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GT4.0-NA-240/208-POS UL-05

GT3.8-NA-240/208 UL-05

GT3.3N-NA-240/208 UL-05
GT3.3-NA-240/208 UL-05
GT3.3-NA-240/208-POS UL-05

GT2.8-NA-240/208 UL-05
GT2.8-NA-240/208-POS UL-05

Owner's Manual

Xantrex Grid Tie Solar Inverter

www.xantrex.com

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Owner's Manual

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864-1002-02 GT2.8-NA-240/208-POS UL-05

Contact Information

Telephone:	1 866 519 1470 (toll free North America) 1 650 351 8237 (direct)
Fax:	1 604 422 2756 (direct)
Email:	customerservice@xantrex.com
Web:	www.xantrex.com

About This Manual

The purpose of this Owner's Manual is to provide explanations and procedures for installing, operating, maintaining, and troubleshooting the Xantrex Grid Tie Solar Inverter.

Scope

The manual provides safety guidelines as well as detailed planning and setup information. It provides procedures for installing, operating, and troubleshooting the inverter. It does not provide details about particular brands of photovoltaic (PV) panels. Consult individual PV manufacturers for that information.

Audience

Chapter 1 and Chapter 5 are intended for anyone who needs to operate the Xantrex Grid Tie Solar Inverter. Operators must be familiar with all the safety regulations pertaining to operating high-voltage equipment as dictated by local code. Operators must also have a complete understanding of this equipment's features and functions. Do not use this product unless it has been installed by qualified personnel in accordance with the instructions in Chapter 2, "Installation".

Chapter 2, Chapter 3, Chapter 4, and Chapter 6 are intended for qualified personnel who need to install the Xantrex Grid Tie Solar Inverter. Qualified personnel have training, knowledge, and experience in:

- installing electrical equipment and PV power systems (up to 1000 V).
- applying all applicable installation codes.
- analyzing and reducing the hazards involved in performing electrical work.
- selecting and using Personal Protective Equipment (PPE).

Installation, commissioning, and maintenance of the GT Inverter must be done only by qualified personnel.

Organization

This manual is organized into six chapters and an appendix.

Chapter 1 contains information about the features and functions of the Xantrex Grid Tie Solar Inverter.

Chapter 2 provides instructions for installing the GT Inverter. It contains information on determining a suitable location for installation, PV array requirements, and procedures for mounting the unit.

Chapter 3 provides information about DC and AC wiring as well as grounding the GT Inverter and the PV array.

Chapter 4 provides instructions for starting the Xantrex Grid Tie Solar Inverter and performing a functional test.

Chapter 5 contains information about the LCD screens and the LED indicators.

Chapter 6 contains information on general maintenance of the Xantrex Grid Tie Solar Inverter. It also provides information about troubleshooting the unit.

Appendix A contains specifications for the Xantrex Grid Tie Solar Inverter.

Abbreviations and Acronyms

AHJ	Authority Having Jurisdiction
CEC	California Energy Commission
CSA	Canadian Standards Association
GFDI	Ground Fault Detector/Interrupter
GT	Grid Tie
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MPPT	Maximum Power Point Tracking
NEC	US National Electrical Code NFPA-70
PV	Photovoltaic
PVGFP	PV Ground Fault Protection
STC	Standard Test Condition
UL	Underwriters Laboratories
VAC	Volts AC
VDC	Volts DC
VMPP	Voltage at Maximum Power
VOC	Open Circuit Voltage

Conventions Used

The following conventions are used in this guide.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, can result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous condition which, if not avoided, can result in minor or moderate injury.

NOTICE

NOTICE indicates a situation that can result in property damage if not avoided.

Note: These notes describe things which are important for you to know, but not as serious as a notice, caution, warning, or danger.

Symbols Used

	Ground
	In this guide: Important information, warnings, or cautions. On the product: Important information, warnings, or cautions with further explanation in the product guide.
	On the product: Warning – risk of electric shock.
	On the product: Warning – hot surface, risk of burns.
	On the product: Danger – hazard of electric shock, explosion, or arc flash.

Related Information

You can find more information about Xantrex Technology Inc. as well as its products and services at **www.xantrex.com**.

Important Safety Instructions

SAVE THESE INSTRUCTIONS—This manual contains important safety and operating instructions that must be followed during the installation, operation, and maintenance of the Xantrex Grid Tie Solar Inverter. Read and keep this manual for future reference.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

No user serviceable parts inside. To be installed and serviced only by qualified personnel equipped with appropriate personal protective equipment and following safe electrical work practices.

Do not use the GT Inverter in connection with life support systems, medical equipment, or where human life or medical property may be at stake.

Before installing and using the GT Inverter, read all instructions and cautionary markings on the inverter, wiring box, and all appropriate sections of this guide.

Energized from two sources: PV array when exposed to light and AC grid. Before opening doors or covers, consult system diagram to identify all sources; de-energize, lock-out, and tag-out all sources; and wait at least five minutes for internal capacitors to discharge to safe voltages.

Before servicing, test using a meter rated at least 1000V AC and DC to ensure all circuits are de-energized.

Provided with integral PV ground fault protection. Normally GROUNDED conductors may be UNGROUNDED and ENERGIZED when a GROUND FAULT is indicated. Disconnect all sources of power before opening.

Employs field adjustable voltage and frequency set points and time delays that are factory set in compliance with local utility and safety requirements and may be changed only by trained technicians with approval by both the local utility and equipment owner.

To reduce shock, fire, and energy hazards, the installation must be in accordance with all applicable local installation codes. It is the installer's responsibility to ensure adherence to applicable codes.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

To avoid a risk of fire and electric shock, make sure that all wiring is in good condition and that wire is not undersized. Do not operate the GT Inverter with damaged or substandard wiring.

The GT Inverter must be connected to the AC ground from the utility via the GT Inverter ground lug.

A DC grounding electrode conductor may be required by the Authority Having Jurisdiction (AHJ). Use the GT Inverter ground bar for this connection.

The “AC–N” connection is for voltage sensing only and is not used as a current carrying conductor. It is not internally bonded to ground within the inverter.

Do not operate the GT Inverter if it has received a sharp blow, been dropped, or otherwise been damaged in any way. If the GT Inverter is damaged, see the Warranty section.

Use only accessories recommended or sold by the manufacturer.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

HAZARD OF BURNS OR FIRE

Do not touch the heat sink. Under some conditions the GT Inverter heat sink can reach temperatures hot enough to cause skin burns if touched. Make sure that the GT Inverter is located away from normal traffic areas.

Observe the clearance recommendations as described on page 2–7.

Do not install the GT Inverter in a zero-clearance or unventilated compartment.

Failure to follow these instructions can result in personal injury or equipment damage.

Safety and Data Labels

The figure below shows the location of the external safety labels and the data label with model, serial number, and part number information.

FCC Information for the User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and—if not installed and used in accordance with the instructions—may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception—which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to a different circuit from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Contents

A Specifications

1 Introduction

Chapter 1 contains information about the features and functions of the Xantrex Grid Tie Solar Inverter.

About the Xantrex Grid Tie Solar Inverter

The Xantrex Grid Tie Solar Inverter (GT Inverter) is designed to convert solar electric (photovoltaic or PV) power into utility-grade electricity that can be used by the home or sold to the local power company.

Installing the GT Inverter consists of mounting it to the wall and connecting the DC input to a PV array and the AC output to the utility. See Figure 1-1 for a simple diagram of a typical installation.

In order to operate, the GT Inverter must have grid power available and connected. It will not provide backup power if the AC grid fails.

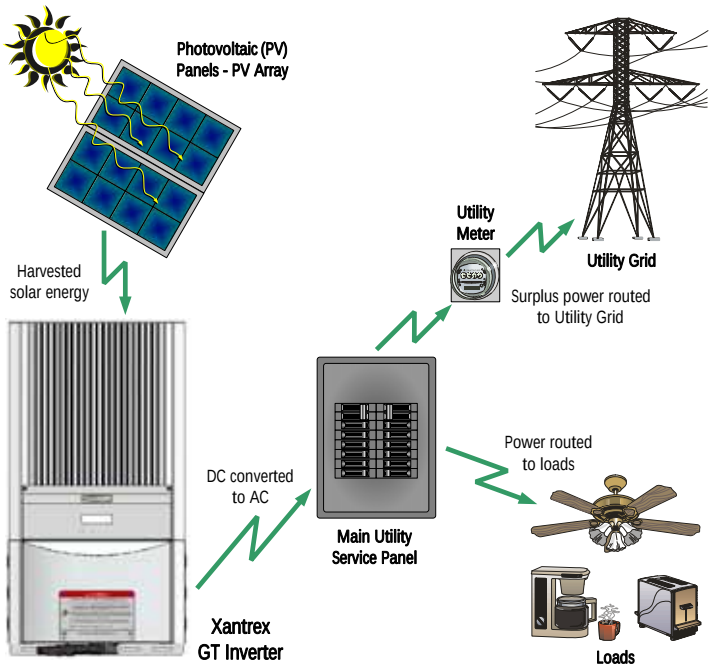

Figure 1-1 Basic System Overview

PV compatibility	The GT Inverter is designed to take advantage of solar modules configured as high voltage PV string arrays—single crystalline, poly crystalline, or thin film—with an input voltage Maximum Power Point range (depending on inverter model) of 195 to 550 VDC, 240 to 550 VDC, 240 to 480 VDC, or 200 to 400 VDC. See "Electrical Specifications" on page A–1 for more information.
Utility grid compatibility	The GT Inverter can operate on either 240 V or 208 V nominal grid voltage. The inverter senses the phase-to-phase voltage and automatically changes the power limit value for each grid voltage. The disconnect thresholds (see "Adjustable Voltage, Frequency, and Reconnection Settings" on page A–12) remain the same because both nominal voltages have the same 120 VAC phase-to-neutral thresholds.
Maximum Power Point Tracking (MPPT)	The GT Inverter uses Xantrex proprietary Maximum Power Point Tracking (MPPT) technology to harvest the maximum amount of energy from the solar array. Xantrex MPPT learns your array's specific characteristics, maximizing its output at all times.
High efficiency	The high-frequency, solid-state design of the GT Inverter is extremely efficient. See Appendix A, "Specifications" for the efficiency ratings of each model.
Positive-ground models	Xantrex offers positive-ground models (designated by the -POS suffix in the model name) designed to work with positive-grounded PV arrays. Some brands of PV modules require positive grounded arrays for increased power harvest. Although most PV modules work fine with negative-ground GT Inverter models, the installer must confirm the PV array grounding type with the module manufacturer before installing the inverter.
Expandable	Multiple GT Inverters may be networked together for increased net metering capacity or future system growth. All models have adjustable voltage and frequency disconnect settings and can be aggregated above 30 kW on a single point-of-common-coupling (PCC). See "Adjustable Voltage, Frequency, and Reconnection Settings" on page A–12.
Communications protocol	The GT Inverter uses the Xanbus™ communications protocol, enabling it to communicate with multiple units connected within the system. For more information, see "Xanbus Network Technology" on page 3–19.

Standard Features

The GT Inverter has the following standard features:

- sealed inverter section protecting power electronic components
- liquid Crystal Display (LCD) providing easy-to-read system status and daily cumulative energy production information
- two LED indicator lights providing status and ground fault indication
- wiring/disconnect box providing protection for all AC and DC connections and eliminating exposed "live" wiring if the inverter is removed

Front Panel Features

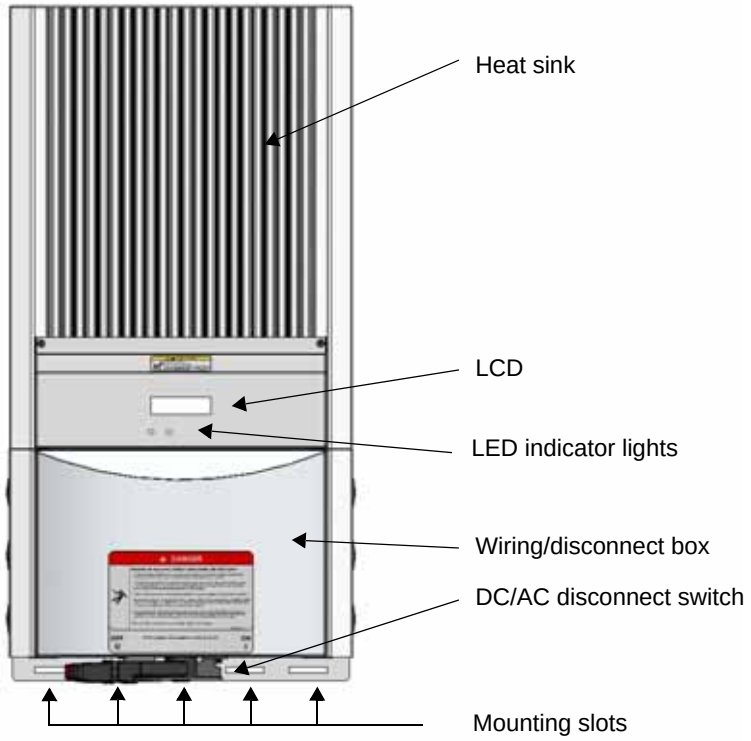

Figure 1-2 Main Features of the GT Inverter

Wiring/Disconnect Box

The wiring/disconnect box is standard on all North American models of the GT Inverter. The wiring/disconnect box provides a location for making AC, DC, and ground connections. It also contains the DC/AC (PV array/utility) disconnect switch. When used in conjunction with the GT Inverter, the DC/AC disconnect switch is suitable for disconnecting both AC and DC input voltages up to 600 volts. The switch is lockable and meets the requirements of NEC Section 690 as a means of disconnect, subject to acceptance by your local AHJ.

The wiring/disconnect box has been designed to be physically mated to the electronics section of the GT Inverter at the factory, but it remains in place as a non-serviceable item in the event that the inverter electronics section must be removed. The inverter and wiring/disconnect box together form a NEMA 3R enclosure to allow outdoor installation.

In jurisdictions where the local utility requires that the AC disconnect be capable of being locked in the open position by its service personnel, this disconnect switch can also serve as a lockable isolating device.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The 600 volt DC/AC disconnect in the wiring/disconnect box meets NEC Article 690 requirements. It is a non-serviceable component and shall remain in place. Separating the inverter and wiring/disconnect box, or removing the wiring/disconnect box cover can expose energized conductors. PV input circuits in the wiring box ahead of the switch remain energized even when the switch is in the OFF position—hazardous voltage will still be present on the DC input (PV) terminals under the clear plastic insulation barrier inside the wiring/disconnect box.

No user serviceable parts inside.

To be installed and serviced only by qualified personnel equipped with appropriate personal protective equipment and following safe electrical work practices.

Energized from two sources: PV array when exposed to light and AC grid. Before opening doors or covers, consult system diagram to identify all sources; de-energize, lock-out, and tag-out all sources; and wait at least five minutes for internal capacitors to discharge to safe voltages.

Before servicing, test using a meter rated at least 1000V AC and DC to ensure all circuits are de-energized.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

In North America and other locations, the wiring/disconnect box is an electrical code requirement. Regulatory approval is based on the wiring/disconnect box always being attached to the inverter during operation. Any attempt to remove this box will invalidate the approvals and create an electrical hazard. Make sure the wiring/disconnect box is correctly installed in all applications.

Failure to follow these instructions will result in death or serious injury.

2 Installation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The Xantrex Grid Tie Solar Inverter must be installed and serviced only by qualified personnel equipped with appropriate personal protective equipment and following safe electrical work practice and all applicable code requirements.

Failure to follow these instructions will result in death or serious injury.

Chapter 2 provides instructions for installing the GT Inverter. It contains information on determining a suitable location for installation, PV array requirements, and procedures for mounting the unit.

The topics in this chapter are organized as follows:

Installation Options

The GT Inverter can be installed as a single inverter for a single PV array of one to three PV strings. When two or more PV strings are connected, the existing wiring/disconnect box can serve as a fuse box, but fuse holders and fuses must be purchased and installed. See “Combiner Fuses (Optional)” on page 3–6 for details.

The GT Inverter can also be installed in a multiple inverter configuration. If multiple inverters are used, each inverter must be wired to an independent PV array.

Enable communication between inverters by installing network cabling to the inverter RJ-45 ports. See “Connecting Network Cable Between Multiple Inverters” on page 3–23.

Planning the Installation

Make sure you have obtained all permits required by local authorities or utilities before beginning installation.

Installation Codes

Governing installation codes vary depending on the specific location and application of the installation. Some examples include the following:

- The U.S. National Electrical Code (NEC)
- The Canadian Electrical Code (CEC)
- The U.S. Code of Federal Regulations (CFRs)
- Canadian Standards Association (CSA)

It is the installer’s responsibility to ensure that all applicable installation requirements are met.

Inverter Location

⚠CAUTION

HAZARD OF BURN

In extreme conditions, the GT Inverter chassis can reach temperatures over 70 °C (158 °F), which can cause skin burns if accidentally touched.

Make sure the GT Inverter is located away from normal traffic areas.

Failure to follow these instructions can result in personal injury.

