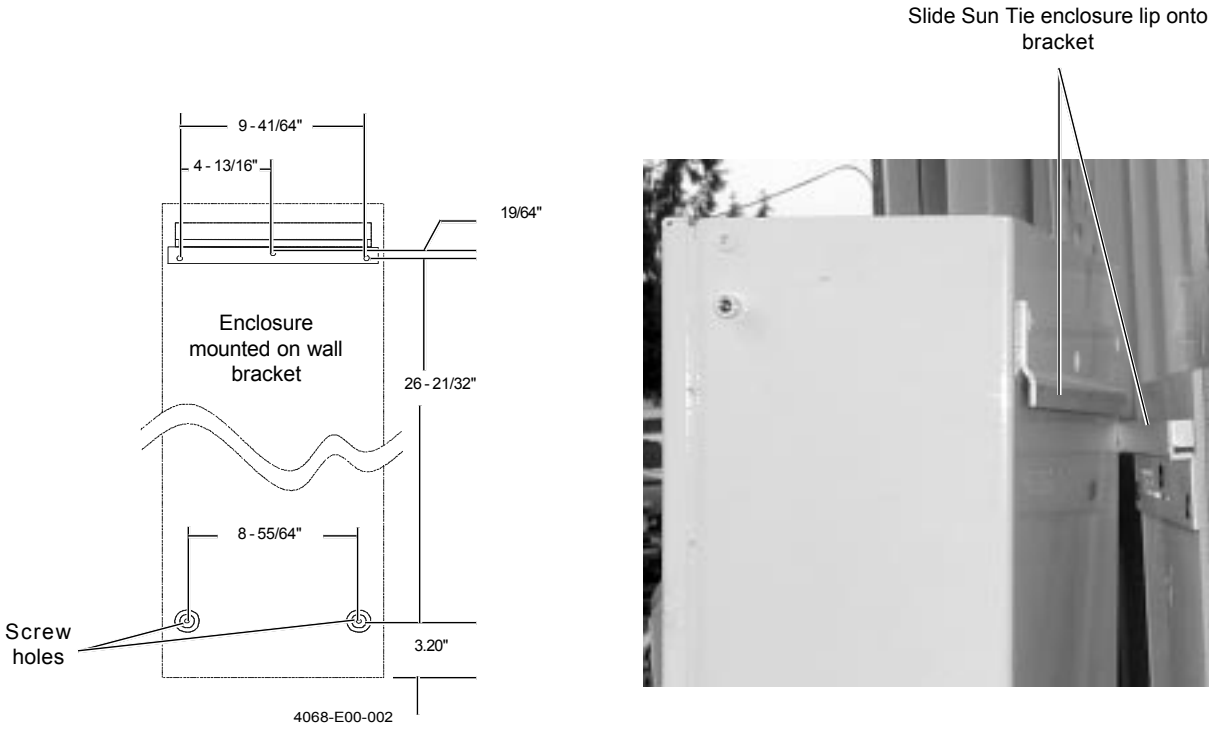


Figure 2-5
Enclosure Mounting

Mounting (continued)

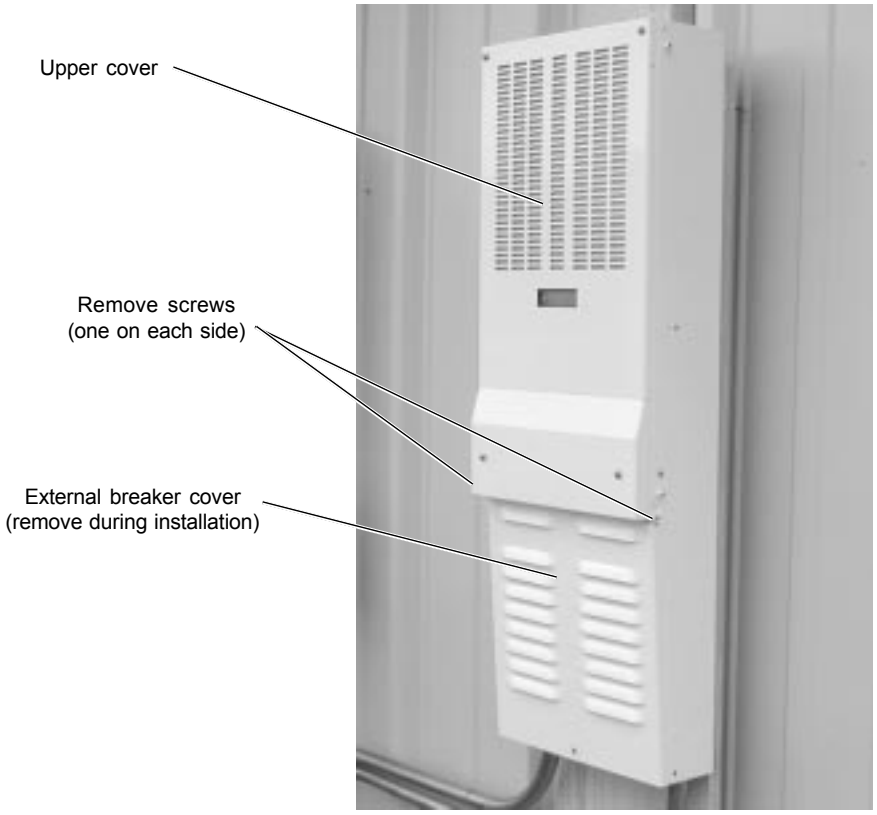


Figure 2-6
Outer Cover Components

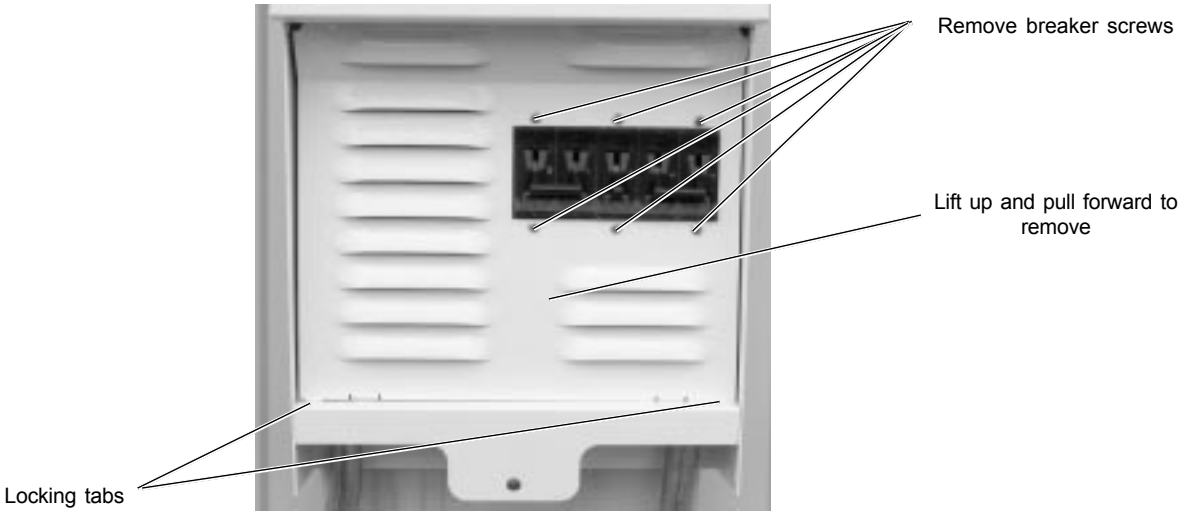


Figure 2-7
Inner Breaker Cover

Mounting (continued)