Inverter failure due to improper installation will void the inverter's warranty. Consider the following when determining where to install the inverter:

Indoor/ Outdoor

- The GT Inverter uses a Type 3R-rated enclosure (vertical mount only) that can be mounted indoors or outdoors. Type 3R enclosures are intended for outdoor use primarily to provide a degree of protection against falling rain and to be undamaged by the formation of ice on the enclosure.
- While the 3R-rated enclosure protects the GT Inverter from moisture, outdoor installations should be located away from lawn sprinklers and other sources of spray.
- A sun shade is recommended for outdoor installations. In bright sun conditions, when the GT Inverter is at or near full output with an ambient temperature above 40 °C (104 °F), shading the unit will help increase inverter performance. A sun shade can also protect the inverter from dust, debris, and birds. The sun shade should be made from an opaque (dark) material to provide shade for the heat sink. It should be large enough and positioned so that it shades the heat sink when the inverter is operating at full power—usually a four-hour time period centered around noon. Make sure the shade is installed according to the minimum clearances specified on page 2–7.

Orientation

- The GT Inverter must be mounted vertically on a wall or pole.
- Do not mount the GT Inverter horizontally.
- If mounting the inverter indoors on a south-facing wall, make sure the wall is insulated to reduce the amount of heat absorbed by the inverter. Unless walls are properly insulated, avoid mounting the inverter indoors on any wall that is directly exposed to the sun.

Temperature

- Make sure the GT Inverter is mounted in a location where the ambient temperature range is –25 to +65 °C (–13 to +149 °F).
- Above 40 °C (104 °F), the GT Inverter may derate power output. See "Output Power vs. Ambient Temperature" on page A–13 and "Environmental Specifications" on page A–13.
- At extremely cold temperatures, the front panel LCD may not function normally.

Distance

- To minimize resistance and resulting power loss, make sure the wire lengths between the PV array and the GT Inverter and between the inverter and the main utility service panel are kept to a minimum.
- Maximum distances will depend on the wire gauges used and PV array output voltages. To minimize system failures due to AC voltage faults, Xantrex recommends sizing the AC and DC wiring to have a maximum 1 to 1.5% voltage drop.

Debris free

- Excessive debris (such as dust, leaves, and cobwebs) can accumulate on the unit, interfering with wiring connections and ventilation. Do not install in a location where debris can accumulate (for example, under a tree).

MPPT Requirements

MPPT operational window

The MPPT software maximizes the output energy of solar arrays as long as the operating voltage is within the MPPT operational window of the inverter. Make sure the open circuit voltage (VOC) of the PV array is within the MPPT operational window. See “Input voltage, Maximum Power Point range” in Appendix A, “Specifications” for the MPPT operational window of each GT Inverter model.

Effects of array voltages outside of the MPPT operational window are shown in Table 2-1.

Table 2-1 MPPT Operational Window

Voltage	Effect of Array Voltage	Inverter Mode
VOC < Lower limit of MPPT range	Inverter not operating.	Offline
VMPP < Lower limit of MPPT range (VOC > Lower limit of MPPT range)	Operating voltage shifts to lower limit of MPPT range; the array is not at its maximum power point.	Online (low power)
VMPP within MPPT range	Maximum harvest of solar energy.	Online (MPPT window)
VMPP between upper limit of MPPT range and absolute maximum VOC	Does not allow maximum harvest of solar energy.	Online (power derating)
VMPP > absolute maximum VOC (or VOC > absolute maximum VOC)	Inverter stops delivering power and shuts down. Inverter may be damaged.	Offline (shutdown)

Array voltage and current limits

The maximum power point voltage (VMPP) of a string connected to the GT Inverter should preferably be above the lower limit of the MPPT range for that model. If it is below the lower limit of the MPPT range, the inverter continues to operate, but it regulates the PV voltage to the lower limit of the MPPT range. Because the array is not operating at its maximum power point, lower than expected energy harvest may result. If VOC is below the lower limit of the MPPT range, the inverter remains offline and does not deliver power.

NOTICE

RISK OF EQUIPMENT DAMAGE

To prevent damage to the inverter, the array voltage must never exceed 600 VOC (open circuit voltage) under any condition.

Failure to follow these instructions can result in equipment damage.

The short circuit current (I_{sc}) rating of the array at any temperature must not exceed the I_{sc} rating of the inverter. For maximum solar energy harvest, it is recommended that the effective power output of the array be matched with the input power capacity of the inverter.

Guidelines for Matching PV Array Size to Xantrex Grid Tie Solar Inverter Input

- Consider the expected VOC of the string under all possible conditions. The panel manufacturer provides a VOC rating per panel, but it is usually rated at 25 °C (77 °F). Make sure that the VOC rating at the coldest ambient temperature does not exceed 600 VDC. Panel voltage increases in cold temperatures—the panel manufacturer should be able to provide a coefficient of voltage increase per degree.
- The NEC has required temperature/voltage deratings that must be used. These can be found in Article 690 of the NEC. You must determine the coldest temperatures expected on the site, and then size the array strings accordingly. To prevent inverter damage, the array's maximum DC voltage in the coldest expected temperature—with both manufacturer coefficient and NEC derating— must not exceed 600 VDC.
- Panel voltage decreases in high temperatures. This will affect the panels' VMPP and VOC. The manufacturer's coefficient must be used with the highest expected temperature to determine the minimum VMPP and VOC.

Note: The GT PV array sizing tool is available at **www.xantrex.com**.

Mounting the Inverter

Dimensions and Knockout Locations

Inverter dimensions and knockout locations are shown in Figure 2-1.

Four 27 or 35 mm (1 or 1-3/8 inch) dual knockouts are provided on the back and bottom of the unit to accommodate wiring, and four 22 mm (7/8 inch) knockouts are provided on the back of the wiring/disconnect box.

Six 27 mm (1 inch) conduit holes on the sides of the wiring/disconnect box (three on each side) are filled with plastic plugs (thread size Pg 21). These plugs can be removed to insert conduit nipples as required for multiple inverter installations; however, they must remain in place if not being populated with a conduit connection. Side conduit holes must be used to accommodate network communication cables connected between multiple inverters.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not drill, cut, or punch holes in the wiring/disconnect box. Use only the knockouts provided for conduit entry.

Failure to follow these instructions will result in death or serious injury.

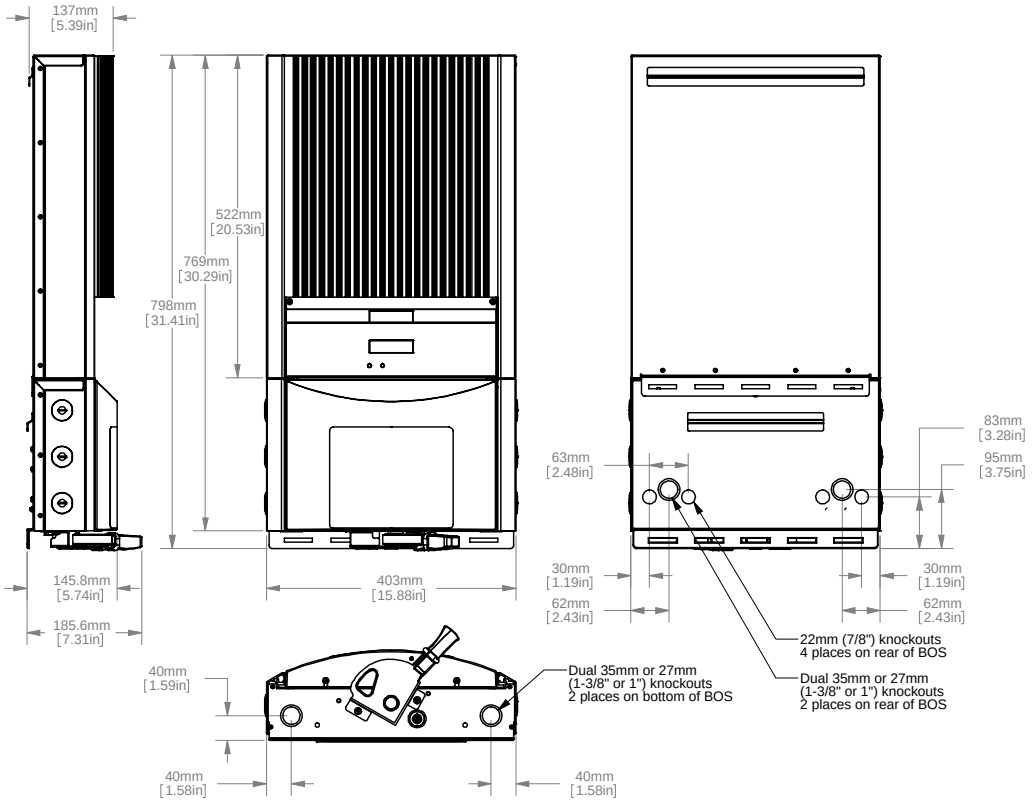

Figure 2-1 GT Inverter Dimensions and Knockout Locations

Installing the Mounting Bracket

Secure the mounting bracket to a vertical structure or surface. The GT Inverter mounting hooks attach to the flanges on the mounting bracket. Mounting bracket dimensions are shown in Figure 2-2.

If mounting more than one inverter, install each mounting bracket at least 150 mm (6 inches) apart to provide enough space for the inverters to hang side by side.

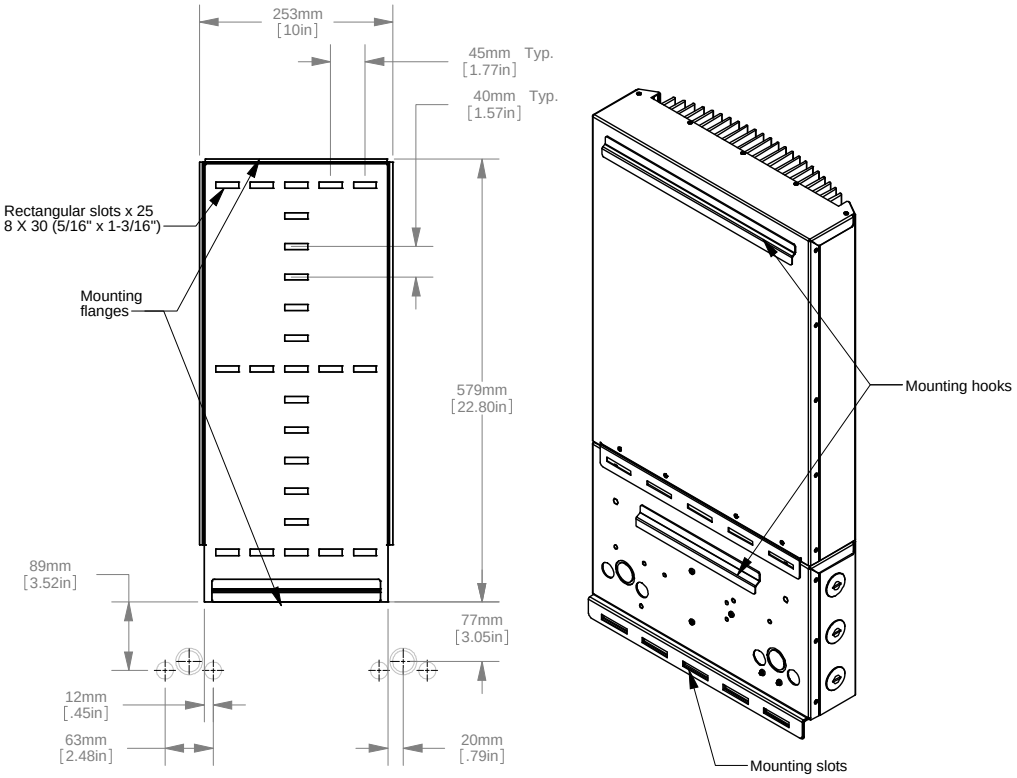

Figure 2-2 Mounting Bracket and GT Inverter

Clearance Requirements

For optimal and safe operation, make sure there is adequate clearance around the inverter. If the minimum clearances in Table 2-2 are not met, rated power may not be achieved.

Table 2-2 Inverter Clearance Requirements

Location	Minimum Clearance
Above	300 mm (12 inches)
Below	There is no clearance requirement between the bottom of the inverter and the ground. The inverter extends below the bracket by approximately 170 mm (6 ¾ inches)

Table 2-2 Inverter Clearance Requirements

Location	Minimum Clearance
Front	300 mm (12 inches) minimum. 910 mm (36 inches) are recommended for easy access for reading the display, avoiding accidental contact with hot surfaces, and servicing the inverter.
Sides	Units can be mounted side by side with no clearance between them, but 150 mm (6 inches) of clearance around the outside edges of the outermost two units is recommended. In hot climates, some clearance between units may be needed to prevent thermal derating.

Surfaces for Mounting

The GT Inverter can be mounted to a vertical surface such as wallboard, wood siding, concrete wall, or pole assembly. Make sure the mounting surface or structure can support the weight of the inverter (29.6 kg/65.3 lb) as well as the associated wiring and conduit. Installation onto wallboard requires either the use of a supporting material such as plywood or securing the mounting screws to supporting wall studs.

Note:

- Local codes may impose additional mounting requirements in earthquake or other high-risk areas.
- No mounting hardware is supplied with the GT Inverter. It is recommended to use 6 mm (¼ inch) diameter fasteners. However, because mounting surfaces can vary, installers must select appropriate hardware for each installation.

Mounting the Inverter on the Bracket

Place the inverter's mounting hooks over the flanges on the bracket. Make sure the inverter is seated properly, then secure the bottom of the inverter with appropriate screws or anchors through the mounting slots.

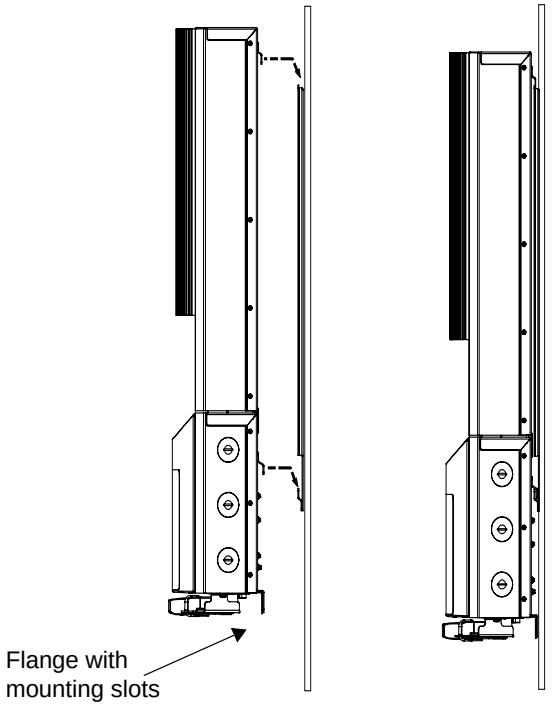

Figure 2-3 Placing the Inverter on the Mounting Bracket

3 Wiring the Inverter

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The Xantrex Grid Tie Solar Inverter has no user serviceable parts inside. It must be installed and serviced only by qualified personnel equipped with appropriate personal protective equipment and following safe electrical work practices.

The GT Inverter is energized from two sources: PV array while exposed to light and AC grid. Before opening doors or covers, consult the system diagram to identify all sources; de-energize, lock-out, and tag-out all sources; and wait at least five minutes for internal capacitors to discharge to safe voltages.

Before servicing, test using a meter rated at least 1000V AC and DC to ensure all circuits are de-energized.

The GT Inverter is provided with integral PV ground fault protection. Normally GROUNDED conductors may be UNGROUNDED and ENERGIZED when a GROUND FAULT is indicated. Disconnect all sources of power before opening.

The GT Inverter employs field adjustable voltage and frequency set points and time delays that are factory set in compliance with local utility and safety requirements and may be changed only by trained technicians with approval by both the local utility and equipment owner.

Failure to follow these instructions will result in death or serious injury.

Chapter 3 provides information about DC and AC wiring as well as grounding the GT Inverter and the PV array.

This chapter does not provide sufficient information for anyone but qualified personnel to install this product. Installers should be electricians or technicians fully educated on the hazards of installing electrical equipment.

The topics in this chapter are organized as follows:

Grounding Requirements

AC Grounding

The GT Inverter must be connected to the AC ground from the utility via the GT Inverter ground lug (see Figure 3-1 on page 3–3).

PV Grounding

The PV array (frame) ground should be connected to the GT Inverter ground bar (see Figure 3-1 on page 3–3). The size for the conductor is usually based on the size of the largest conductor in the DC system.

A DC grounding electrode conductor may be required by the AHJ. Use the GT Inverter ground bar for this connection (see Figure 3-2 on page 3–4).

NOTICE

RISK OF EQUIPMENT DAMAGE

Provide adequate clearance for grounding wires inside the GT Inverter wiring box. Make sure the bare copper grounding wire is more than ½ inch clear of the DC/AC interconnect circuit board.

Failure to follow these instructions can result in equipment damage.

Two ¼-inch (7 mm) knockouts in the bottom of the wiring box are intended for routing the ground conductors to the ground bar. See Figure 3-1.

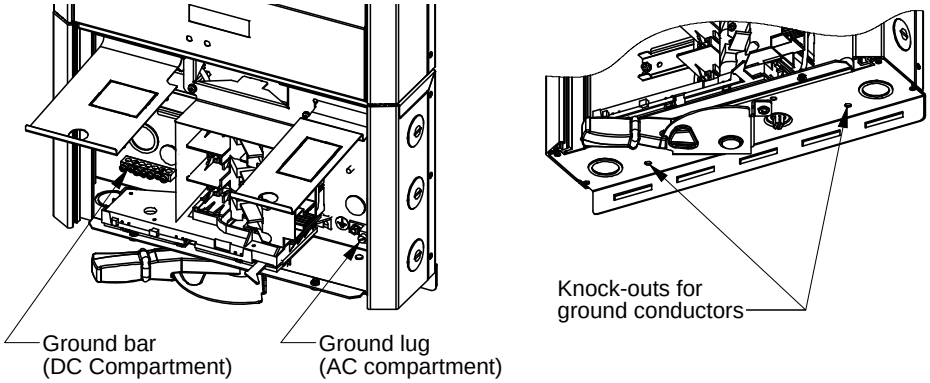

Figure 3-1 Ground Conductor Knockouts

The ground bar accepts wires up to #4 AWG. Use wire size #12 to #4 AWG, copper conductors only, rated 90 °C minimum. Torque ground wires as specified in Table 3-1.

Table 3-1 Torque Values for Ground Wiring

Wire Size		Torque Value	
AWG	**mm^2**	**in-lb**	**Nm**
12–10	4.0–6.0	25–35	3.0–4.0
8	10	30–40	3.4–4.5
6–4	16–25	35–45	4.0–5.0

NOTICE

RISK OF EQUIPMENT DAMAGE

In most models, the negative PV conductor is internally bonded to the ground system within the inverter's ground fault detection circuit.

Inverter models marked with the "-POS" suffix are positive grounded and have the positive PV conductor internally bonded to the ground system through the inverter's ground fault protection circuit.

It is important that the grounded PV conductor is not bonded to the ground at any other point in the system.

Failure to follow these instructions can result in equipment damage.

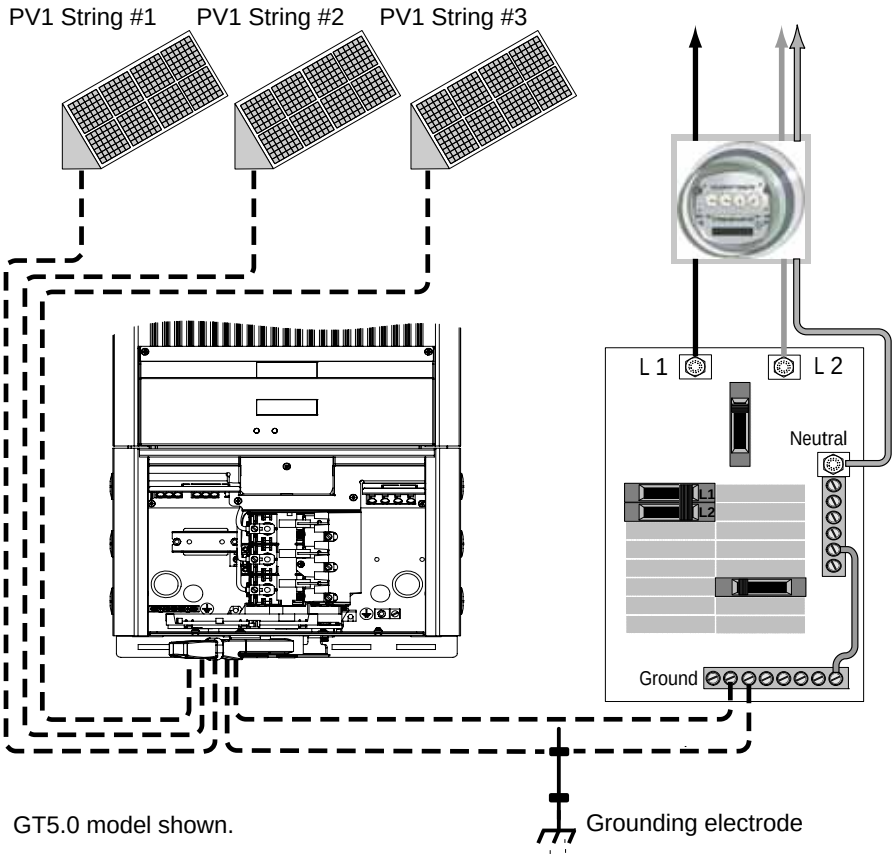

Figure 3-2 Grounding Diagram

Important: A DC grounding electrode conductor may be required by the AHJ. Check local codes before installation.

Ground Fault Fuse

The GT Inverter is equipped with a 600 volt, 1 amp ground fault protection fuse (replace with Littelfuse KLKD 1 or equivalent).

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not attempt to service the ground fault protection fuse yourself. This should be done only by qualified service personnel, such as certified electricians or technicians. See “Replacing the Ground Fault Protection Fuse” on page 6–8.

Failure to follow these instructions will result in death or serious injury.

Wiring Requirements

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Check for existing electrical or plumbing prior to drilling holes in walls.

Failure to follow these instructions will result in death or serious injury.

Use wire size #12 to #6 AWG, copper conductors only, rated 90 °C minimum. Strip all wires 12 – 13 mm (0.48 – 0.51 inches).

For safety and compliance with local electrical codes such as the NEC, run AC, DC, and communication wires in separate conduits.

⚠ WARNING

HAZARD OF FIRE

Wiring must not be undersized. Wire sizes must be coordinated with the array maximum short circuit current or the AC breaker sizes used.

Make sure wiring is in accordance with the NEC or applicable codes.

Failure to follow these instructions can result in death or serious injury.

AC Circuit Breaker Requirements

The main utility service panel must dedicate a double pole breaker to operate each installed GT Inverter. This breaker must be sized to handle the rated maximum output voltage and current of the GT Inverter (see “Electrical Specifications”, “Output” on page A–2).

DC/AC Disconnect Switch

The wiring box includes a 600 volt PV/Utility disconnect switch that switches both AC and DC at the same time.

Depending on the installation, an external AC and/or DC disconnect may be required if the inverter is installed in a location not easily accessible to utility or fire personnel. Consult local authorities for additional information.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not remove the wiring/disconnect box. The 600 volt DC/AC disconnect in the wiring box meets NEC Article 690 requirements. It is a non-serviceable component and shall remain in place. Removal can expose energized conductors.

Use caution when working around sources of DC power. Although the DC/AC disconnect switch disconnects the inverter from DC power, hazardous voltages from paralleled PV strings will still be present upstream of the switch and inside the wiring box. To reduce the risk of shock during installation, cover the array with an opaque (dark) material before making any connections, and always test for voltage before touching exposed wiring or devices.

Failure to follow these instructions will result in death or serious injury.

Combiner Fuses (Optional)

⚠ WARNING

HAZARD OF FIRE

If the array consists of more than two strings, fusing may be required to prevent conductor overloads. Consult your local authority and electrical code for details.

Failure to follow these instructions can result in death or serious injury.

There is provision for an optional touch-safe, DIN rail mount (35 mm x 7.5 mm) fuse holder. Xantrex recommends a Ferraz-Shawmut fuse holder (Part Number USM3). The fuse holder must be wired in series with the PV **UNGROUNDED** terminals in the wiring box using a minimum of 10 AWG wire, and it must be secured to the DIN rail installed in the DC side of the wiring box. See Figure 3-3.

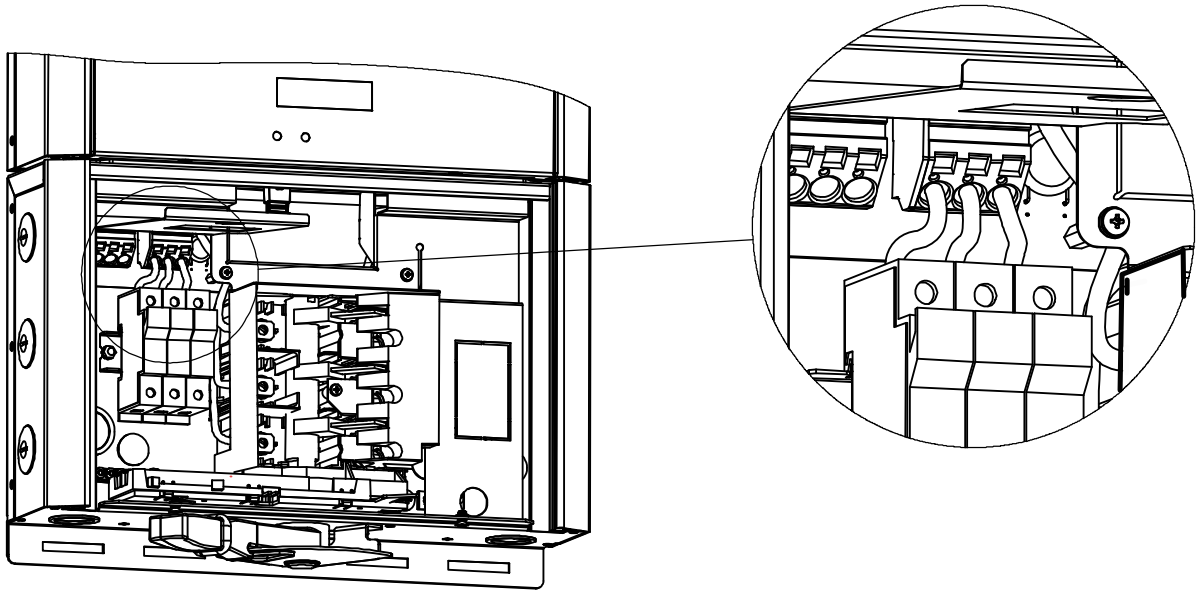

Figure 3-3 Fuse Holder Wiring

The fuse holders must:

- be either CSA certified to or UL Listed/UR Recognized for use in 600 VDC circuits and up to a minimum of 30 ADC.
- be suitable for use with copper field wiring, for either stranded or solid wire, as appropriate.
- be rated for use in ambient temperatures up to at least 40 °C.
- accept wire gauges of at least 10 AWG.
- fully disconnect and isolate the fuse body from the PV circuit when opened to allow for finger-safe removal of PV fuses when servicing.

The fuses must be:

- compatible with the fuse holder used (refer to the fuse holder manufacturer's instructions).
- marked with either CSA certified or UL Listed/UR Recognized for use in 600 VDC circuits.
- sized for amperage according to the array sizing and in accordance with Article 690 of the NEC as well as any other local electrical codes.

Accessing the Wiring Terminals

You must remove the GT Inverter wiring box cover to access the terminal blocks, ground bar, and communications ports.

To remove the wiring box cover (see Figure 3-4):

1. Make sure the DC/AC disconnect switch is set to OFF. A safety lock prevents removal of the wiring box cover if the switch is not set to OFF.
2. Using a Phillips screwdriver, loosen (but do no remove) the two screws on the bottom side of the wiring box until you can lift the bottom of the wiring box cover.
3. Lift the bottom of the wiring box cover.
4. Slide the wiring box cover down, and then lift it off the chassis.

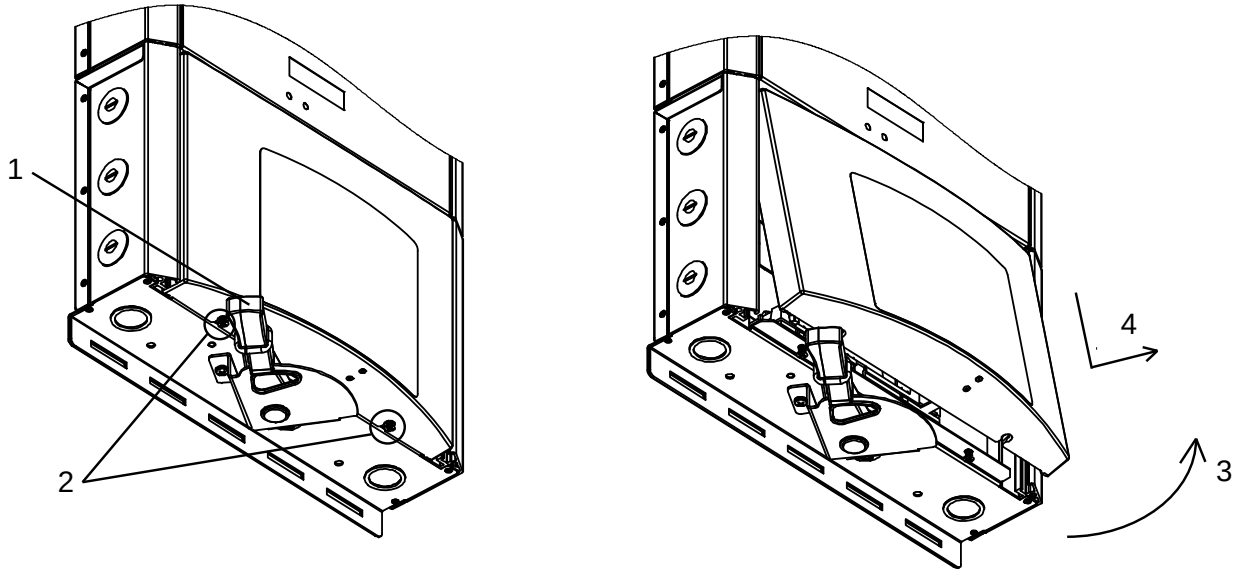

Figure 3-4 Removing the Wiring Box Cover

AC and DC connections are made at the wiring terminals shown in Figure 3-6 on page 3–9.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The insulating barrier must not be removed.

Failure to follow these instructions will result in death or serious injury.

Insulating barrier

The clear plastic insulating barrier inside the wiring box is a permanent component. Its purpose is to separate the high-voltage AC and DC wiring from any communications cabling and must not be removed.

When wiring the unit, it is necessary to pull the barrier back to access the wiring terminals. See Figure 3-5. After completing the wiring, return the insulating barrier to its original position.

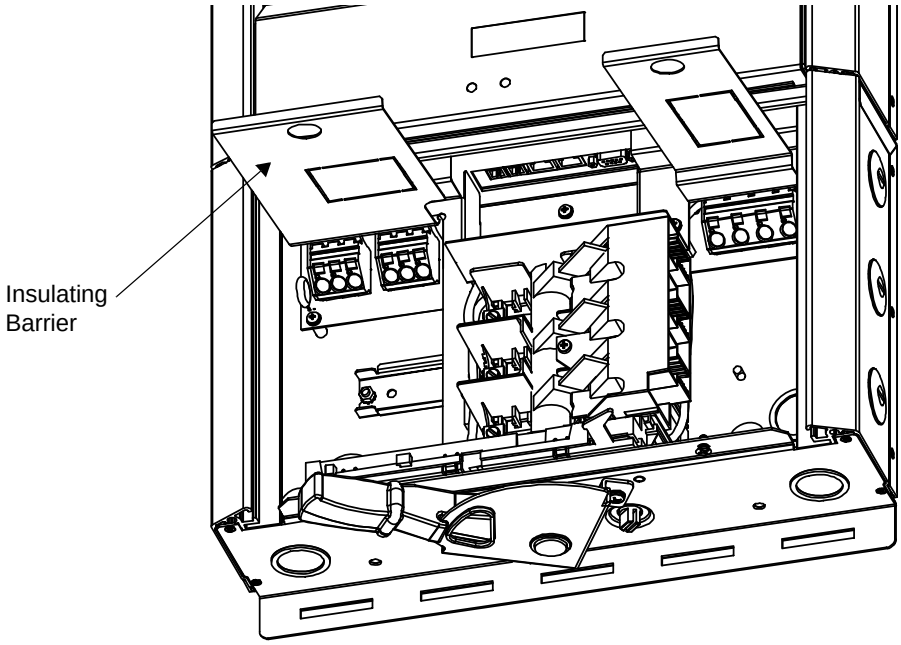

Figure 3-5 Insulating Barrier Location

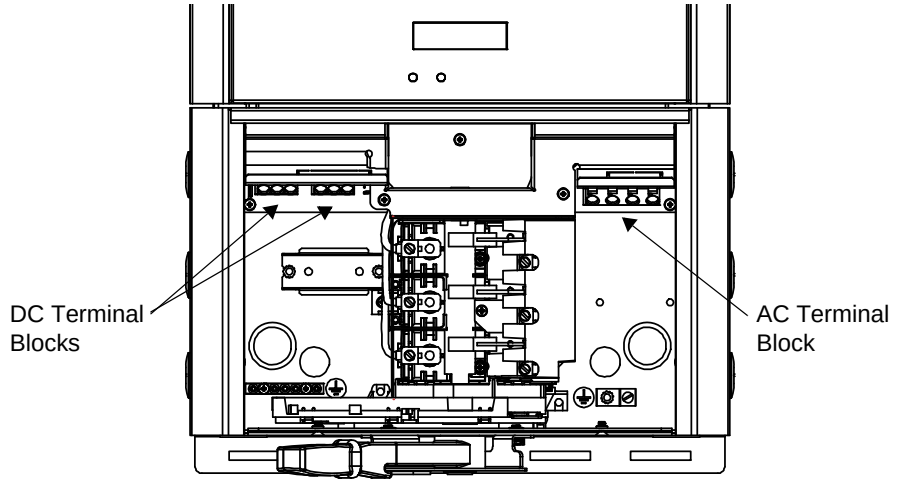

Figure 3-6 AC and DC Terminal Block Location

Connecting the DC Wiring

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Use caution when working around sources of DC power. Although the DC/AC disconnect switch disconnects the inverter from DC power, hazardous voltages from paralleled PV strings will still be present upstream of the switch and inside the wiring box. To reduce the risk of shock during installation, cover the array with an opaque (dark) material before making any connections, make sure the DC/AC disconnect switch is set to OFF (see Figure 3-7), and always test for voltage before touching exposed wiring or devices.