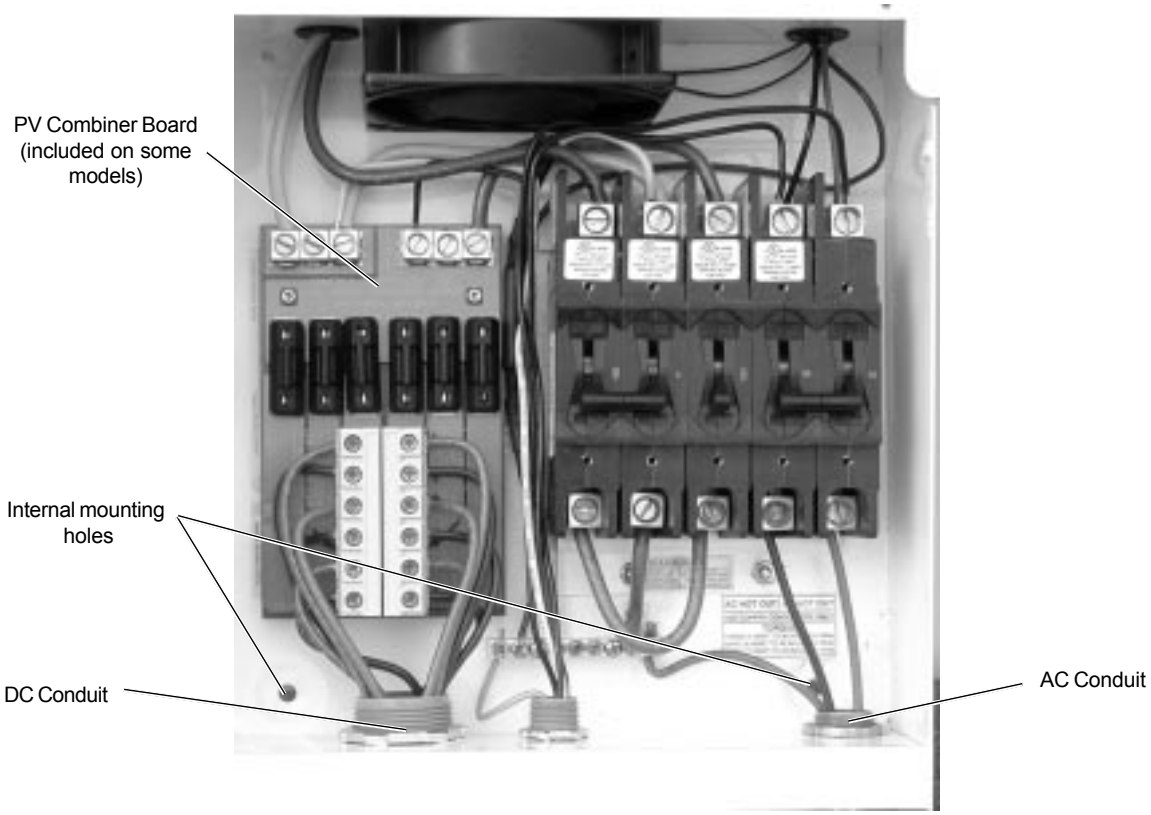
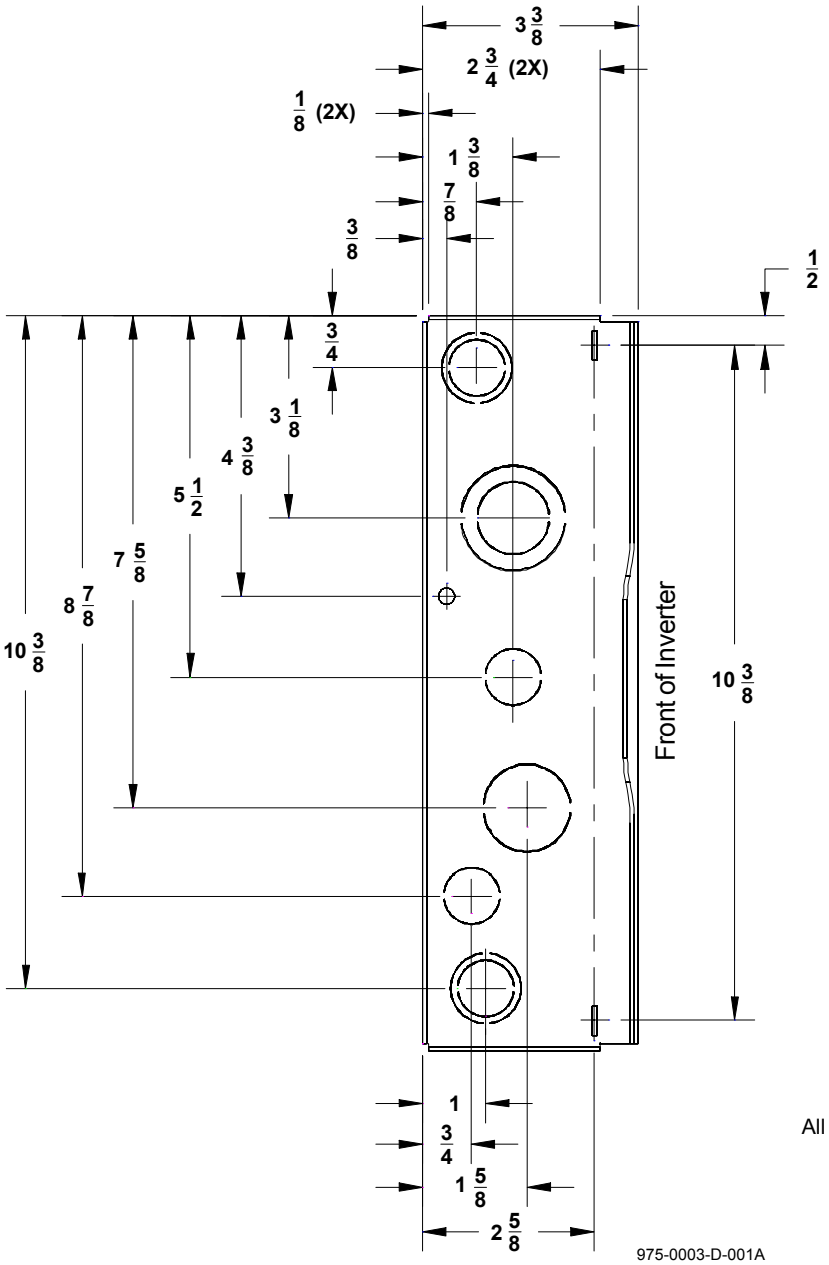


Figure 2-8
Mounting Holes and AC DC Conduit in Customer Access Area

Mounting (continued)



All dimensions are in inches

Figure 2-9
Bottom Conduit Hole Locations
(Bottom View)

Wiring:

DC Wiring

The combiner board (included on some models) in the Sun Tie XR 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 maximum, ceramic type, 0.25" x 1.25"). The combiner board is rated for 100 amps maximum input.

The combiner board PV array input connection block is located in the lower left-hand section of the Sun Tie XR unit.

STXR1500 and STXR2500 DC Wiring (Refer to Figures 2-10 and 2-11)
PV Array Conduit/Wire Run

1. Install the DC conduit from the PV arrays to the bottom of the Sun Tie, via one of the knockout holes (Figures 2-8 and 2-9).
2. Route the wires from the PV array(s) through the conduit and into the lower section of the Sun Tie enclosure (Figure 2-11).

NOTE: If more than one solar 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.

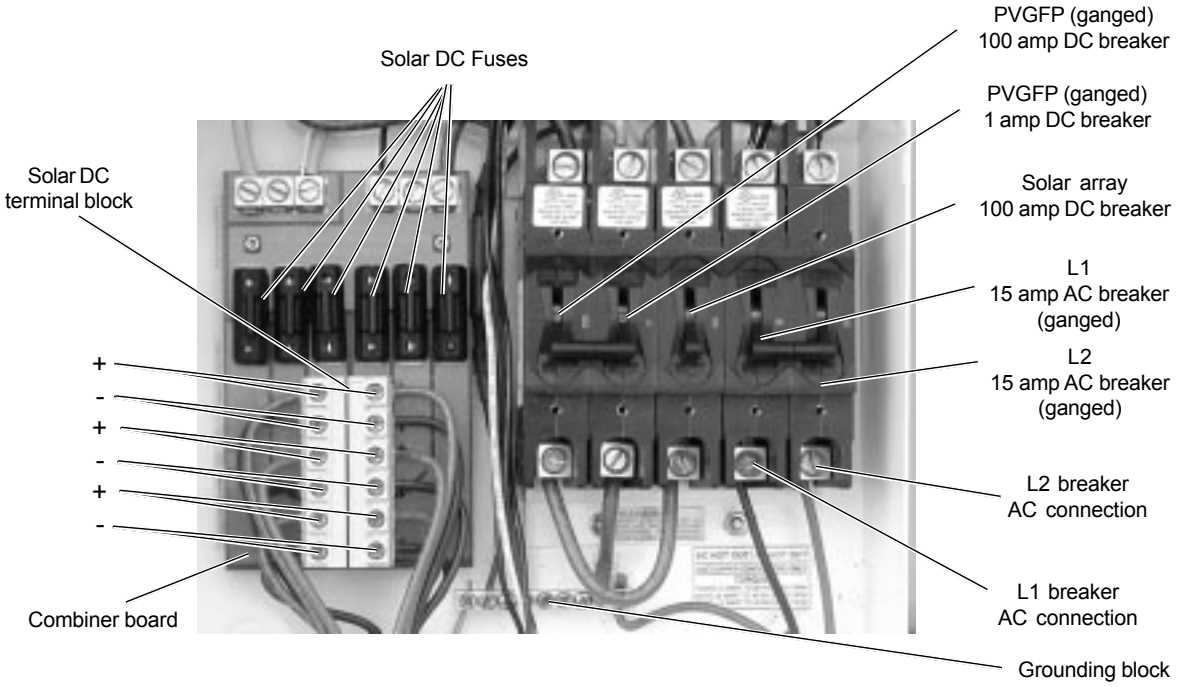


Figure 2-10
STXR1500 and STXR2500 Electrical Component Location

Wiring: (continued)