If AC wiring has been connected previously, turn off and lock-out the AC breaker in the main utility panel prior to connecting the DC wiring.

Failure to follow these instructions will result in death or serious injury.

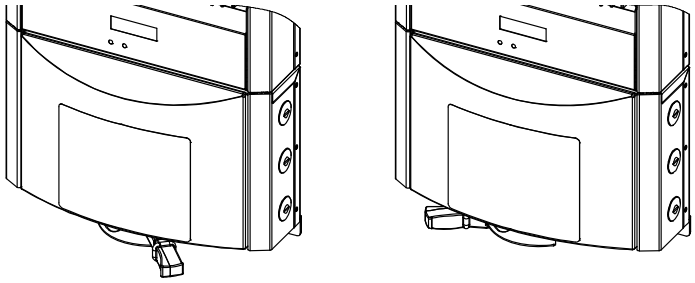

Figure 3-7 DC/AC Disconnect Switch Positions

Note: If you are connecting the DC wiring using an optional fuse holder, see "Connecting the DC Wiring Using the Optional Fuse Holder" on page 3–12.

The following procedure is illustrated in Figure 3-8 on page 3–11 which shows a negative-grounded system. If there is more than one PV string, label the positive and negative wire pairs appropriately (for example, PV1-String #1 POS, PV1-String #1 NEG, PV1-String #2 POS, and so on).

Note: To release the cage clamp on the PV terminal, insert a flat blade screwdriver into the rectangular hole directly above the wiring hole where you want to insert the wire, and then pull up. Insert the wire, and then remove the screwdriver to engage the cage clamp.

To wire the PV array to the GT Inverter:

1. Connect the POSITIVE (+) wire from PV1-String #1:
   - For a **positive-grounded** system, insert the wire into one of the PV terminals marked **GROUNDED**.
   - For a **negative-grounded** system, insert the wire into one of the PV terminals marked **UNGROUNDED**.
2. Connect the NEGATIVE (–) wire from PV1-String #1:
   - For a **positive-grounded** system, insert the wire into one of the PV terminals marked **UNGROUNDED**.
   - For a **negative-grounded** system, insert the wire into one of the PV terminals marked **GROUNDED**.
3. Repeat for PV1-String #2, if there is one.
4. Repeat for PV1-String #3, if there is one.
5. Make sure all connections are correctly wired and secured.

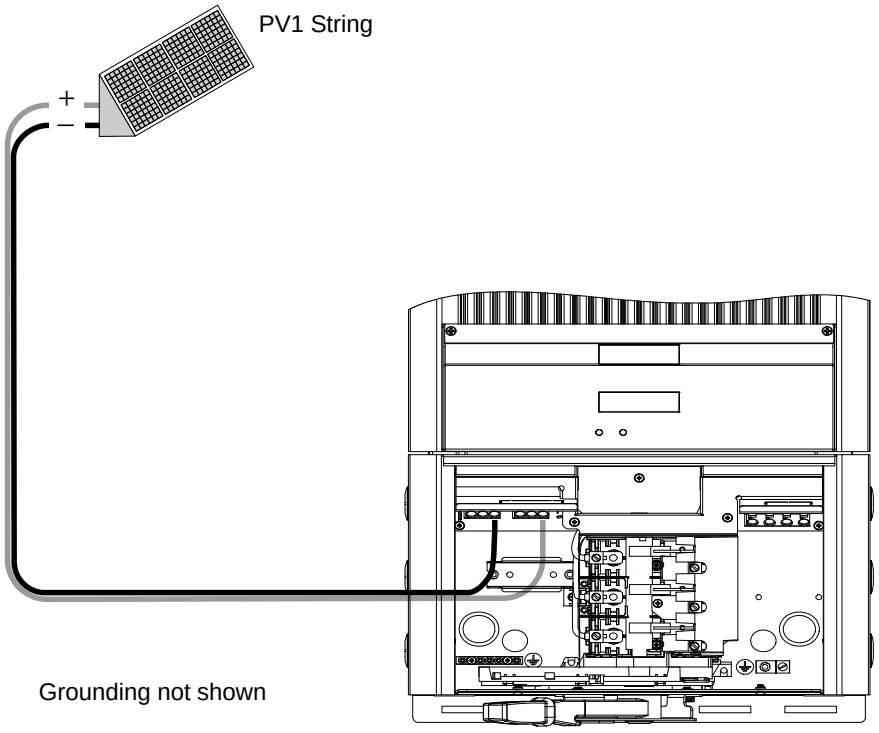

Figure 3-8 DC Connections for Single PV String (Negative-grounded System Shown)

Connecting the DC Wiring Using the Optional Fuse Holder

⚠WARNING

HAZARD OF FIRE

If the array consists of more than two strings, fusing may be required to prevent conductor overloads. Consult your local authority and electrical code for details.

Failure to follow these instructions can result in death or serious injury.

You can connect the DC wiring using an optional fuse holder. See “Combiner Fuses (Optional)” on page 3–6 for more information. The following procedure is illustrated in Figure 3-9 which shows a negative-grounded system. Label the positive and negative wire pairs appropriately (for example, PV1-String #1 POS, PV1-String #1 NEG, PV1-String #2 POS, and so on).

Note: To release the cage clamp on the PV terminal, insert a flat blade screwdriver into the rectangular hole directly above the wiring hole where you want to insert the wire, and then pull up. Insert the wire, and then remove the screwdriver to engage the cage clamp.

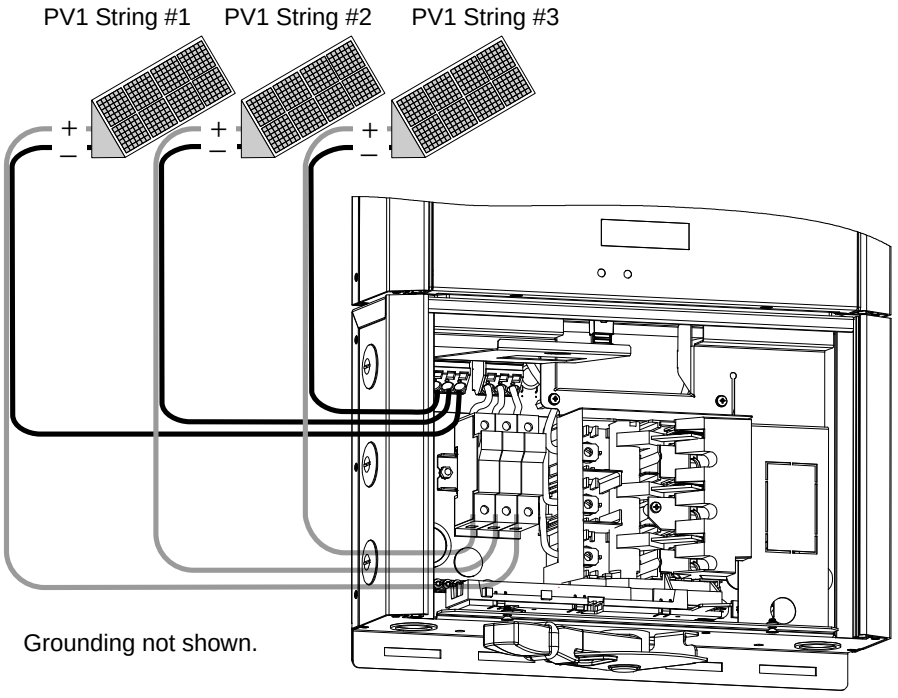

Figure 3-9 DC Connections for Multiple PV Strings (Negative-grounded System Shown Using Optional Fuse Holder

To wire the PV array to the GT Inverter:

1. Prepare the fuse holder:
   a) Strip 12 – 13 mm from both ends of three 65 mm lengths of 10AWG wire.
   b) Insert one end of each wire into each of the three top lugs of the fuse holder. See Figure 3-10.
   c) Torque screws to the value indicated by the manufacturer on the fuse holder to secure the wires.

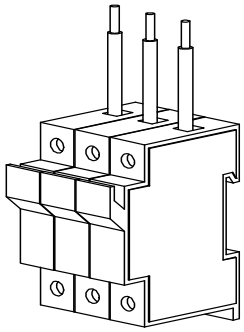

Figure 3-10 Fuse Holder with 10AWG Wiring

2. Insert the free ends of each of the three wires into the PV terminals marked **UNGROUNDED**. See Figure 3-11.
3. Snap the fuse holder to the provided DIN rail to secure it to the wiring box. See Figure 3-11.

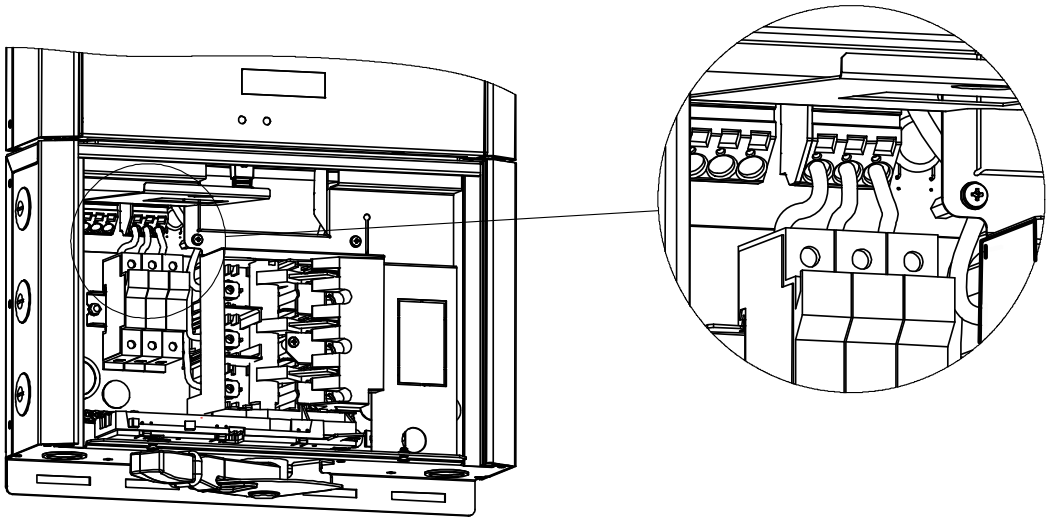

Figure 3-11 Fuse Holder Secured to Wiring Box

4. Connect the POSITIVE (+) wire from PV1-String #1:
   - For a **positive-grounded** system, insert the wire into one of the PV terminals marked **GROUNDED**.
   - For a **negative-grounded** system, insert the wire into one of the fuse holders. Torque the screw to the value indicated by the manufacturer on the fuse holder to secure the wire.
5. Connect the NEGATIVE (–) wire from PV1-String #1:
   - For a **positive-grounded** system, insert the wire into one of the fuse holders. Torque the screw to the value indicated by the manufacturer on the fuse holder to secure the wire.
   - For a **negative-grounded** system, insert the wire into one of the PV terminals marked **GROUNDED**.
6. Repeat for PV1-String #2, if there is one.
7. Repeat for PV1-String #3, if there is one.
8. Make sure all connections are correctly wired and secured. Torque wires in the fuse holder to the value indicated by the manufacturer.
9. Remove the knockout on the DC side of the insulating barrier for fuse holder clearance. See Figure 3-12 on page 3–14.

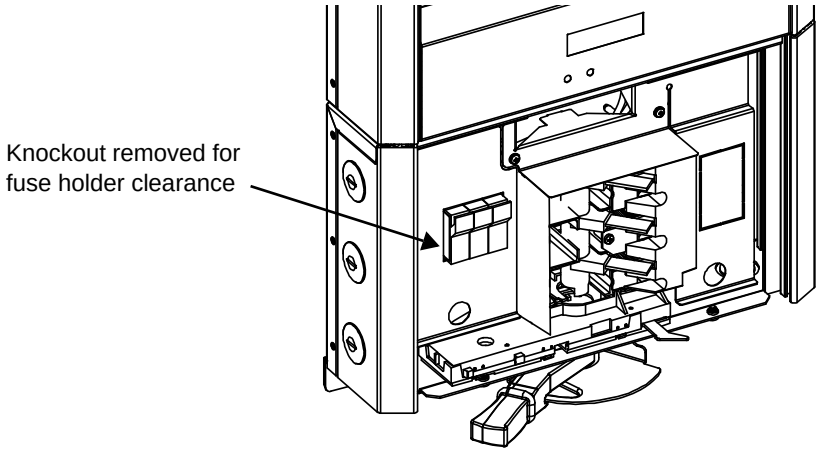

Figure 3-12 Insulating Barrier with DC Knockout Removed

DC Wiring for Multiple Inverters

For installations with multiple GT Inverters, separate solar arrays are required for each unit. The output of each GT Inverter feeds a separate dual-pole circuit breaker (L1 and L2) in the main utility service panel.

For such installations, complete the wiring and perform the commissioning procedure for each inverter one at a time. For the commissioning procedure, see “Commissioning Multiple Inverters” on page 4–4.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

In multiple inverter installations, it is very important to make sure each inverter is correctly connected to its own PV array(s) and that no wires are crossed. For example, connect PV1 positive (+) and PV1 negative (–) to inverter 1 and PV2 positive (+) and PV2 negative (–) to inverter 2.

Do not connect PV1 positive (+) and PV2 negative (–) to inverter 1 and PV2 positive (+) and PV1 negative (–) to inverter 2. As shown in Figure 3-13 on page 3–15, this configuration can cause short circuit failures in the inverters and may also generate hazardous voltages within the system.

Failure to follow these instructions will result in death or serious injury.

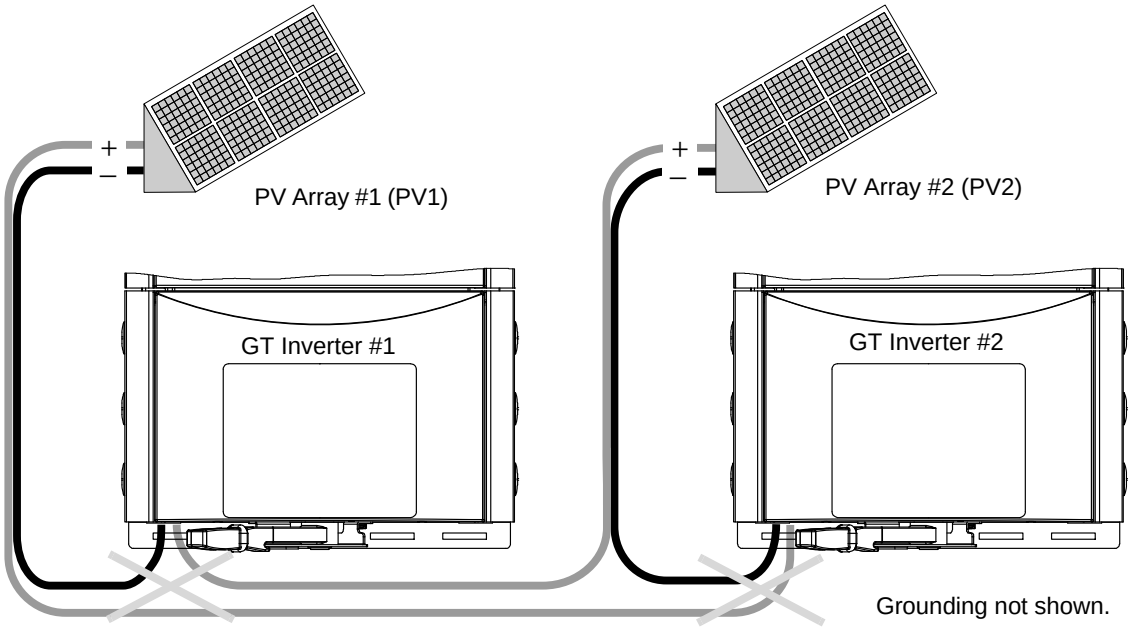

Figure 3-13 Improper Multiple Inverter Connections

Connecting the AC Wiring

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before wiring the GT Inverter, make sure the **main breaker** in the primary utility breaker box is switched OFF and locked out. Switch this breaker on only after all wiring is completed as instructed in the procedures.

If the DC wiring has been completed, make sure the DC/AC disconnect switch is in the OFF position and the array is covered with an opaque (dark) material.

Failure to follow these instructions will result in death or serious injury.

The GT Inverter can be connected to a single bi-directional meter, or to dual meters, where one meter indicates power used and the second meter indicates power sold (power supplied back to the utility). Consult the local utility to determine the proper components to install, and obtain any permits required prior to installation.

Make sure all connections are secured in the terminal block. To release the cage clamp on the AC terminal, insert a flat blade screwdriver into the rectangular hole directly above the wiring hole where you want to insert the wire, and then pull up. Insert the wire, and then remove the screwdriver to engage the cage clamp.

The AC wiring procedure is illustrated in Figure 3-14.

Note: The neutral conductor must be attached to the inverter in all cases. The neutral conductor is used for phase-to-neutral voltage sensing only and is not a current-carrying conductor. This conductor is not bonded to ground in the inverter.

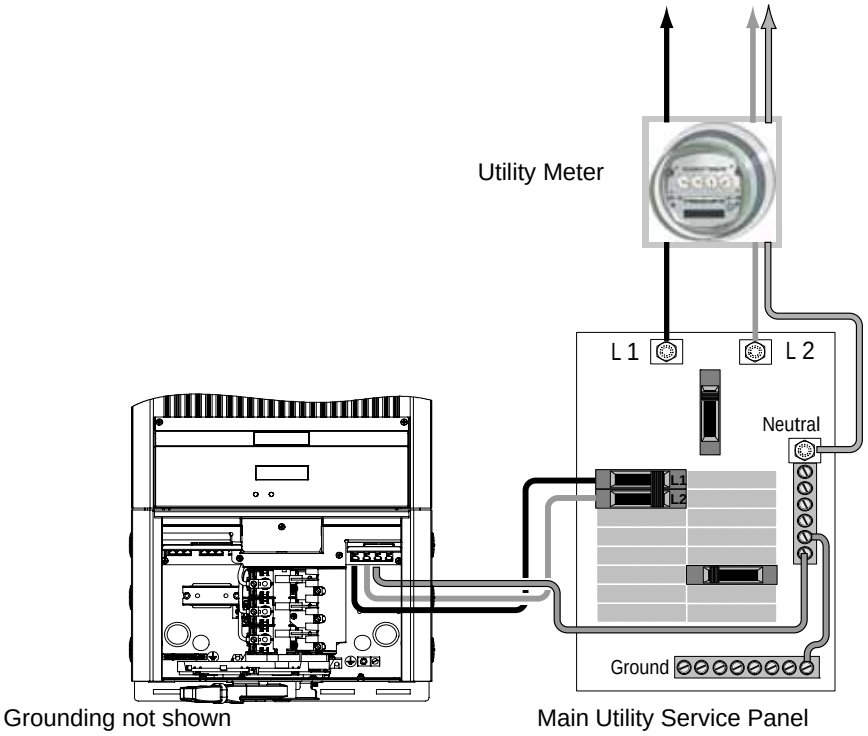

Figure 3-14 AC Connections from GT Inverter to Utility Service Panel

DC and AC Wiring for Multiple Inverters

DC and AC wiring for multiple inverters is illustrated in Figure 3-15.

If there is more than one PV array, label the positive and negative wire pairs appropriately (for example, PV1-String #1 POS, PV1-String #1 NEG, and so on).

If required by the AHJ, a DC grounding conductor may be connected to each inverter's ground bar. One inverter will connect to a common grounding conductor. The other inverters will use tap connectors. Connection is then made to the DC or AC grounding electrode as per NEC 690.47.

Make sure all connections are secured in the terminal block. To release the cage clamp on a PV or AC terminal, insert a flat blade screwdriver into the rectangular hole directly above the wiring hole where you want to insert the wire, and then pull up. Insert the wire, and then remove the screwdriver to engage the cage clamp.

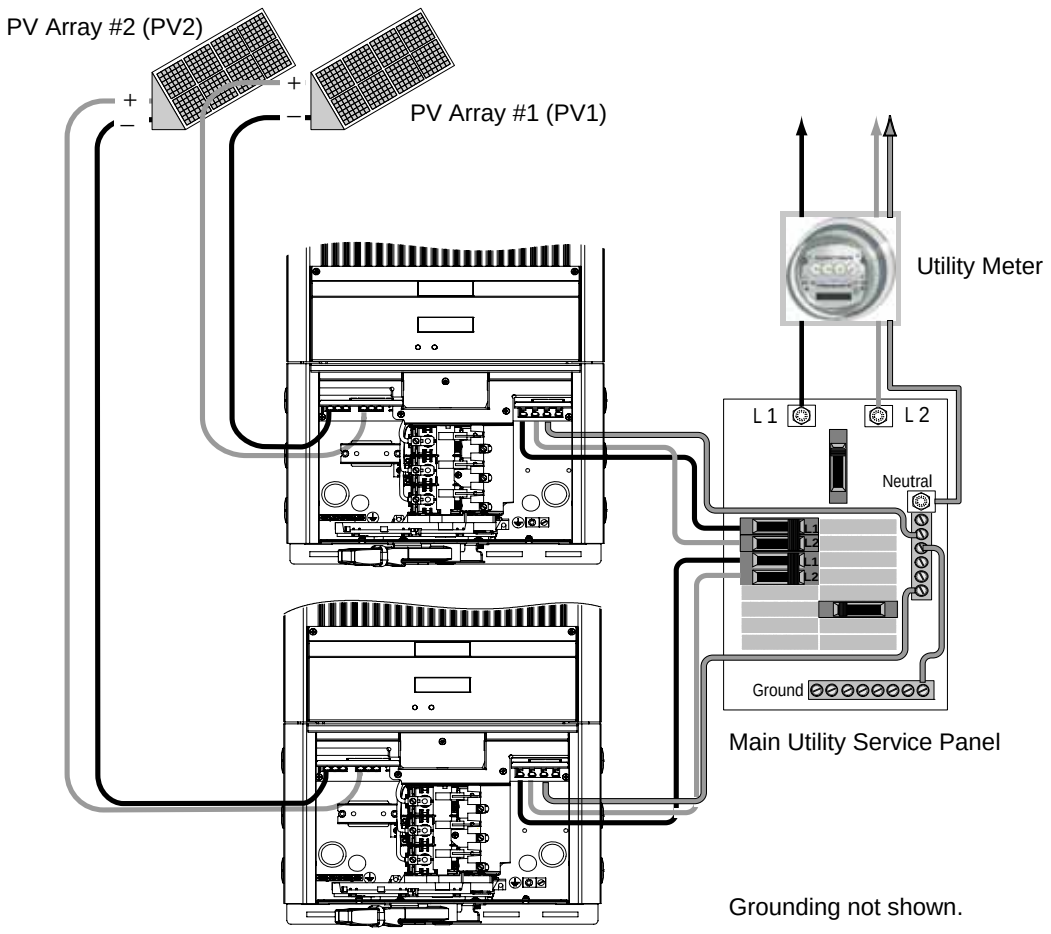

Figure 3-15 DC and AC Wiring With Multiple GT Inverters

Communications Wiring for Multiple Inverters

Communications wiring between multiple GT Inverters allows information about each inverter and its associated PV array to be communicated between all of the inverters in the system. Information about the entire system can be displayed on any inverter LCD in the system.

For example, in a two-inverter system, if Inverter #1 is producing 1500 W and Inverter #2 is producing 2000 W, both inverters display a total system power of 3500 W. The cumulative energy produced by both inverters that day is also displayed.

You can also view information for an individual inverter in a system. See “To view unit-specific screens in a multiple unit system:” on page 5–5.

Without communications wiring (network cables), each inverter in a system will only display information pertinent to the unit and its associated PV array.

Xanbus Network Technology

GT Inverters use Xanbus technology to communicate with other GT Inverters. Network connections for multiple inverters are laid out in a daisy chain pattern, each device on the network linked together with separate lengths of cable, as shown in Figure 3-16.

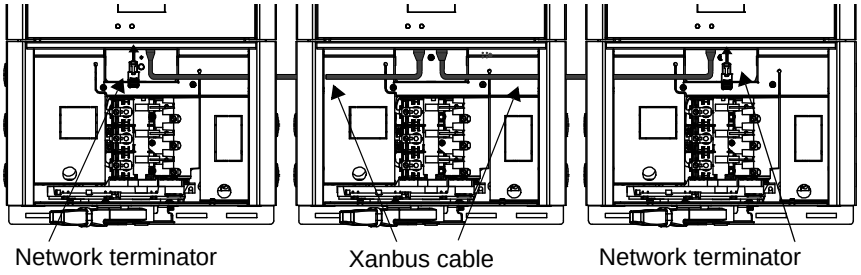

Figure 3-16 Daisy Chain Layout

NOTICE

RISK OF EQUIPMENT FAILURE

Connect only Xanbus-enabled devices.

Although the cabling and connectors used in this network system are the same as ethernet connectors, **this network is not an ethernet system**. Equipment damage may result from attempting to connect Xanbus to different systems.

Failure to follow these instructions can result in equipment damage.

Table 3-2 provides information on maximum Xanbus network length.

Table 3-2 Total Xanbus Network Length

Xanbus Baud Rate	Total Xanbus Network Length
250 kbps	40 m (130 ft)
125 kbps	300 m (1000 ft)

Note: Xanbus baud rate is set to 250 kbps by default. If you want to switch to 125 kbps, make sure to follow the recommended procedure supplied by Xantrex. See the Application Note, "Xantrex Grid Tie Solar Inverter Baud Rate Change Procedure" (976-0216-01-01 available on www.xantrex.com).

Note: Remote upgrade using the Gateway is not supported on systems with a 125 kbps baud rate. If you change the baud rate to 125 kbps, then you will no longer be able to use the Gateway to upgrade the firmware on GT inverters. You will have to upgrade each inverter in the system using an RS-232 cable and a laptop.

NOTICE

RISK OF UNPREDICTABLE NETWORK OPERATION

Do not exceed the maximum total Xanbus network length shown in Table 3-2, “Total Xanbus Network Length” on page 3–19. Proper network operation cannot be guaranteed when these distances are exceeded.

Failure to follow these instructions can result in unpredictable network operation.

Note: When creating long Xanbus networks (i.e. greater than 100 m), you must verify network integrity using a CANbus network analysis tool such as the Maretron N2KMeter Diagnostic Tool for NMEA2000 compatible networks. See “Verifying the Xanbus Network” on page 3–24.

Terminators

The network terminator supplied with each GT Inverter (Figure 3-17) is required at each end of the network to ensure the communication signal quality on the network.

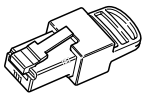

Figure 3-17 Network Terminator

RJ-45 Xanbus ports

Two RJ-45 ports are provided in the GT Inverter, accessible from the wiring box. See Figure 3-18 for the location of these ports.

RJ-11 ports

The 4-position RJ-11 port connectors allow interconnection of multiple inverters for 3-phase configurations where the requirement is to avoid high unbalanced generating conditions on the transformer. Any inverter disconnecting from the grid also forces the remaining inverters offline. This condition remains until grid parameters for all inverters are within operating specifications.

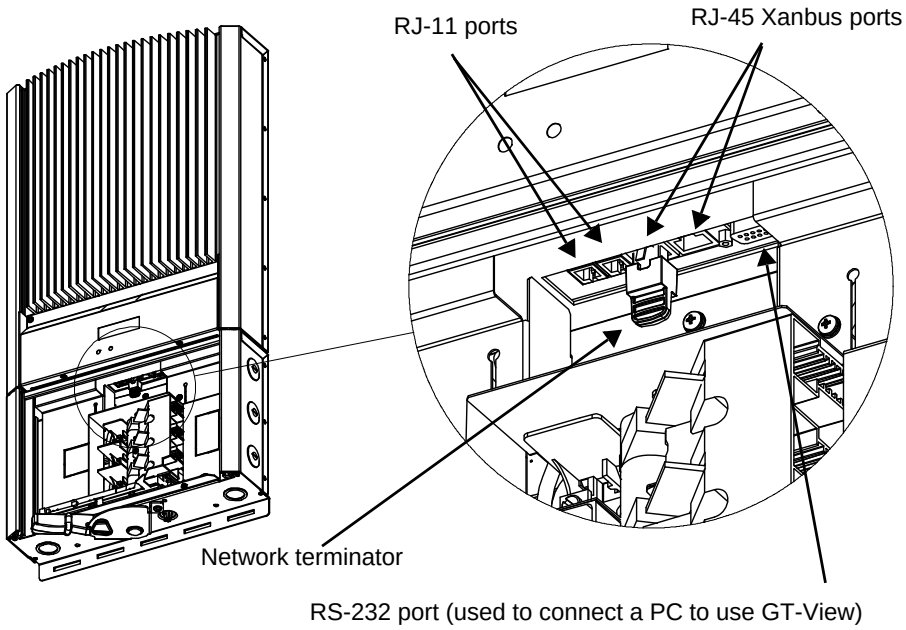

Figure 3-18 Xanbus RJ-45 Ports in the GT Inverter Wiring Box

Cabling Requirements

NOTICE
RISK OF EQUIPMENT DAMAGE Do not use a crossover cable in a Xanbus system. **Failure to follow these instructions can result in equipment damage.**

The network uses Category 5 (CAT5 or CAT5e) cable: a standard cable available from any computer supply store. The cable consists of eight conductors in four twisted pairs with an RJ-45 modular connector wired to the T568A standard. Table 3-3 shows the arrangements of wire colors to pin numbers for the T568A standard.

Table 3-3 T568A Standard Wiring

Pin Number	Conductor Name	CAT5 Cable Insulation Color	CAT5e Cable Insulation Color
1	NET_S	White/Green	White/Orange
2	NET_S	Green	Orange
3	NET_C	White/Orange	White/Green
4	CAN_L	Blue	Blue
5	CAN_H	White/Blue	White/Blue
6	NET_C	Orange	Green
7	NET_S	White/Brown	White/Brown
8	NET_C	Brown	Brown

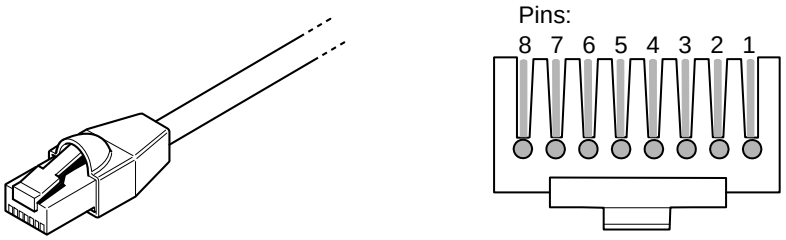

Figure 3-19 RJ-45 Connector

Purchasing Network Components

Consult your system designer to determine what network component you need for your specific installation. Table 3-4 provides a partial list of network components and part numbers. Pre-made cables are available in standard lengths from 3 feet to 75 feet.

Call your dealer or visit **www.xantrex.com** to purchase network components.

Table 3-4 Network Components and Part Numbers

Network Component	Part Number
Network cable 3 ft. (0.9 m)	809-0935
Network cable 25 feet (7.6 m)	809-0940
Network cable 75 feet (22.9 m)	809-0942

Guidelines for Routing the Network Cables

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not route the network cables in the same conduit or panel as the AC and DC power cabling.

The cables should run on top of the insulation barrier inside the wiring/disconnect box and out a side conduit hole, avoiding any contact with the AC and DC wiring.

Failure to follow these instructions will result in death or serious injury.

Note: Unpredictable device behavior may result from connecting one end of the network to the other to make a ring or loop.

Connecting Network Cable Between Multiple Inverters

The following procedure (illustrated in Figure 3-16 on page 3–19) assumes only two inverters are connected. However, up to five inverters can be connected in this configuration.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before opening the GT Inverter wiring/disconnect box, turn OFF the breaker switches connected to the GT Inverter AC output, and turn the DC/AC disconnect switch to the OFF position. Hazardous voltage will still be present on the DC input (PV) terminals located under the clear plastic insulation barrier. Do not remove the insulation barrier during this procedure. To reduce the risk of shock, cover the array with an opaque (dark) material.

Failure to follow these instructions will result in death or serious injury.

To provide communication between multiple inverters:

1. Remove the wiring/disconnect box cover from each unit. See “Accessing the Wiring Terminals” on page 3–8.
2. Connect the network cable to any RJ-45 port in Inverter #1.
3. Route the cable along the top of the insulation barrier and through a side conduit hole to Inverter #2.

4. Connect the network cable to any RJ-45 port in Inverter #2.
5. For more than two inverters, continue connecting cable as described above.
6. Insert network terminators into the empty RJ-45 ports in the inverters at the beginning and end of the network. There should be no empty RJ-45 ports in any of the inverters.

Verifying the Xanbus Network

For long Xanbus networks (greater than 100 m), you must verify network integrity using a CANbus network analysis tool such as the Maretron N2KMeter Diagnostic Tool for NMEA 2000 compatible networks. To determine if the network is healthy, check to see if any bus errors are present on the network. The presence of bus errors, specifically more than one bus error per second, indicates that the network is not operating optimally.