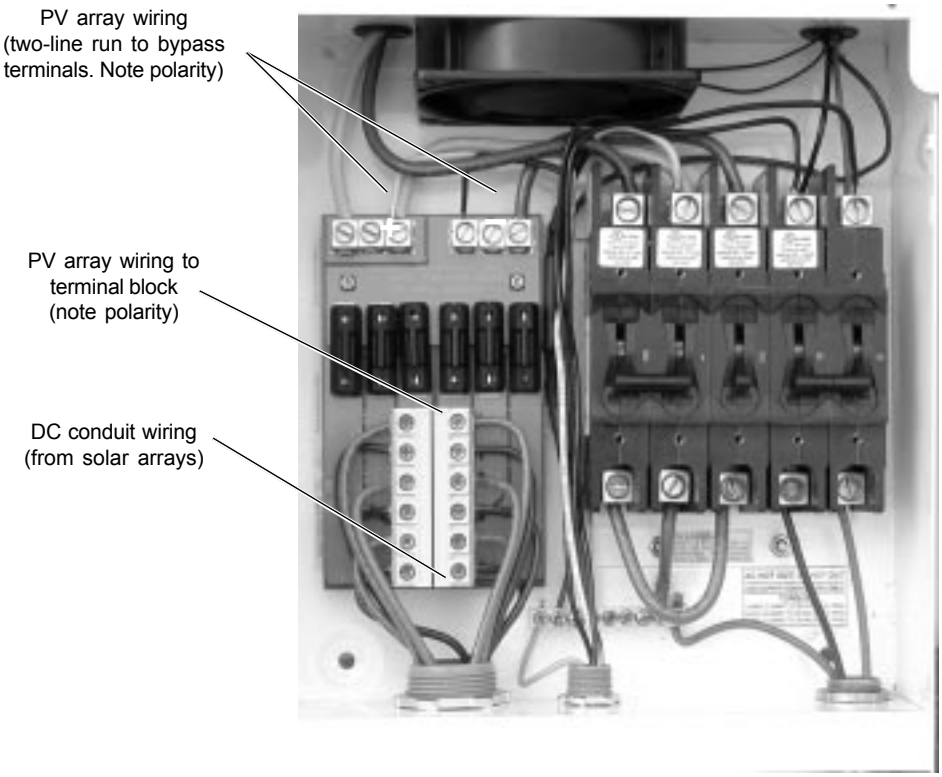


Figure 2-11
PV Array DC Connection Points (STXR1500 and STXR2500)

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: For two-wire runs, use an external, fused combiner and run two wires from the external combiner to the bypass terminals on the combiner board. This bypasses the STXR's combiner terminals and fuses.

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 electrically tied together.

7. Torque wires according to the following table.

Wire Size	Torque (in-lb)
14 -10 AWG	35
8 AWG	40
4 - 6 AWG	45
2 - 1/0 AWG	50

975-000-003

Table 2-12
Wire Torque Values

Wiring: (continued)

STXR1000 and STXR2000 DC Wiring (Refer to Figure 2-12)
PV Array Conduit/Wire Run

1. Install the DC conduit from the PV arrays to the bottom of the Sun Tie, via one of the knockout holes.

2. Route the wires from the PV array through conduit and into the lower section of the Sun Tie enclosure.

3. Connect the positive (+) wire from the array to the lower terminal of the 100 amp DC CIRCUIT BREAKER. Check that the wire is in the proper location and tighten the screw (Figure 2-12).

4. Connect the negative (–) wire from the PV array to the lower connection of the DC NEGATIVE TERMINAL. Check that the wire is in the proper location and tighten the screw (Figure 2-12).

5. Torque all wires according to Table 2-4 (previous page).

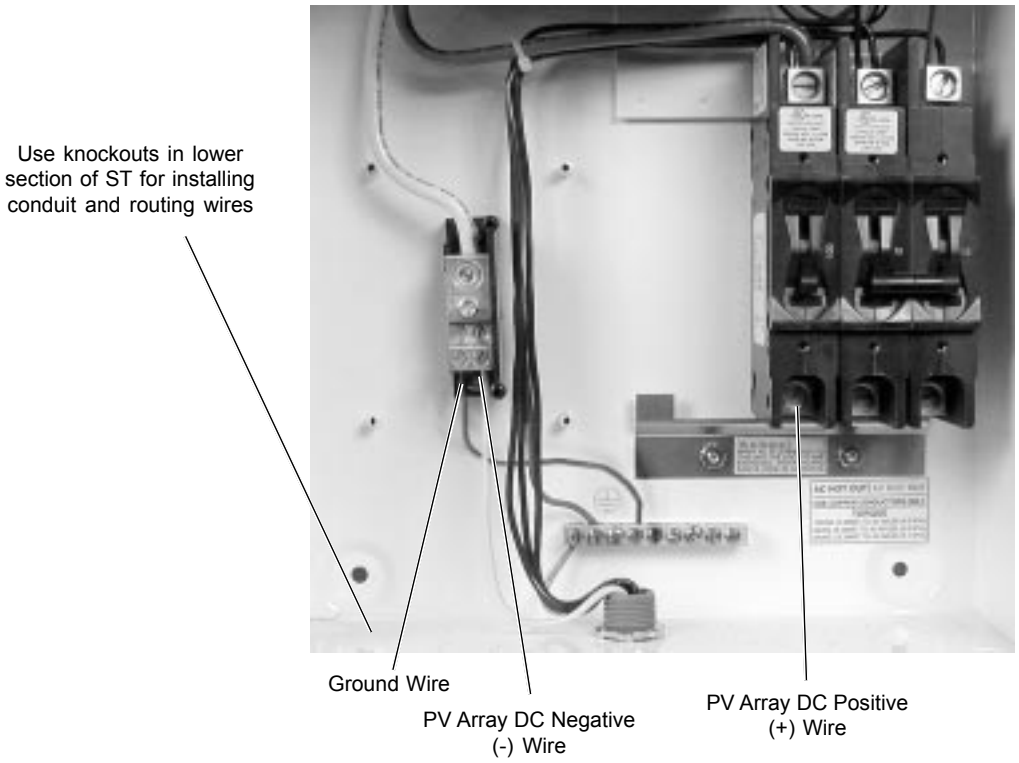


Figure 2-12
PV Array DC Connection Points (STXR1000 and STXR2000)

Wiring: (continued)

AC Wiring

AC HOT wiring is connected to the Sun Tie's L1 and L2 breakers, the ground wire connects to the GROUND bar. All AC wiring is located in the lower section of the Sun Tie.

WARNING: AC UTILITY WIRING TO THE SUN TIE 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 Sun Tie can be connected to a single bidirectional meter, or to dual meters, where one meter indicates power used and the second meter indicates power sold (power supplied back to the utility). The installer and utility must determine the proper components to install.

WARNING: BEFORE WIRING THE SUN TIE, 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 Sun Tie. Run the two HOT wires (L1 and L2) and ground through the conduit and into the Sun Tie'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 Sun Tie. Refer to Figure 2-13 for STXR1500 and STXR2500 or Figure 2-14 for STXR1000 and STXR2000 models.
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 Sun Tie.
5. Connect the ground wire (green or bare copper) from the GROUND bar in the main breaker panel, to the GROUND bar in the lower section of the Sun Tie.
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

975-0003-D-003

Table 2-5
Wire Torque Values

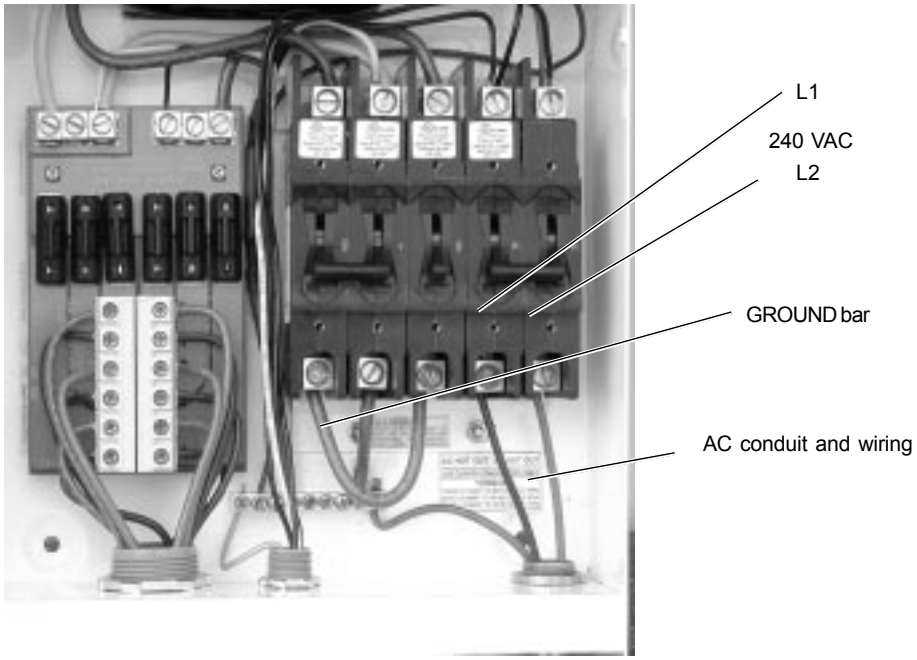


Figure 2-13
240 VAC Connection Points (STXR1500 and STXR2500)