If the CANbus analyzer indicates your network is not operating properly, check the following and then re-test the network:

- Make sure the total Xanbus network length has not been exceeded. See Table 3-2, “Total Xanbus Network Length” on page 3–19.
- Make sure the network has only two terminators installed – one at each far end of the network.
- Make sure there are no long stub connections coming from a Xanbus 3-port T connector (if any are used). Daisy chain network configuration is the optimal configuration.
- Make sure all cable sections are correct and not shorted anywhere.

Communications Wiring for Monitoring a Single Inverter

You can view GT Inverter operational data on a personal computer using the Xantrex GT Solar Inverter Viewer (GT-View), which you can download for free at **www.xantrex.com**.

To use GT-View, connect your computer’s serial port to the GT Inverter RS-232 port (see Figure 3-18 on page 3–21).

RS-232 cable requirements

To connect your computer to the GT Inverter, you must use a serial DB9 “straight through” cable.

The RS-232 connector on the GT is configured as follows:

- Pin 2: transmit
- Pin 3: received
- Pin 5: ground

All other pins are unused.

To connect a single GT Inverter to a personal computer:

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before opening the GT Inverter wiring/disconnect box, turn OFF the breaker switches connected to the GT Inverter AC output, and turn the DC/AC disconnect switch to the OFF position.

Hazardous voltage will still be present on the DC input (PV) terminals located under the clear plastic insulation barrier. Do not remove the insulation barrier during this procedure.

To reduce the risk of shock, cover the array with an opaque (dark) material.

Failure to follow these instructions will result in death or serious injury.

1. Feed the male end of the serial cable through a top, side conduit hole on the GT Inverter.

   If the end of the serial cable is too large to fit through the conduit hole, you may need to use two DB9 to CAT 5 adaptors. Plug the DB9 end of the adapter into the GT Inverter, and feed the CAT 5 end of the cable out the conduit hole. Use another adapter to convert the CAT 5 end of the cable back to DB9.
2. Plug the male end of the serial cable into the GT Inverter RS-232 port.
3. Plug the female end of the serial cable into your computer's serial port. A USB to DB9 converter (not supplied) may be required.
4. Replace the wiring/disconnect box cover.
5. Turn the DC/AC disconnect switch to the ON position and turn the main utility panel breaker switches ON.

When power is restored to the GT Inverter, you can run GT-View on your computer to monitor the inverter's operation.

Note: In multiple installations, GT-View monitors only the inverter to which the computer is connected. However, if the inverters are connected with a Xanbus network cable, GT-View will display total system wattage and the accumulated daily energy produced by all inverters. Monitoring multiple inverters requires multiple DB9 cable connections (one per inverter) to your computer.

For more information about GT-View, see the *GT-View User Manual*, included with the GT-View software.

4 Starting the Inverter

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The Xantrex Grid Tie Solar Inverter has no user serviceable parts inside. It must be installed and serviced only by qualified personnel equipped with appropriate personal protective equipment and following safe electrical work practices.

The GT Inverter is energized from two sources: PV array while exposed to light and AC grid. Before opening doors or covers, consult the system diagram to identify all sources; de-energize, lock-out, and tag-out all sources; and wait at least five minutes for internal capacitors to discharge to safe voltages.

Before servicing, test using a meter rated at least 1000V AC and DC to ensure all circuits are de-energized.

The GT Inverter is provided with integral PV ground fault protection. Normally GROUNDED conductors may be UNGROUNDED and ENERGIZED when a GROUND FAULT is indicated. Disconnect all sources of power before opening.

The GT Inverter employs field adjustable voltage and frequency set points and time delays that are factory set in compliance with local utility and safety requirements and may be changed only by trained technicians with approval by both the local utility and equipment owner.

Failure to follow these instructions will result in death or serious injury.

Chapter 4 provides instructions for starting the Xantrex Grid Tie Solar Inverter and performing a functional test.

The topics in this chapter are organized as follows:

Startup Procedure

Starting the GT Inverter includes several steps. You must:

1. Make sure the DC/AC disconnect switch is in the OFF position (see Figure 4-1).
2. Check the PV array DC voltage. Follow the procedure in "Checking the PV Array DC Voltage" on page 4–2.
3. Check the AC utility voltage. Follow the procedure in "Checking the AC Utility Voltage" on page 4–2.
4. Replace the cover on the wiring box. Follow the procedure in "Replacing the Wiring/Disconnect Box Cover" on page 4–3.
5. Start the GT Inverter by switching the DC/AC disconnect switch ON (see Figure 4-1).

Checking the PV Array DC Voltage

To check the PV array DC voltage:

1. Uncover the PV arrays and expose them to full sunlight. The sunlight must be intense enough to produce the required output voltage.
2. Measure the PV array open circuit DC voltage across the DC positive (+) and negative (–) terminals of the string combiner. This voltage must be greater than 150 volts DC (to energize the electronics) and less than 600 volts DC (to prevent damage to the inverter).

Checking the AC Utility Voltage

To check the AC utility voltage:

1. Switch on the main and inverter breakers in the main electrical service panel.
2. Using an AC voltmeter, measure the AC open circuit utility voltage between L1 and L2. Make sure this voltage is at approximately the nominal value. The inverter operates with a line-to-line voltage (L1 to L2) range around the nominal value.

3. Measure the phase-to-neutral voltage. Phase-to-neutral voltage should be 120 VAC (nominal) for each phase-to-neutral measurement, whether the grid is 120/240 V split-phase or 208 V three-phase WYE.

Phase-to-phase voltage may rise 3 to 4 VAC (at the field wiring points, depending upon grid impedance) when current is flowing to a typical 240 V grid. If the grid voltage is within 1 to 2 VAC of the high voltage disconnect threshold when the inverter is at full rated power output (see “Adjustable Voltage, Frequency, and Reconnection Settings” on page A–12), the inverter may disconnect more frequently than it normally would. If the grid is normally high, the unit may disconnect and then refuse to reconnect due to the required reconnect voltage of 106 per cent of nominal.

If this occurs, consult the utility about reducing the utility voltage or to get permission to allow the installer to adjust the disconnect threshold to gain additional margin.

See “Electrical Specifications”, “Output” in Appendix A, “Specifications” for the utility voltage operating range of your GT Inverter model.

Replacing the Wiring/Disconnect Box Cover

After performing the voltage checks, turn OFF the breaker switches in the main utility service panel and the DC/AC disconnect switch on the GT Inverter, and then replace all covers that were removed during installation and startup.

To replace the wiring/disconnect box cover:

1. Make sure the clear plastic insulating barrier is properly positioned in the wiring box.
2. Slide the cover into position on the wiring box, being careful not to pinch any wires inside. Make sure the DC/AC disconnect switch is set to OFF (see Figure 3-7 on page 3–10) otherwise the wiring box cover cannot be replaced.
3. Make sure the two screw holes in the bottom of the wiring box cover are aligned with the corresponding screws in the bottom of the wiring box.
4. Securely tighten the two screws that were loosened when the cover was removed (see “Accessing the Wiring Terminals” on page 3–8).

Starting the GT Inverter

To start the inverter:

1. Turn the AC breaker ON.
2. Switch the DC/AC disconnect switch to the ON position (see Figure 4-1).
3. Check the GT Inverter LCD. The startup screens (see Table 5-1 on page 5–2) should appear for five seconds each, and then the "Reconnecting in *sss* seconds" special screen (see Table 5-10 on page 5–9) will appear until the 305 second (default value) protection timer countdown is completed.

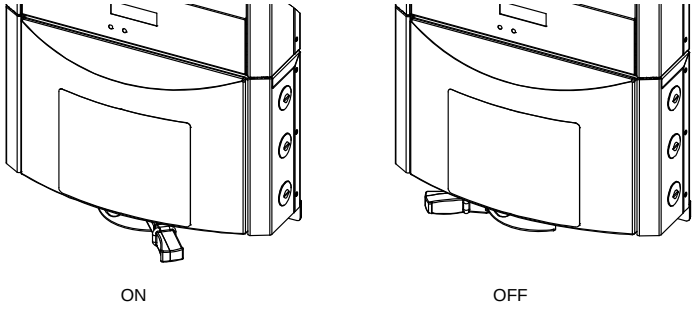

Figure 4-1 DC/AC Disconnect Switch Positions

Commissioning Multiple Inverters

In an installation with multiple GT Inverters, special commissioning procedures must be followed in order to safely determine if any DC wiring problems exist.

Note: Before performing this procedure, all inverters should be off, with the DC/AC disconnect switch in the OFF position.

To commission multiple inverters:

1. Uncover the PV arrays and/or close the main DC disconnect switch, if one is installed.
2. Start the first inverter by turning the DC/AC disconnect switch to the ON position.
3. Check the GT Inverter LCD. The startup screens (see Table 5-1 on page 5–2) should appear for five seconds each, and then the "Reconnecting in *sss* seconds" special screen (see Table 5-10 on page 5–9) will appear until the 305 second (default value) protection timer countdown is completed.
4. Wait for the input current to rise above 1 A.

   This information is displayed on the Array Readings screen. To display the Array Readings screen, tap the inverter's front panel LCD four times.

5. After the input current has risen above 1 A, if the inverter is still operating normally switch off the inverter by turning the DC/AC disconnect switch to the OFF position. Proceed to step 5.

   If the inverter stops operating after the input current has risen above 1 A, turn the unit off, remove DC power, and have a certified electrician or technician inspect the ground fault protection fuse. If the fuse has blown, a DC wiring problem may exist. Check all DC wiring to make sure the unit is connected to a single PV array.

6. Run the disconnect test (see “Disconnect Test” on page 4–5).
7. Proceed to the next inverter and perform the same test. See Figure 4-2 for an example of the recommended commissioning sequence.

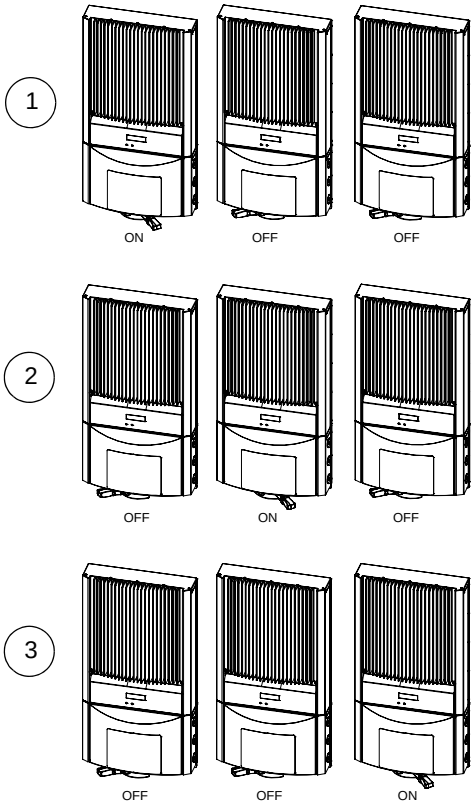

Figure 4-2 Commissioning Sequence for Multiple Inverters

Disconnect Test

The disconnect test is designed to verify correct operation of the GT Inverter both on initial operation and periodically through its life as required by the local utility. This test makes sure the Xantrex Grid Tie Solar Inverter does not send electricity to the utility grid when the local utility has shut off the grid for repairs or when the utility wiring is damaged.

When operation of the inverter has been verified and the unit is producing power, run the disconnect test as described in this procedure.

To run the disconnect test:

1. Switch off the AC circuit for the inverter. This can be accomplished by switching the breaker on the main panel that feeds the inverter(s). The disconnect for the home or business may be used as well.
2. Have someone watch the front panel of the inverter to make sure the green light on the front of the inverter goes out within two seconds.

   The green light goes out when the AC circuit is switched off, disconnecting the inverter from the AC grid. The front panel display will show an AC Fault display, indicating that the AC is out of the operating range.
3. Switch on the AC circuit for the inverter.

   The inverter responds by starting its 305 second protection timer. Make sure the inverter does not produce power before the countdown is over. After completing the countdown, the green light turns on and the inverter begins delivering power. The display returns to showing the power being produced and the total kWh produced to date.

Note: The default voltage, frequency, and reconnect delay values are programmed into the unit at the time of shipment from the factory. With the utility's approval, these settings can be adjusted in the field using the GTConfigLite software tool. See "Adjustable Voltage, Frequency, and Reconnection Settings" on page A–12.

4. If you have another GT Inverter to commission, switch off the AC circuit for the inverter you have just commissioned and tested by switching off the breaker on the main panel. You can then run the commissioning procedure and disconnect test on the next inverter.

Locating the Firmware Version Number

The firmware version number for the protection processor is visible on a screen that appears when the unit is started or is powered up after switching the DC/AC disconnect switch to ON. The screen reads:

Flash = 03.xx
ROM = 03.xx

The number appearing after `ROM` is the firmware version number for the protection processor.

5 Monitoring the Inverter

Chapter 5 contains information about the LCD screens and the LED indicators.

The topics in this chapter are organized as follows:

Monitoring the Front Panel Display

During startup	During startup, the inverter's front panel LCD (see Figure 5-1 on page 5–2) shows the screens described in Table 5-1, "Startup Screens on GT Inverter Front Panel Display" on page 5–2.
During waiting period	When the 305 second protection timer begins, the inverter displays "Reconnecting in *sss* seconds" (see Table 5-10, "Special Message Screens" on page 5–9).
During operation	When the protection timer stops, the GT Inverter begins delivering power, indicated by the power output reading in the display (see Table 5-2, "Normal Operation Default Screen" on page 5–4).
When the inverter is offline or there is fault condition	When the GT Inverter is offline (at night, for example) or a fault condition has been detected, the LCD displays a message to indicate that the inverter is offline and to identify the specific fault condition. See Table 5-5, "Offline Mode Default Display" on page 5–6 and Table 5-8, "Fault Message Screens" on page 5–7.

Note: If both DC and AC power supplies are either not present or too low, then the front panel LCD will be blank.

Figure 5-1 Front Panel LCD

Viewing more information

Additional information screens about the performance of the GT Inverter can be displayed by tapping the inverter's front panel. This causes the LCD to cycle through a series of information screens in normal operation, offline, or fault modes. These are described in detail in the following section, "Front Panel Display Screens and What They Mean".

Front Panel Display Screens and What They Mean

Note: For the tables in this section, all numbers are examples only. Your model, revision numbers, and performance data will vary.

The front panel display shows different message screens during different modes of operation (Startup, Normal, Offline, and Fault). All single units display a basic set of message screens. Multiple unit systems display additional screens in Normal Operation and Offline modes.

In addition, there are special message screens that may appear in any operational mode. All these message screens are described in the following tables.

Startup Mode

During startup, the GT Inverter displays several message screens on its front panel LCD. These screens appear in the following order:

Table 5-1 Startup Screens on GT Inverter Front Panel Display

Display	Duration	Description
Power 5000W **NA-240/208V**	5 seconds	**Startup message 1:** Maximum output power and Region-nominal output voltage.
Flash = 03.01 **ROM = 03.00**	5 seconds	**Startup message 2:** Model and revision numbers for Flash and ROM memory on the GT Inverter. The ROM revision number applies to the protection processor.

Table 5-1 Startup Screens on GT Inverter Front Panel Display

Display	Duration	Description
Vh= 266V Clr t < 1.00s	3 seconds	**Vh:** Phase-to-phase (rms) high threshold voltage setting—the threshold at which the inverter disconnects itself from the power grid when abnormally high phase-to-phase AC voltage is detected.* **Clr t:** Clear time.†
Vl= 177V Clr t < 2.00s	3 seconds	**Vl:** Phase-to-phase (rms) low threshold voltage setting—the threshold at which the inverter disconnects itself from the power grid when abnormally low phase-to-phase AC voltage is detected. **Clr t:** Clear time.†
Vph= 130V Clr t < 1.00s	3 seconds	**Vph:**Phase-to-neutral (rms) high threshold voltage setting—the threshold at which the inverter disconnects itself from the power grid when abnormally high phase-to-neutral AC voltage is detected. **Clr t:** Clear time.†
Vpl= 107V Clr t < 2.00s	3 seconds	**Vpl:** Phase-to-neutral (rms) low threshold voltage setting—the threshold at which the inverter disconnects itself from the power grid when abnormally low phase-to-neutral AC voltage is detected. **Clr t:** Clear time.†
Fh= 60.4Hz Clr t < 0.16s	3 seconds	**Fh:** Frequency high threshold setting—the threshold at which the inverter disconnects itself from the power grid when abnormally high frequency is detected. **Clr t:** Clear time.†
Fl= 59.4Hz Clr t < 0.16s	3 seconds	**Fl:** Frequency low threshold setting—the threshold at which the inverter disconnects itself from the power grid when abnormally low frequency is detected. **Clr t:** Clear time.†
Reconnect Delay 305.00s	3 seconds	Setting for the reconnect delay for the protection timer. After a fault clears for the specified clear time, the protection timer starts counting down before the inverter attempts to deliver power to the grid.

*The voltage and frequency thresholds, clear times, and reconnect delay can be adjusted for multi-unit installations producing 30 kW or more (with the permission of the local utility) using GTConfigLite software.