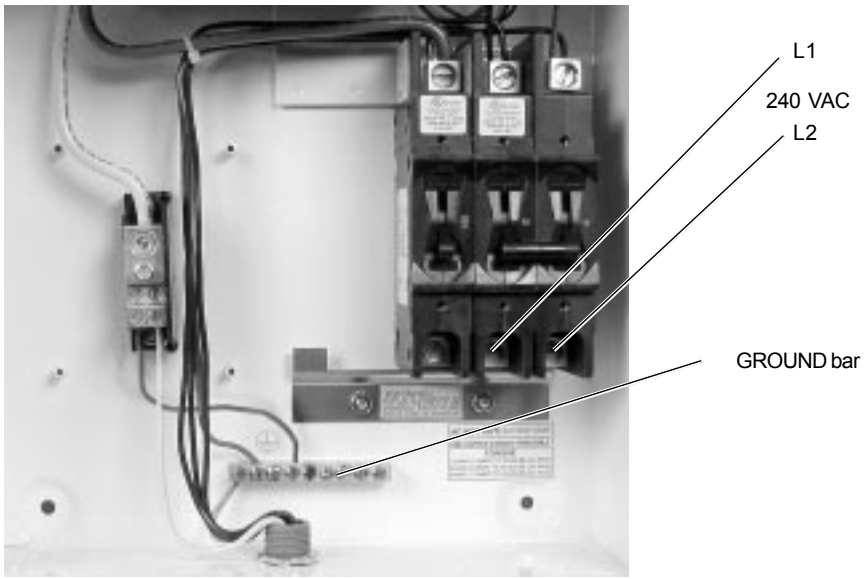


Figure 2-14
240 VAC Connection Points (STXR1000 and STXR2000)

Installing the Optional Remote Monitor

The optional Remote Monitor duplicates the function of the front panel meter and can be mounted in a more accessible location such as the garage, kitchen, living room, etc. Refer to the Remote Monitor's installation guide for installation details.

Wiring to Sun Tie

1. Route the Remote Monitor's six-conductor cable separate from the other wiring, if possible, to prevent noise and interference from being introduced into the data cable. Refer to Figures 2-15 and 2-16. The connector is located in the upper right-hand section of the wiring compartment.

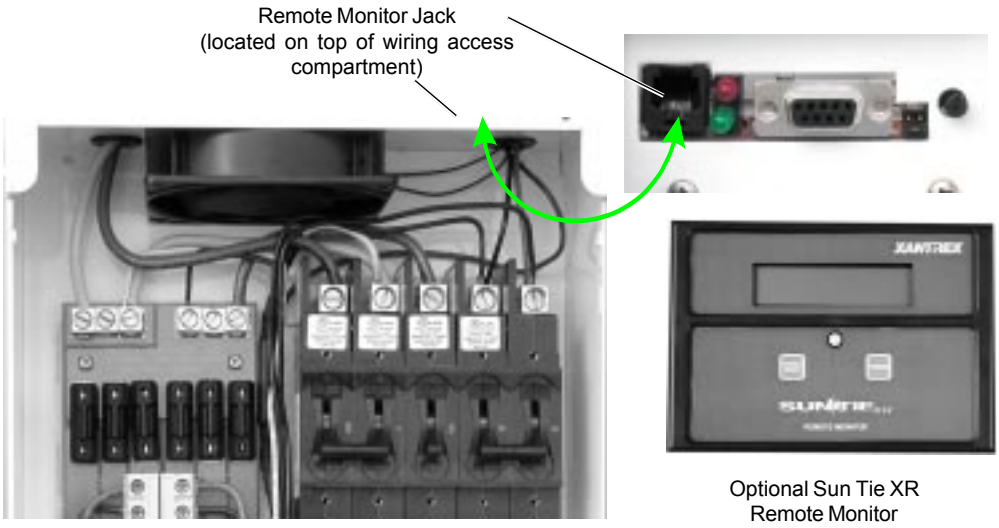


Figure 2-15
Location of the Optional Remote Monitor Jack

CAUTION: THE SERIAL PORT CONNECTION (DB9 CONNECTOR) IS FOR AUTHORIZED FIELD SUPPORT PERSONNEL ONLY. DO NOT CONNECT A PC TO THIS PORT AS DAMAGE MAY OCCUR.

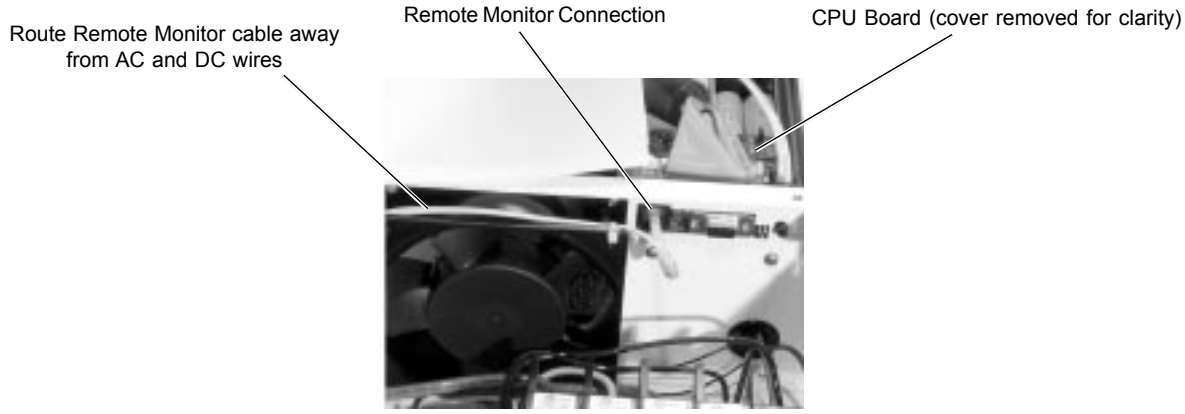


Figure 2-16
Remote Monitor Connection and Cable

2. Run the cable through one of the lower knockouts (with a strain relief installed) and plug it into the Remote Monitor port.

3. Recheck all wiring and reinstall the panels and the Rain Shield (if used).

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 2-17).

If the solar array is located a considerable distance from the Sun Tie, then an additional ground rod must be installed close to the solar array for the most reliable lightning protection (Figure 2-18). 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.

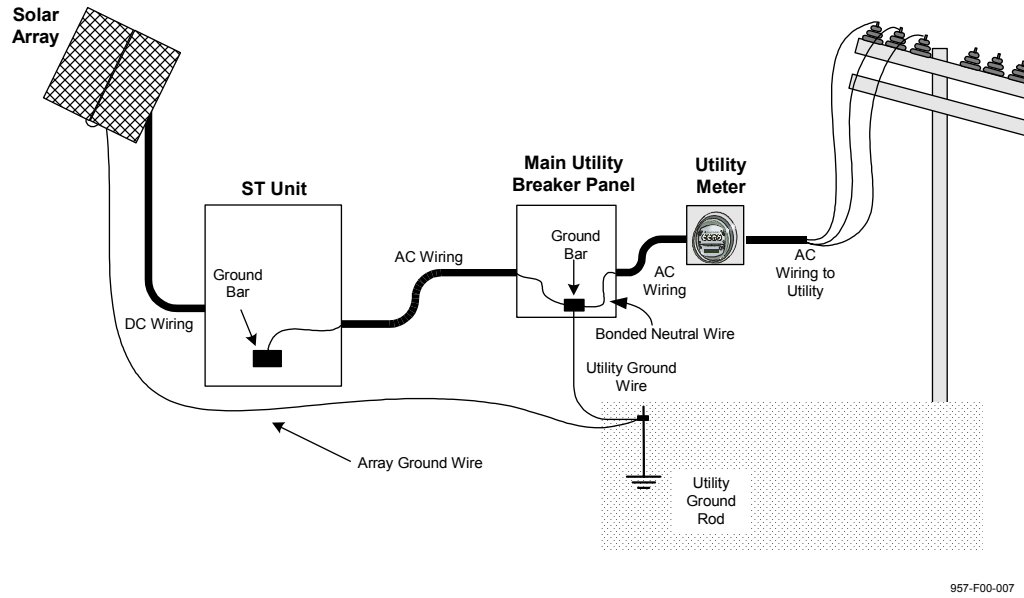


Figure 2-17
Typical Roof Mount Installation Grounding

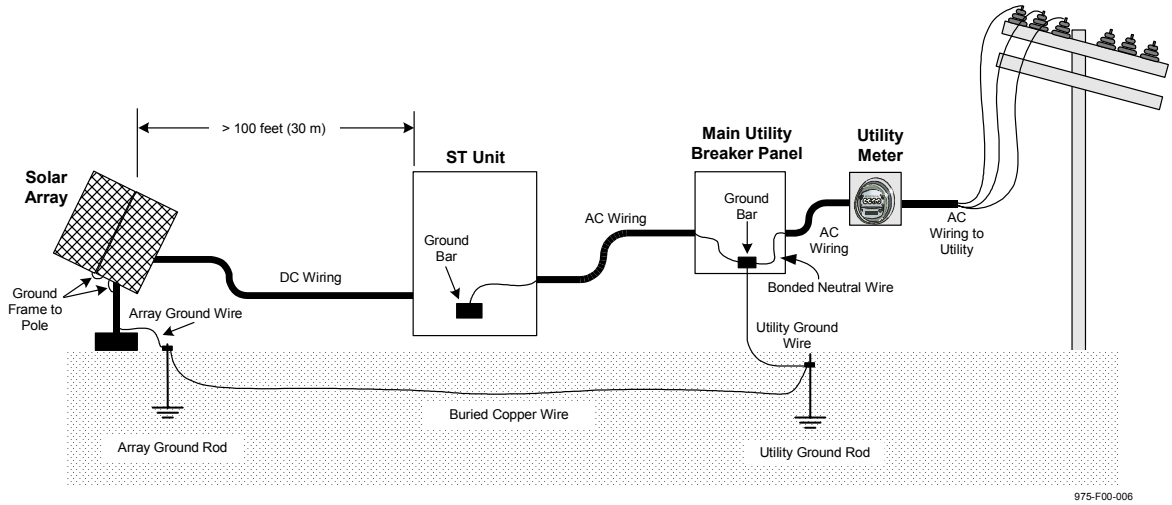


Figure 2-18
Long Distance Grounding

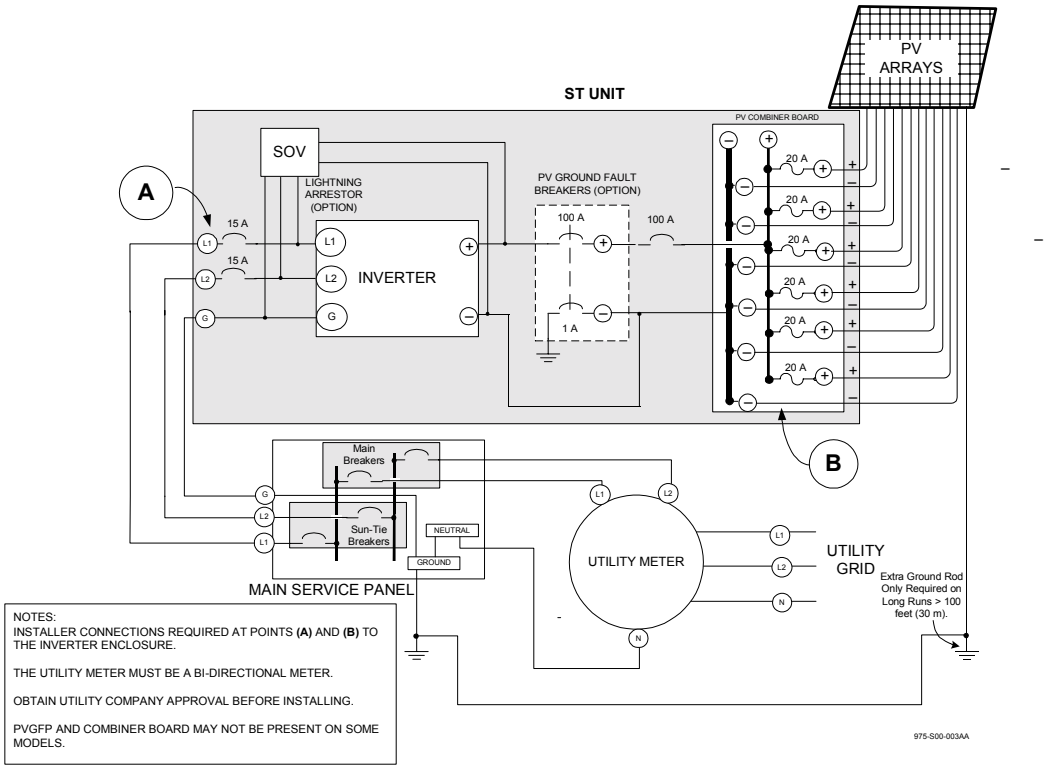


Figure 2-19
Simplified Electrical Wiring Diagram (Typical for STXR1500 and STXR2500)

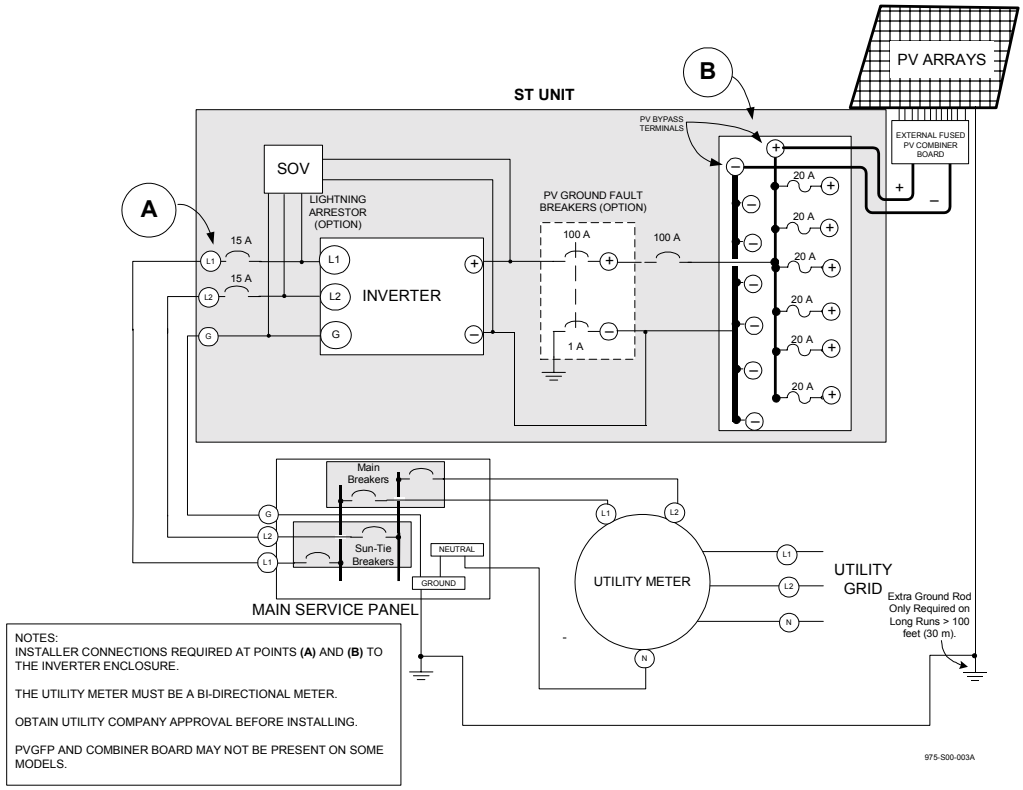


Figure 2-20
Simplified Electrical Wiring Diagram
(using the PV bypass lugs and an externally fused combiner)

3.0 OPERATION

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 (Figure 3-1)

1. Switch ON the MAIN 240 V breakers in the building's electrical service panel.

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

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

4. Using a true rms AC voltmeter, 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 211–264 volts AC.

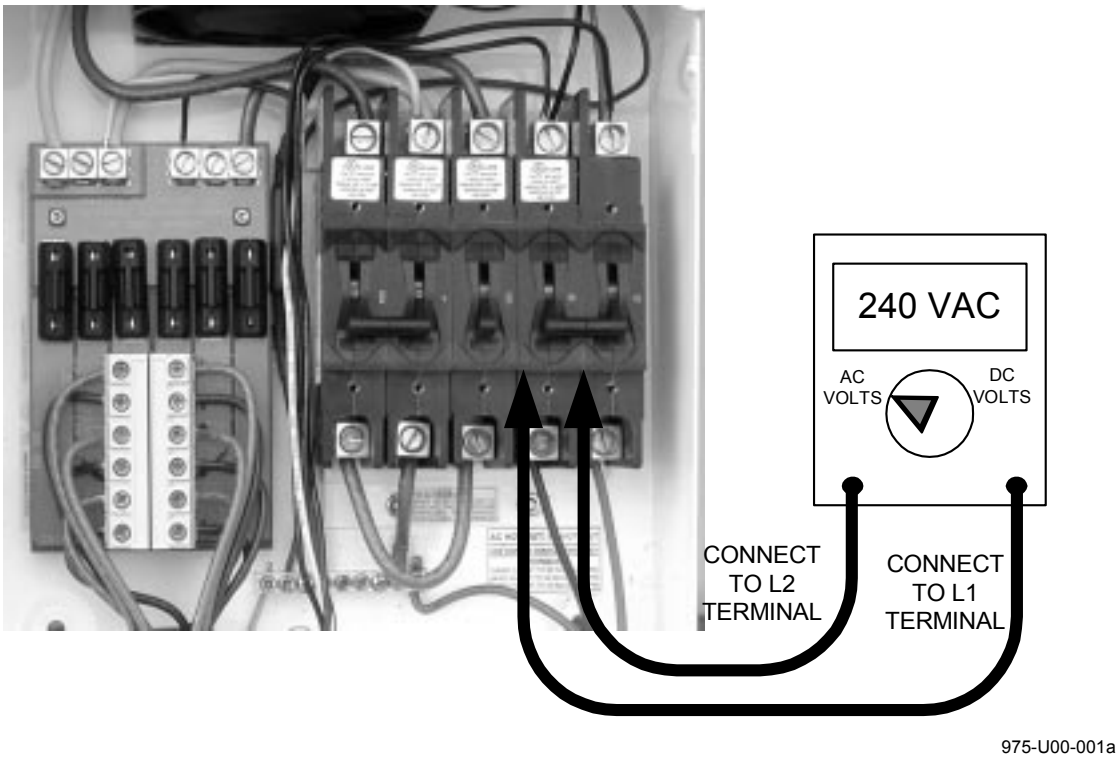


Figure 3-1
Utility 240 Volts AC Test

Start-up Procedure (continued)