†The clear time is the total time to disconnect the output from the grid. It is the sum of the debounce time and the hardware delay time. The debounce time is the protection processor waiting time before it declares a fault. This delay is necessary to avoid nuisance trips.

The protection timer begins counting down the reconnect delay during startup and the `Reconnecting in sss seconds` screen appears until the timer countdown is complete.

Normal Operation Mode

The LCD on the GT Inverter is refreshed every two seconds, so all readings are current to within two seconds. There is a default display available at all times, and a series of additional screens can be displayed by tapping the inverter's front panel.

Normal operation default display

After the protection timer has completed its countdown and during normal operation, the GT Inverter displays the following normal operation message screen:

Table 5-2 Normal Operation Default Screen

Display*	Description
System 5000W **Today 9.875kWh**	Power being produced by the system now and cumulative energy produced by the system today.

*All numbers in this table and the following tables are examples only.

If there is sufficient energy from the PV array, the default screen is displayed continuously while the system is operating normally. In a multiple unit system with communications cables properly connected, the power and cumulative energy values displayed are for the entire system.

During low light conditions when the GT Inverter cannot produce any power, the normal operation default screen flashes alternately (every two seconds) with the `Insufficient Solar Energy` screen (see Table 5-10 on page 5–9).

More screens for all systems

In addition to the default normal operation display, additional system information messages can be viewed.

To view more normal operation information:

- Tap the front panel to advance the display to the next screen. Normal operation screens shown in Table 5-3 are displayed in the order given, as you tap successively on the unit. They are common to all GT Inverter systems, no matter how many units are installed.

If you continue to tap the front panel, the LCD continues to cycle through all of the available normal operation screens. Each screen is displayed for a maximum of 30 seconds. If you do not tap again during that time period, the LCD backlight turns off and the display reverts to the default system message screen.

Table 5-3 Normal Operation Screens

Tap	Display*	Description
1st	**System 5000W** **Today 2.500kWh**	LCD backlight turns on for better readability and default Normal Operation screen is displayed.
2nd	**System Lifetime** **305kWh**	Lifetime energy produced by the GT Inverter system.
3rd	**Time Online** **Today hh:mm:ss**	Length of time inverter has been online today, in hours (hh), minutes (mm) and seconds (ss).
4th	**Array Readings** **350.5V 8.4A**	Immediate DC voltage and current readings from the PV array.
5th	**Grid Readings** **242.6V 60.0Hz**	Immediate AC voltage and frequency readings from the Grid
6th	**XanBus 250Kbps** **Tx:OK Rx:OK**	Xanbus network baud rate, transmitter, and receiver status.

*In a multiple unit system with network cables properly installed, the *System* values displayed are for the entire system. For example, in a two-inverter system, if Inverter #1 is producing 1500 W and Inverter #2 is producing 2000 W, both inverters display a total system power of 3500 W. `Time Online` and `Array Readings` are for the local inverter and PV array associated with that inverter.

Additional screens for multiple units

In addition to the normal system message screens, additional screens specific to each GT Inverter unit can be displayed when the unit is networked to other GT Inverters. These screens are only available on multiple unit systems.

To view unit-specific screens in a multiple unit system:

1. Tap the inverter front panel to advance the display to the next screen. Continue tapping until the final system message screen (“Grid Readings”, in Table 5-3 above) is displayed.
2. Tap again. Normal operation screens shown in Table 5-4 are displayed in the order given, as you tap successively on the unit.

If you continue to tap the unit, the LCD will cycle through all of the available normal operation screens. Each message is displayed for up to 30 seconds. If you do not tap again within that time period, then the LCD backlight turns off and the display reverts to the default normal operation screen (Table 5-2).

Table 5-4 Additional Normal Operation Screens for Each GT Inverter Unit in a Multiple Unit System

Tap	Display	Description
7th	**Unit 5000W** **Today 1.250kWh**	Power being produced by this unit now and cumulative energy produced by this unit today.
8th	**Unit Lifetime** **150kWh**	Lifetime energy produced by this GT Inverter.

Offline Mode

Offline default display

At night and when no power is being produced by the PV array (offline mode), the GT Inverter displays the screen shown in Table 5-5.

Table 5-5 Offline Mode Default Display

Display	Description
Inverter Offline	Displayed at all times while the system is offline.

Offline messages for all systems

Additional message screens can be viewed when the system is offline by tapping the inverter front panel. Each additional tap displays the next screen, in the order shown in Table 5-6.

These message screens are common to all GT Inverter systems, no matter how many units are installed. If you continue to tap the unit, then the LCD will continue to cycle through all of the available offline mode screens.

Table 5-6 Offline Mode Screens for All GT Inverter Units

Tap	Display*	Description
1st	**Inverter Offline**	LCD backlight turns on for better readability and default offline mode screen is displayed.
2nd	**System 0W Today 2.50kWh**	Power being produced by the system now and cumulative energy produced by the system today.
3rd	**System Lifetime 305kWh**	Lifetime energy produced by the system.
4th	**Time Online hh:mm:ss**	Total time that the system was online today, in hours (hh), minutes (mm), and seconds (ss).

*In a multiple unit system with communications cables properly installed, the `System` values displayed are for the entire system. `Time Online` is for the local inverter.

Additional offline messages for multiple unit systems

Multiple unit systems in offline mode display all the message screens shown in Table 5-6, plus the additional screens shown in Table 5-7. These additional screens are displayed following the `Time Online` screen.

These screens are displayed only on multiple unit GT Inverter systems with communications cables installed. If you continue to tap the unit, the LCD continues to cycle through all of the available offline mode screens.

Table 5-7 Additional Offline Mode Screens for Each GT Inverter Unit in a Multiple Unit System

Tap	Display	Description
5th	**Unit 0W** **Today 1.25kWh**	Power being produced by this unit now and cumulative energy produced by this unit today.
6th	**Unit Lifetime** **150kWh**	Lifetime energy produced by this unit.

Fault Mode

When a fault state is detected, the appropriate fault message appears on the front panel display at the next screen refresh (within 2 seconds). The GT Inverter fault message screens are shown in Table 5-8. The numbers used in Table 5-8 are examples of what could display when a fault is present.

Fault Mode causes

These message screens only appear when there is a fault, and then they flash alternately with the `Inverter Offline` default screen (Table 5-5) until the fault is corrected.

Table 5-8 Fault Message Screens

Display	Appears When...
DC Voltage Fault **145.5V**	The actual DC voltage is over or under the allowable range. Self-clearing, no action required. The PV array should be configured such that DC voltage falls within the input voltage maximum power point range as specified for your model in “Electrical Specifications” in Appendix A.*
AC Voltage Fault **280V**	The actual AC voltage is over or under the allowable range, as specified in “Electrical Specifications” in Appendix A. This is a utility fault. It will clear itself when the AC voltage comes within the specified range.† If the fault does not clear, a phase-to-neutral line may not be connected properly.
AC Current Fault	The AC output current is over the allowable limit, which is 0.5 A less than the maximum output fault current. See “Electrical Specifications” in Appendix A. The message clears after 15 seconds if the output current falls below the limit.
Frequency Fault **47.0Hz**	The actual frequency is over or under the allowable range, as specified in “Electrical Specifications” in Appendix A.This is a utility fault. It will clear itself when the frequency comes within the specified range.†
Over Temp Fault **81.4C 178.5F**	The unit’s internal temperature is greater than 80° C (176° F). The unit will shut down automatically and only restart when the temperature has dropped to less than 70° C (158° F).

Table 5-8 Fault Message Screens

Display	Appears When...
Ground Fault Reset System	A grounding fault is detected. The ground fault fuse will be blown. The system must be shut down completely, the fault must be corrected, and the fuse must be replaced (see "Replacing the Ground Fault Protection Fuse" on page 6–8). Then, the system must be restarted. Troubleshooting a grounding fault must be performed by qualified personnel, such as a certified electrician or technician.
Unit Shutdown via Remote	The GT Inverter unit has been shut down via a computer connected to the RS-232 port.
Protection uP Not Responding	The protection microprocessor is not responding.

*It is normal to receive this fault during low light conditions at dawn or dusk. At such times, the array does not have sufficient energy to power the inverter, so the PV voltage drops below the lower limit of the maximum power point range occasionally.
†Grid fault. When this fault is cleared the protection timer will begin its countdown and you will see the `Reconnecting in sss seconds` and `Inverter Offline` special screens (see Table 5-10) flashing alternately until the countdown is complete.

Additional Fault messages for all systems

Additional message screens can be viewed in fault mode by tapping the inverter's front panel. Each additional tap displays the next screen in the order shown in Table 5-9.

Table 5-9 Additional Fault Mode Screens

Tap	Display*	Description
1st	Current fault message screen (see Table 5-8)	LCD backlight turns on for better readability.
2nd	**System 0W Today 2.500kWh**	Energy being produced by the system now and cumulative energy produced by the system today.
3rd	**System Lifetime 305kWh**	Lifetime energy produced by the system.
4th	**Time Online Today hh:mm:ss**	Length of time inverter was online today, in hours (hh), minutes (mm), and seconds (ss).
5th	**Array Readings 350.5V 8.4A**	Immediate DC voltage and current readings of power from the PV array.
6th	**Grid Readings 242.6V 60.0Hz**	Immediate AC voltage and frequency readings of power from the grid.

*In a multiple unit system with network cables installed, the `System` values displayed are for the entire system. `Time Online` and `Array Readings` are for the local inverter and PV array associated with that inverter.

Special Screens

Special message screens are displayed in specific situations that are not considered fault situations. They can appear in any mode of operation. These screens are described in Table 5-10.

Table 5-10 Special Message Screens

Display	Description
Reconnecting in *sss* seconds	Time remaining in seconds (sss) before the GT Inverter reconnects to the grid. This is a protection timer. It runs for approximately five minutes at startup and after any grid fault.
Inverter Offline	GT Inverter switching (or has switched) from normal operation to offline mode. This screen may flash alternately with a fault message screen.
System *9600W Today 15.56kWh	The asterisk (*****) in these two screens (see Table 5-2 and Table 5-4) indicates that the unit is derating its output power because the inverter heat sink temperature is above 75° C (167° F). The asterisk only appears when the power is actually being limited by the inverter.
Unit *4800W Today 7.82kWh	
Insufficient Solar Energy	Indicates the GT Inverter is not producing power due to insufficient solar energy during low light conditions in early morning or late afternoon or when the PV array is in shade. This screen flashes alternately with the normal operation default screen.

Custom Screens

Two custom screens are available. The inverter does not display them unless they are configured using GT-View (see page 3–24). If programmed, the custom screens display as the fourth and fifth screens during the startup sequence. They can also be viewed by tapping the unit during normal operation and fault mode.

The first custom screen is intended for the home owner to display information such as the name or location of the PV array associated with the inverter.

The second custom screen is intended for installers, who can configure the screen to display, for example, contact information for service.

Status Indicator Lights

The GT Inverter has two status indicator lights (LEDs) located below the front panel LCD (Figure 5-2). These LEDs indicate the inverter's status (Table 5-11) and assist in troubleshooting the performance of the unit.

Only one indicator light will be lit at any time.

Table 5-11 Status Indicator LEDs

LED on	Means
Green	GT Inverter is on (DC voltage and AC voltage are qualified and the protection timer has finished) and delivering power. No action required. Turns off when a fault state is detected.
Red	Ground fault condition detected. Check for any fault messages on the display (see Table 5-8), and refer to Table 6-1, "Troubleshooting the GT Inverter" on page 6–15 to resolve the fault condition.

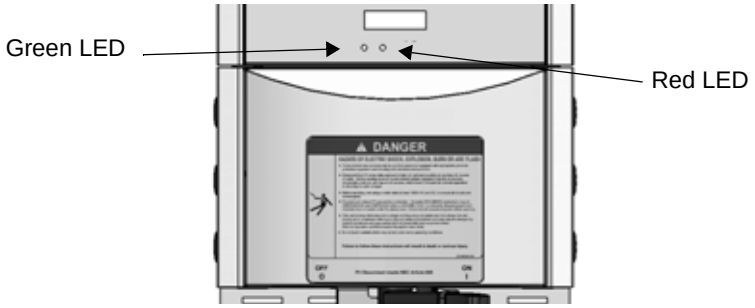

Figure 5-2 Status Indicator Lights

6 Maintenance and Troubleshooting

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The Xantrex Grid Tie Solar Inverter has no user serviceable parts inside. It must be installed and serviced only by qualified personnel equipped with appropriate personal protective equipment and following safe electrical work practices.

The GT Inverter is energized from two sources: PV array while exposed to light and AC grid. Before opening doors or covers, consult the system diagram to identify all sources; de-energize, lock-out, and tag-out all sources; and wait at least five minutes for internal capacitors to discharge to safe voltages.

Before servicing, test using a meter rated at least 1000V AC and DC to ensure all circuits are de-energized.

The GT Inverter is provided with integral PV ground fault protection. Normally GROUNDED conductors may be UNGROUNDED and ENERGIZED when a GROUND FAULT is indicated. Disconnect all sources of power before opening.

The GT Inverter employs field adjustable voltage and frequency set points and time delays that are factory set in compliance with local utility and safety requirements and may be changed only by trained technicians with approval by both the local utility and equipment owner.

Failure to follow these instructions will result in death or serious injury.

Chapter 6 contains information on general maintenance of the Xantrex Grid Tie Solar Inverter. It also provides information about troubleshooting the unit.

The topics in this chapter are organized as follows:

Factors Affecting GT Inverter Performance

This section describes several factors that affect the amount of power a properly installed and operating GT Inverter can produce.

PV Array Factors

PV array ratings

PV arrays are rated under standardized conditions, such as specified illumination (1000 W/m^2), spectrum of the light, and specified temperature (25 °C / 77 °F), which seldom reflect real-world installations. This is called the STC (Standard Test Condition) rating and is the figure that appears on the PV module nameplate label.

Expected performance

Due to several unavoidable environmental factors, you can expect your PV array to produce around 60% to 70% of its peak STC-rated output for a properly designed and installed PV system on a typical day.

Temperature and reduced output

PV array temperature affects the output of the entire system. As the temperature on the array surface rises, its energy output decreases. Roof-mounted arrays also collect the heat generated by the roof surface (or trapped under the array) and will produce less output than pole-mounted arrays, which allow greater air circulation behind the panels.

Note: The GT Inverter will reduce its energy output to protect its electronic circuits from overheating and to protect from possible damage in high heat conditions. For maximum output in hot climates, mount the GT Inverter in a shaded location with good air flow.

Angle of the sun

The angle of the sun in relation to the PV array surface—the array orientation—can dramatically affect the PV array output. The array energy output will vary depending on the time of day and time of year as the sun's angle in relation to the array changes. Incident sunlight decreases when the sun is near the horizons (such as in winter in North America) due to the greater atmospheric air mass that must be penetrated. This reduces both the light intensity that strikes the array's surface and the spectrum of the light. In general, you can expect only four to six hours of direct sunlight per day.

Partial shade

Shading of only a single module of the array will reduce the output of the entire system. Such shading can be caused by something as simple as the shadow of a utility wire or tree branch on part of the array's surface. This condition acts like a weak battery in a flashlight, reducing the total output even though the other batteries are good. However, the output loss is not proportional to the shading.

The GT Inverter is designed to maximize its energy production in all of the above situations using its MPPT algorithm.

Other Factors

Other factors that contribute to system losses are:

- Dust or dirt on the array
- Fog or smog
- Mismatched PV array modules, with slight inconsistencies in performance from one module to another
- Inverter efficiency
- Wire losses
- Utility grid voltage

For additional information and technical notes concerning PV array performance, please visit our Web site at **www.xantrex.com**.

Performing General Maintenance

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Use caution when working around sources of DC power. Although the DC/AC disconnect switch disconnects the inverter from DC power, hazardous voltages from paralleled PV strings will still be present upstream of the switch and inside the wiring box. To reduce the risk of shock during installation, cover the array with an opaque (dark) material before making any connections, make sure the DC/AC disconnect switch is set to OFF (see Figure 3-7 on page 3–10), and always test for voltage before touching exposed wiring or devices.

Before attempting any maintenance or cleaning or working on any circuits connected to the inverter, consult the system diagram to identify all sources; de-energize, lock-out, and tag-out all sources. Internal capacitors remain charged for five minutes after disconnecting all sources of power.

Do not use a pressure washer to clean the GT Inverter, and do not use other cleaning methods that could allow water to enter the unit.

Failure to follow these instructions will result in death or serious injury.

Follow these simple routines to ensure many years of service and optimal performance of your solar energy system:

- Keep the heat sink clear of dust and debris.
- Clean the PV array during the cool part of the day whenever it is visibly dirty.
- Periodically inspect the system to make sure that all wiring and supports are securely in place.
- At least once a year clean and lubricate the DC/AC disconnect switch with a thin film of Molokyte® BG20 synthetic bearing grease. Only qualified service personnel should clean and lubricate the switch. See “Cleaning and Lubricating the DC/AC Disconnect Switch” below for more information.
- Maintain a log of system performance readings so that you can recognize when system performance becomes inconsistent.