Solar Array DC Voltage Check (Figure 3-2 for STXR1500 and STXR2500, Figure 3-3 for STXR1000 and STXR2000 models)

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 across the DC positive (+) and negative (-) terminals. This voltage must be greater than 50 volts DC for 5 minutes minimum to start the inverter.

NOTE: Some thin film modules (amorphous) may produce an open circuit voltages 100-120 volts. Crystalline solar modules will produce open circuit voltages at 75-85 volts (four modules wired in series). 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.

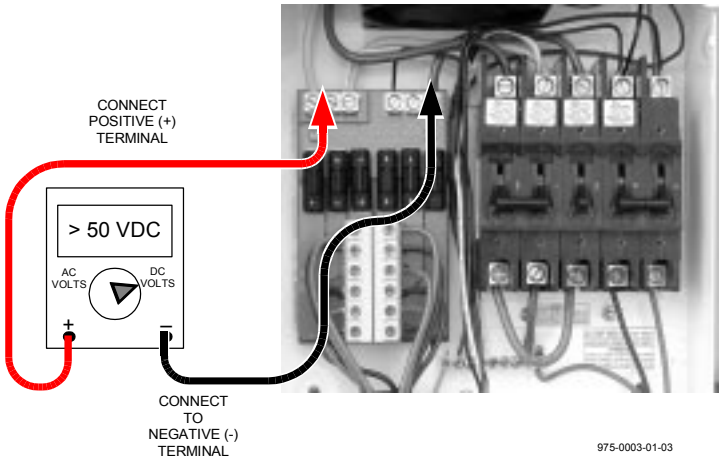


Figure 3-2
Solar Array DC Voltage Test (STXR1500 and STXR2500)

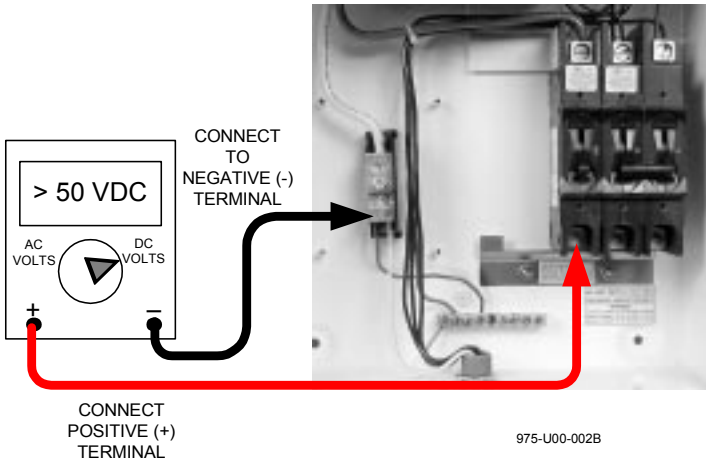


Figure 3-3
Solar Array DC Voltage Test (STXR1000 and STXR2000)

Start-up Procedure (continued)

Operational Test

1. Switch ON the double-pole 15 amp AC circuit breakers located in the Sun Tie unit. These breakers provide the Sun Tie 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). Refer to Figure 3-4, item 1.

2. Switch ON the 100 amp DC circuit breaker located in the Sun Tie unit. This breaker supplies the DC power from the PV array to the ST unit. Refer to Figure 3-4, item 2.

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. Refer to Figure 3-4, item 3.

4. The inverter's Liquid Crystal Display (LCD) displays the Trace name, software revision, and finally operational information during this sequence. During the 5-minute timer, system status and 00000 Wh today appears on the display (Figure 3-5). The inverter will provide two different system status indicators:

   - Connecting
   - Producing Power

   The Sun Tie XR will display “Connecting” while the inverter is counting down the five minute timer, as required by national standards. During successful power production, the inverter will display “Producing Power.”

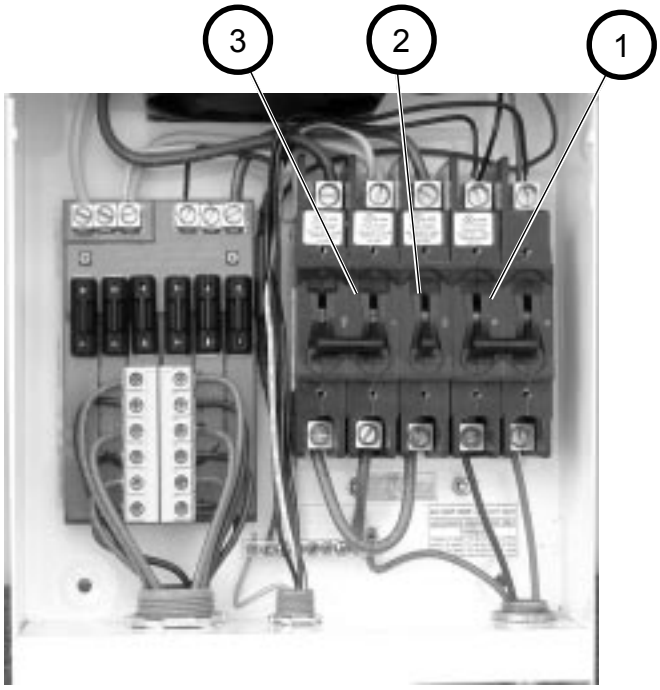


Figure 3-4
Turn-On Sequence

Start-up Procedure (continued)

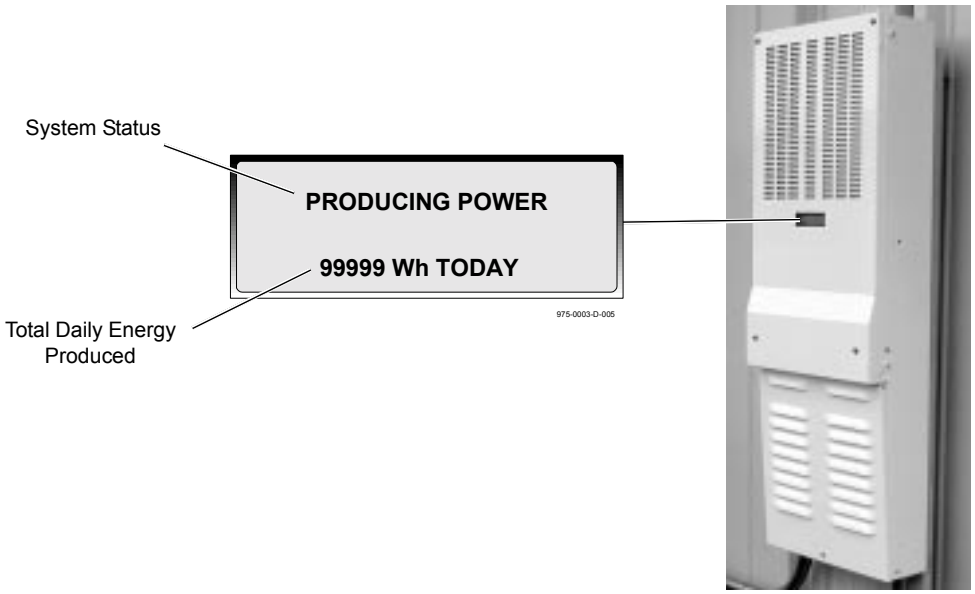


Figure 3-5
LCD Location and Indications

5. Continue to monitor the LCD status meter: (Figure 3-5)
- Ensure the inverter displays the “CONNECTING” status meter. After completion of the five minute wait protection timer, the ST begins selling power indicated by “PRODUCING POWER” in the display and the “00000 Wh” showing ascending values. The array Wh values will increase slowly, depending on the array size and sunlight intensity.

- The *“Sun Sweep”* routine quickly scales down the array open-circuit voltage and attempts to locate the array's maximum power point. Once the inverter detects the maximum power point was passed, it steps back the DC array voltage, selects the maximum power operating voltage and continues to produce power. This process is called *“Sun Sweep.”* The process occurs in several minutes and is initiated each time the inverter starts. This routine may continue several times until the maximum power point is found and may occur several times during the day. After sweeping the array, the inverter will lock on to the array voltage and begin to sell the maximum amount of power possible under the conditions. To monitor the array’s DC voltage at start-up, connect a DC voltmeter as shown in Figures 3-2 and 3-3 or use the Sun Tie remote monitor.

- Throughout the day the *Maximum Power Point Tracking* (MPPT) algorithm, operates an efficient "power sweep" once each minute and can adjust DC voltage twice per second under changing environmental conditions producing maximum kilowatt hours (kWh).

NOTE: The values in the LCD meter are not calibrated.

Start-up Procedure (continued)

6. Replace the circuit breaker panel (Figure 3-6).

- 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 Sun Tie.
- Reinstall the screws on the front of the panel that secure it to the circuit breaker.

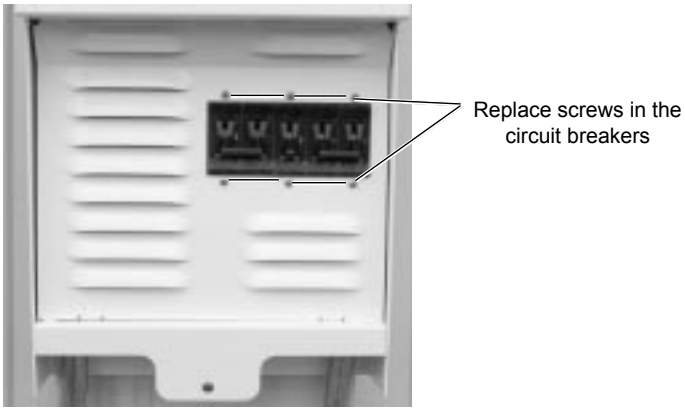


Figure 3-6
Replace Circuit Breaker Cover and Screws

7. Replace the external cover. (Figure 3-7).

- 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.

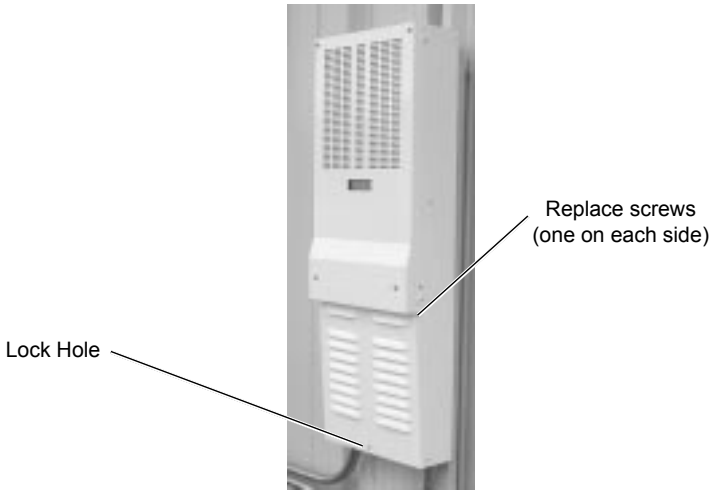


Figure 3-7
Replace Outer Cover and Screws

Start-up Procedure (continued)

8. Install rain shield hood if located outdoors (Figure 3-8).

- Install the rain shield onto the Sun Tie enclosure.
- Secure it with the four screws provided (two each side).

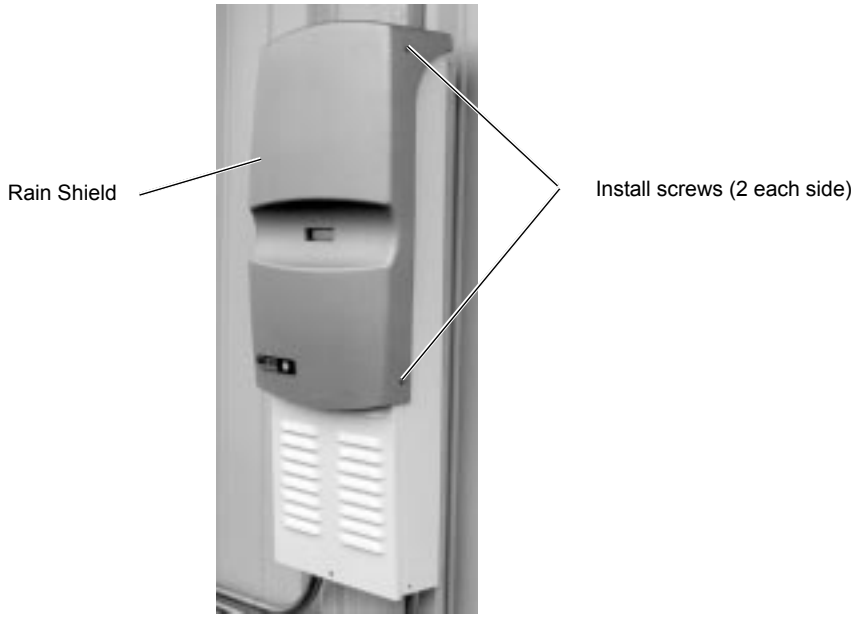


Figure 3-8
Replace Outer Cover and Screws

4.0 TROUBLESHOOTING

Troubleshooting

To aid in troubleshooting the Sun Tie XR, there are two LEDs located on the CPU board accessible after removing the upper cover panel. The LEDs light to indicate the inverters status as per the Troubleshooting table on page 28. The upper cover should be removed only for viewing the inverter status LEDs as dangerous voltages exist in this area. Wait five minutes after disconnecting the inverter before removing the panel to allow the components to discharge. DO NOT REMOVE THIS COVER FOR ANY OTHER PURPOSE.

- Remove the Rain Shield (if installed) by removing the two screws (from each side) securing it to the housing (Figure 4-1). Set the screws aside in a safe place.
- Remove the upper external panel by removing the four screws located on the front of the panel (Figure 4-1). Set the screws aside in a safe place.
- Locate the red and green LEDs on the CPU board (see Figure 4-2).
- Refer to the Troubleshooting table (on page 28) for the LED status indications.

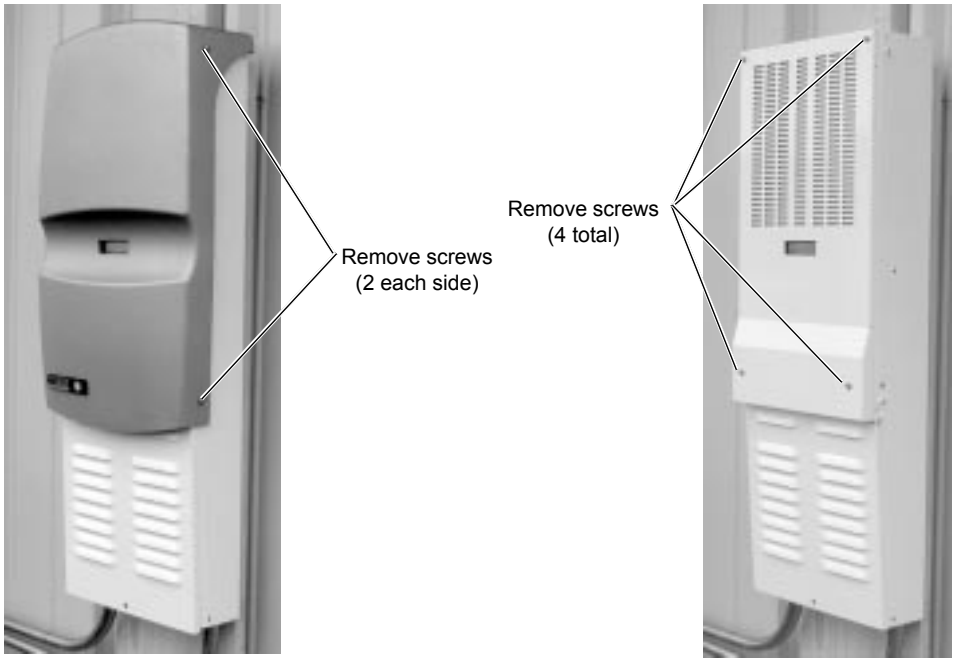


Figure 4-1
Rain Shield and Upper Panel Removal

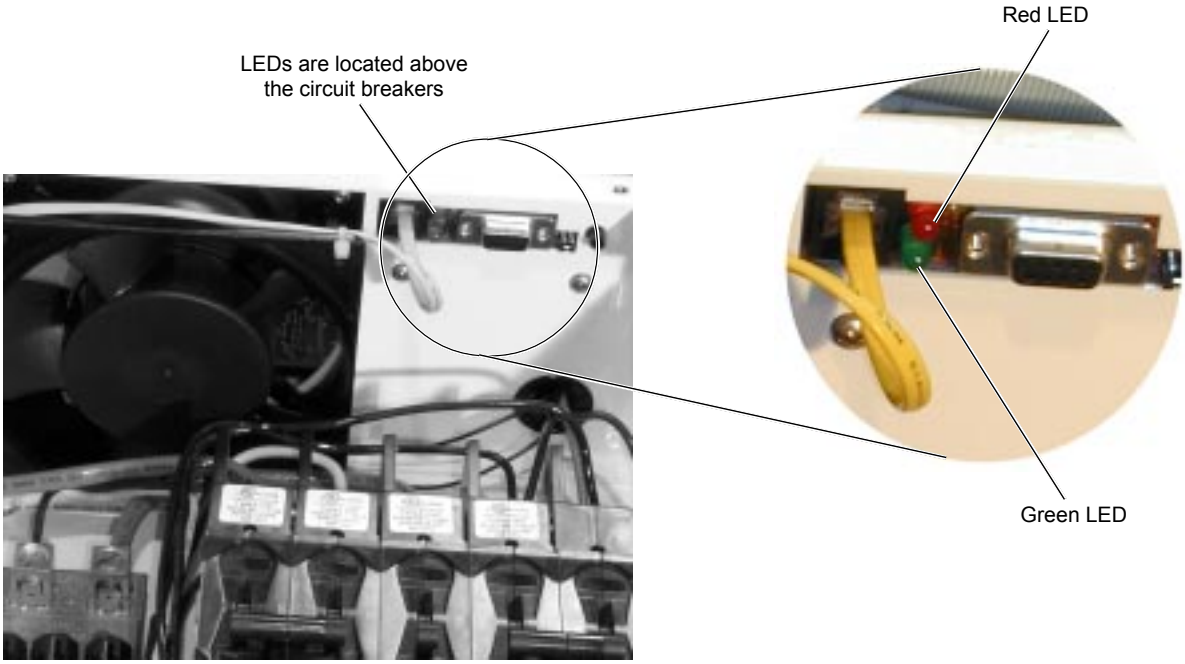


Figure 4-2
Troubleshooting LEDs Location

CAUTION: THE SERIAL PORT CONNECTION (DB9 CONNECTOR) IS FOR AUTHORIZED FIELD SUPPORT PERSONNEL ONLY. DO NOT CONNECT A PC TO THIS PORT AS DAMAGE MAY OCCUR

4.0 TROUBLESHOOTING

Problem	Cause	Remedy
Inverter CPU does not illuminate the red or green LEDs and does not operate in sufficient sunlight.	PVGFP, AC or DC breakers are switched OFF.	Turn ON breakers in the sequence described in the operating 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 on the inverter's disconnect.
	20 amp fuse on combiner board are missing or open.	Install combiner board fuses. Check PV array for short circuits or improper sizing for the 20 amp fuse.
The inverter CPU only illuminates the red LED. The green LED never illuminates in a flashing or solid mode.	The inverter does not recognize any AC input signal.	Ensure the inverter AC disconnect is switched ON. Check the AC voltage at the inverter and ensure AC voltage is present. Check source of the AC voltage.
	Inverter does not recognize the appropriate DC signal.	Check the DC voltage on the positive and negative input terminals. The DC voltage must be 50 volts or greater open circuit to initiate inverter operation. Check for incorrectly wired PV arrays or try again on a day with brighter sunlight intensity.
The inverter illuminates the red LED upon startup and goes into a flashing green mode. The flashing green LED continues for over 5 minutes and never illuminates solid.	The inverter recognizes the AC grid is present, but grid voltage or frequency are not within the appropriate tolerances.	Check the AC voltage and frequency with a multimeter/frequency meter. Wait for grid power to return to acceptable voltage and/or frequency. Notify the utility company that the voltage of frequency is outside of the appropriate boundries.
The inverter CPU illuminates a solid green LED momentarily, then flashes a red LED.	The inverter recognizes the AC grid and DC array voltages and attempts to start selling power. The PV panels are not producing sufficient power for the inverter to operate at a stable DC voltage.	Check the DC input voltage at the inverter's positive and negative input terminals. The PV array is not producing enough power. Wait for sunlight intensity to increase and ensure the panels produce sufficient voltage for inverter initialization.
100 amp DC breaker trips.	Current from the array exceeds the DC input breaker rating.	Check array size and ensure the DC input does not exceed the 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.
Open 20 amp combiner board fuse(s).	A short to ground exists in the DC array wiring.	Check all DC array wiring for improper wiring or exposed wires.
	Array is producing current in excess of the fuse rating.	Check array size and ensure the DC input current does not exceed the fuse rating.
PVGFP breaker trips.	A ground fault exists in the DC array wiring.	Check all PV array wiring for improper wiring, exposed wires, or short circuits.

975-0003-O-001

Electrical Specifications	STXR1000	STXR1500	STXR2000	STXR2500
AC input voltage	240 VAC			
AC input Voltage range	211–264 VAC			
Continuous AC output @ 25 °C	1,000 VA	1,500 VA	2,000 VA	2,500 VA
Efficiency (peak)	92%		94%	
AC output characteristics	Current source			
Frequency (nominal)	60 Hz (+ 0.5 Hz, - 0.7 Hz default per IEEE929 and UL 1741)			
Input voltage (nominal) Typically four nominal 12 VDC PV modules	48 VDC			
Sunsweep™ Maximum Power Point Tracking voltage range	42–85 VDC			
Minimum input DC voltage (for full power output)	52 VDC			
Minimum wake-up DC input voltage	50 VDC			
Absolute Maximum PV open circuit voltage (Voc)	125 VDC			
AC output waveform	Sine wave, high frequency PWM controlled			
Total harmonic Distortion	less than 5% at rated power per IEEE929 and UL1741			
Mechanical Specifications				
Specified temperature range (operating) (non-operating)	-38–113 °F (-39–45 °C) -40–140 °F (-40–60 °C)			
Enclosure Type	Outdoor, rainproof*, powder coated aluminum enclosure, fully screened			
Dimensions (inverter only)	33.25"H x 13.25"W x 5.3"D (83.1 cm H x 33.8 cm W x 13.25 cm D)			
Dimensions (shipping)	37.75"H x 15.75"W x 9.5"D (94.4 cm H x3 9.4 cm W 2x 3.8 cm D)			
Weight (inverter only)	35 lb (15.9 kg)			
Weight (shipping)	40 lb (18 kg)			
Mounting	Vertical wall mount only			
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
Lightning Arrestor–combined AC/DC protection	Standard			
***Rain Shield (STRS) protective rain shield (required for outdoor installation)**	Option			
STRM- Remote Monitor Optional remote display of status, resettable Wh meter, tech menu, and daily energy harvested, includes 50 ft. cable	Optional Accessory			
Forced air cooling	Standard forced air DC brushless fan			
Islanding protection	Standard over/under AC voltage and frequency detection plus active islanding protection–meets IEEE 929 and UL1741 requirements			
User display	Standard backlit alphanumeric LCD display for system status and daily energy harvest (Wh)			
AC disconnect	Standard double-pole, 15 amp, 240 VAC branch rated circuit breaker			
DC disconnect	Standard single-pole, 100 amp, DC rated circuit breaker			
Listings	UL Listed to UL1741–1999 and cUL Listed to CSA C22.2 No. 107.1-95			

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

975-0003-T-003

Optional Accessories for the *Sun Tie XR* from Xantrex

- **STRM–Sun Tie Remote Meter**
  A remote display for mounting up to 50 feet (15 meters) away from the inverter. Provides system status, daily Wh produced, total Wh produced since installed, with a resettable Wh meter. The STRM includes displays specific for user and screens for installation/ troubleshooting. The *Sun Tie XR* remote compliments any green power generating system and may be conveniently located inside a residence or business for easy monitoring.

- **STRS–Sun Tie XR Rain Shield**
  A rainproof shield for outdoor *Sun Tie XR* installations.

6.0 SERVICE INFORMATION

Xantrex 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:

STXR 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

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

- arising out of material or workmanship not provided by Xantrex or its Authorized Service Centers;
- when the product is installed or exposed to an unsuitable environment as evidenced by generalized corrosion or biological infestation;
- resulting from abnormal use of the product, alteration, or use in violation of the instructions;
- in components, parts, or products expressly warranted by another manufacturer.

Xantrex agrees to supply all parts and labor to repair or replace defects covered by this warranty with parts or products of original or improved design at the company's option. Xantrex also reserves the right to improve the design of its products without obligation to modify or upgrade those previously manufactured. Defective products must be returned to Xantrex or its Authorized Service Center in the original packaging or equivalent. The cost of transportation and insurance on items returned for service is the responsibility of the customer. Return transportation (UPS Ground or equivalent) as well as insurance on all repaired items is paid by Xantrex.

All remedies and the measure of damages are limited to the above. Xantrex shall in no event be liable for consequential, incidental, contingent, or special damages, even if Xantrex 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 states or counties 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.

Xantrex Technology Inc.
5916 195th Northeast
Arlington, WA 98223
U.S.A.
t: 360/435.8826
f: 360/435.3945
www.xantrex.com

P/N 975-0003-01-03 Rev. A 05/01

Printed in U.S.A.

XANTREX
Smart Choice For **Power**