Cleaning and Lubricating the DC/AC Disconnect Switch

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Apply appropriate personal protective equipment and follow safe electrical work practices:

- This equipment must be serviced only by qualified electrical personnel.
- Never operate energized switch with door open.
- Turn off switch before removing or installing fuses or making load side connections.
- The GT Inverter is energized from two sources: PV array while exposed to light and AC grid. Before opening doors or covers, consult the system diagram to identify all sources; de-energize, lock-out, and tag-out all sources; and wait at least five minutes for internal capacitors to discharge to safe voltages.
- Always use a properly rated voltage sensing device at all line and load fuse clips to confirm switch is off.
- Turn off power supplying switch before doing any other work on or inside switch.
- Do not use renewable link fuses in fused switches.

Failure to follow these instructions will result in death or serious injury.

At least once a year clean and lubricate the DC/AC disconnect switch with a thin film of Molokyte® BG20 synthetic bearing grease. Only qualified service personnel should clean and lubricate the switch. If switch usage is high or ambient operating conditions are unusual (ambient temperatures below -22 °F (-30 °C) or above
104 °F (40 °C); or abnormal vibration or shock), perform this procedure more often.

To clean and lubricate the DC/AC disconnect switch:

1. Turn OFF the breaker switches in the main utility service panel and the DC/AC disconnect switch on the GT Inverter.
2. Disable the output of the PV arrays by covering them with an opaque (dark) material.
3. Open the switch blades by moving the operating handle to the OFF position.
4. Lock out or tag the switch, per local procedures.

5. Remove the wiring/disconnect box cover (see Figure 3-4 on page 3–8) and the display front panel cover (see Figure 6-2 on page 6–9), and then use a properly rated voltage sensing device at all line and load-side terminals to confirm power is off.

NOTICE

RISK OF EQUIPMENT FAILURE

Do not remove any parts from the switch or operating mechanism unless specifically instructed to do so in the following steps.

Failure to follow these instructions can result in equipment damage.

6. After confirming power is off, replace the display front panel cover.
7. Vacuum any loose material from inside the switch. Wipe internal parts and the inside of the enclosure with a damp, lint-free cloth.
8. Visually inspect the switch for loose parts or hardware:
   a) Retighten the hardware as needed.
   b) Do not re-energize the switch if any worn or damaged parts are found. Replace them before re-energizing the switch.
9. Remove the arc suppressor (see Figure 6-1) from the switch by loosening the fastener holding the suppressor in place.

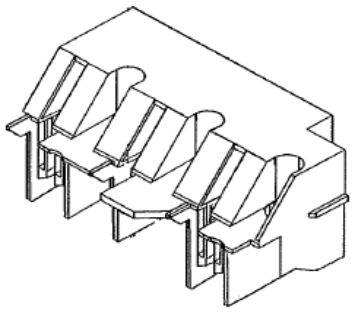

Figure 6-1 Arc Suppressor

⚠CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not disassemble the switch line base assembly or remove the blade rotor when cleaning the line-side jaw or the switch blade.

Failure to follow this instruction can result in equipment damage.

10. Remove old grease and other contaminants from the line-side jaws and switchblades with a clean, lint-free cloth first. If previous lubricant has dried, remove it with CRC®-type HF Contact Cleaner, or equivalent, sprayed on a cloth.
11. Relubricate the cleaned areas with a thin film of Dow Corning® BG20 grease only. Do not substitute any other lubricant. Other lubricants may not be suitable for electrical applications and could alter the performance of the switch.
12. Reinstall the arc suppressor and wiring/disconnect box cover, and then exercise the operating mechanism to ensure proper operation by opening and closing the switch five times with the door closed. Open the switch blades.
13. Enable the PV arrays by uncovering them. Turn ON the breaker switches in the main utility panel and the DC/AC disconnect switch on the GT Inverter.
14. If the switch was serviced as part of other service or maintenance, follow the startup procedure described on page 4–2.

Replacing Parts

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

There are no user serviceable parts inside the GT Inverter. The GT Inverter must be installed and serviced only by qualified personnel equipped with appropriate personal and protective equipment and following safe electrical work practices.

Failure to follow these instructions will result in death or serious injury.

See “Warranty and Return Information” on page WA–1 for information on how to get service for your GT Inverter.

Replacing the Ground Fault Protection Fuse

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Inverter fuses must be replaced only by qualified service personnel, such as a certified electrician or technician using appropriate personal protective equipment and following safe work procedures.

After disconnecting both AC and DC power from the GT Inverter, wait five minutes before attempting troubleshooting or maintenance on any circuits connected to the inverter to allow internal capacitors to discharge to a safe state.

Cover PV arrays with an opaque (dark) material during this procedure. With the array uncovered, leakage current from the ungrounded conductor to ground at the array can cause the grounded lead to become a shock hazard even with the DC/AC disconnect switch turned OFF.

Use insulated fuse pullers or fuse holders.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

HAZARD OF FIRE

For continued protection against risk of fire, replace only with same type and rating of fuse.

Failure to follow these instructions can result in death or serious injury.

The ground fault protection fuse will blow when excessive leakage current occurs between the PV array and earth ground or when the system has been installed with faulty wiring. Before replacing the fuse, it is important to have qualified service personnel, such as a certified electrician or technician, determine the cause of the ground fault. The GT Inverter also has an AC overcurrent protection fuse (see Figure 6-3 on page 6–10) that also must be replaced only by qualified service personnel.

To replace a ground fault protection fuse:

1. Cover the PV array with an opaque (dark) material, turn the DC/AC disconnect switch OFF, and turn the AC breaker in the main utility service panel OFF.
2. Remove the wiring/disconnect box cover, as described on page 3–8.

3. Use an appropriately-rated meter to make sure there are no DC or AC voltages present.
4. Remove the display front panel cover (see Figure 6-2), located below the heat sink. Use a Phillips screwdriver to remove the two external panhead screws and washers and the two screws along the bottom edge of the cover.

   The ground fault protection fuse is located to the left side of the LCD panel (see Figure 6-3), and to the left of the DC interconnect board for positive grounded units (marked with the "-POS" suffix).
5. Using an insulated fuse puller, remove the blown fuse and replace it with a new AC/DC midget cartridge, rated 600 VDC, 1A (Littelfuse KLKD 1 or equivalent).
6. Replace the display front panel cover and tighten all four screws securely.
7. Replace the wiring/disconnect box cover (see instructions on page 4–3).

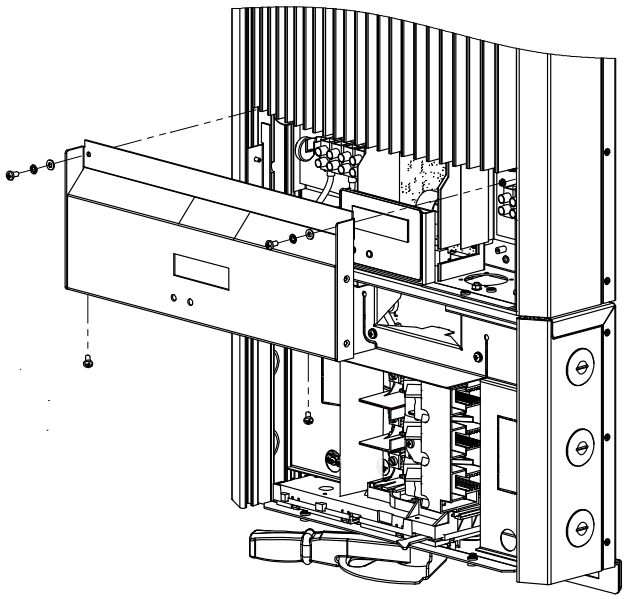

Figure 6-2 Display Front Panel Assembly

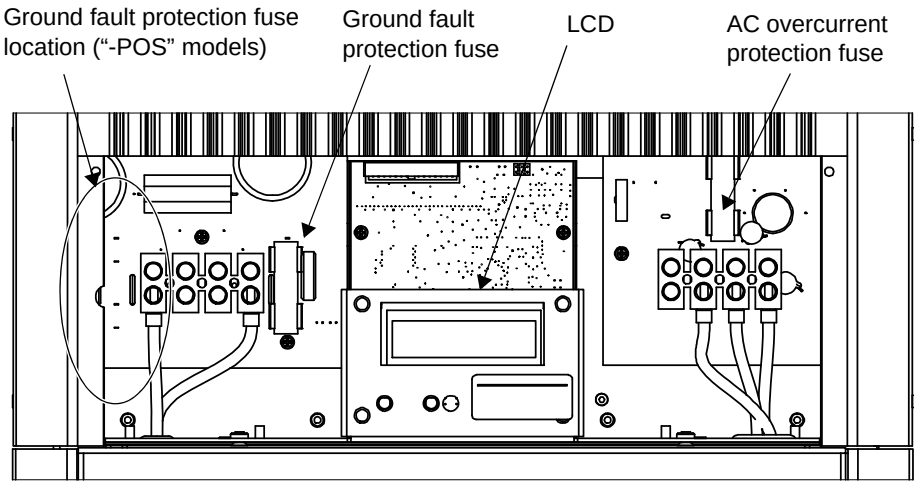

Figure 6-3 Location of Fuse, Front Panel Cover Removed

Replacing the Inverter

> **Note:** Only replace an inverter with another inverter that is the same model and grounding scheme.

If your GT Inverter requires servicing, you can replace it with another inverter of the same model, leaving the existing wiring box in place. This means that you do not have to disturb wiring connections in the wiring/disconnect box. However, you do have to disconnect wiring between the inverter and the wiring/disconnect box.

Recommended tools:

- Insulated screwdriver
- Wire nuts
- 7 mm socket and small ratchet or 7 mm open wrench

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Replacement of the inverter must be done only by qualified service personnel, such as a certified electrician or technician using appropriate personal protective equipment and following safe electrical work practices.

After disconnecting both DC and AC power from the GT Inverter, wait five minutes before attempting troubleshooting or maintenance on any circuit connected to the inverter. This will allow internal capacitors to discharge to a safe state.

Turn OFF the AC breaker in the main utility service panel and the DC/AC disconnect switch on the GT Inverter. Cover the PV arrays with an opaque (dark) material. With the array uncovered, leakage current from the ungrounded conductor to ground at the array can cause the grounded lead to become a shock hazard even with the DC/AC disconnect switch turned OFF.

The inverter should be removed from the wiring box only when a replacement inverter is immediately available. Do not leave the top of the wiring box exposed for extended periods of time.

Failure to follow these instructions will result in death or serious injury.

To remove the inverter from the wiring box:

1. Turn OFF the AC breaker in the main utility service panel and the DC/AC disconnect switch on the GT Inverter. Disable the output of the PV arrays either by covering them with an opaque (dark) material or by turning off any external DC switches.
2. Remove the wiring/disconnect box cover, and then remove the display front panel cover (see Figure 3-4 on page 3–8 and Figure 6-2 on page 6–9).
3. Use an appropriately rated meter to check that there are no DC or AC voltages present at the disconnect box input terminals and inverter terminal blocks.
4. Disconnect any network cables from the GT Inverter.
5. Label the DC and AC wires connected to the inverter terminal blocks so they can be installed in the correct location on the replacement inverter.
6. Disconnect all DC and AC wires from the inverter terminal blocks, pull the wires into the wiring/disconnect box, and cap all disconnected AC and DC wire ends with wire nuts.
7. Inside the inverter, remove the four nuts attaching the wiring box to the inverter. See Figure 6-4.
8. Lift the inverter off the mounting bracket leaving the wiring box in place.

9. Make sure the gasket on the wiring/disconnect box is clean and undamaged. The gasket must create a water-tight seal between the inverter and the wiring/disconnect box.
10. If the replacement inverter is not immediately available, make sure the wiring box is protected from the weather.

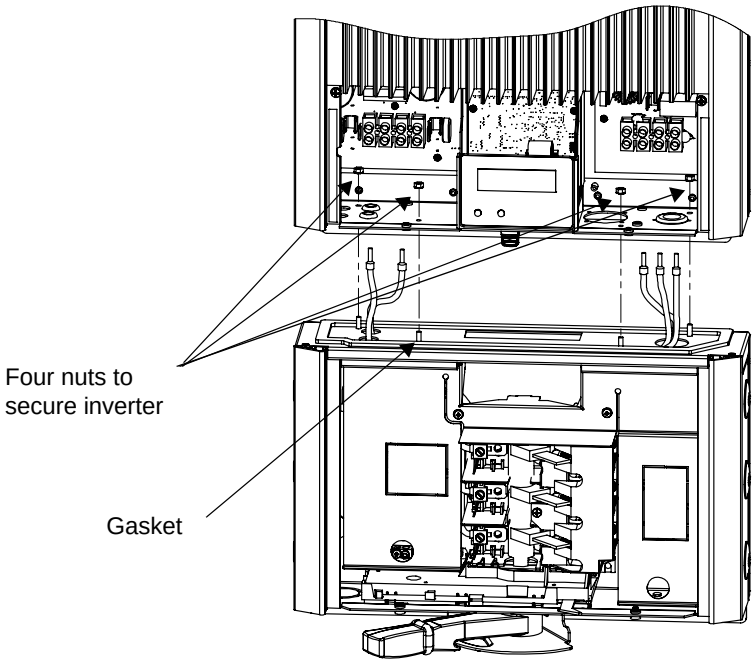

Figure 6-4 Wiring/Disconnect Box and Removable Inverter

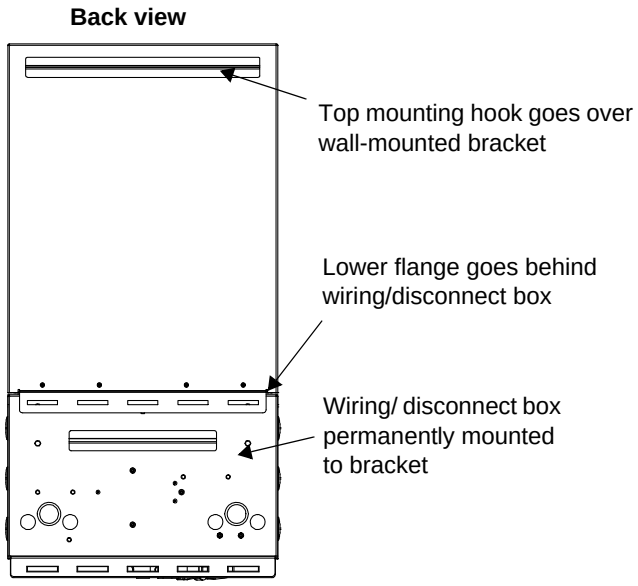

Figure 6-5 Inverter and Wiring/Disconnect Box Sections

To replace the inverter on the wiring box:

1. If it has not already been removed, remove the wiring/disconnect box cover (see Figure 3-4 on page 3–8).
2. Verify the grounding system used in the existing wiring/disconnect box:
   a) Check the model number of the replacement inverter, and see whether "-POS" is included in the model number. If so, the inverter is only intended for a positive ground system.
   b) Re-apply PV system power to the wiring/disconnect box by uncovering the PV arrays and, if applicable, turning external DC switches on. DO NOT turn on the main DC/AC disconnect switch to the ON position at this time.
   c) Using a meter rated for at least 1000 VDC, place the meter's positive test lead on the PV UNGROUNDED terminal block and the negative test lead on the PV GROUNDED terminal block. Measure the voltage.

      If the meter registers a negative voltage, the existing grounding system is wired as a positive system, and the wiring/disconnect box must be used only with model numbers that include "-POS."

If the meter registers a positive voltage, the existing grounding system is wired as a negative system, and the wiring/disconnect box must be used only with model numbers that DO NOT include "-POS."

Measured Polarity	Existing Grounding System	Compatible Model Numbers
Negative	Positive	GTx.x-NA-240/208-POS UL-05
Positive	Negative	GTx.x-NA-240/208 UL-05

d) Disconnect the PV power by re-covering the PV arrays and/or turning off any external switches.

3. If it has not already been removed, remove the display front panel cover on the inverter (see Figure 6-2 on page 6–9).
4. Mount the inverter on the upper mounting bracket above the wiring/disconnect box, making sure the inverter's lower flange goes behind the wiring/disconnect box. See Figure 6-5.
5. Replace the nuts that connect the inverter and the wiring/disconnect box. Tighten each nut alternately to clamp the gasket between the inverter and wiring/disconnect box. Secure all nuts tightly, and torque to 1.8–2.0 Nm (16–17.7 in-lb).
6. Uncap the DC wires and reconnect them to the terminals inside the inverter:
   a) For a **positive-grounded** system, insert the **GROUNDED** wire from the wiring/disconnect box into the PV+ terminal block connection inside the inverter. Insert the **UNGROUNDED** wire from the wiring/disconnect box into the PV– terminal block connection inside the inverter.
   b) For a **negative-grounded** system, insert the **GROUNDED** wire from the wiring/disconnect box into the PV– terminal block connection inside the inverter. Insert the **UNGROUNDED** wire from the wiring/disconnect box into the PV+ terminal block connection inside the inverter.
   c) Torque terminal block connection screws to 1.0 Nm (8.9 in-lb).
7. Uncap the AC wires and reconnect them to the terminals inside the inverter:
   a) Insert the **BLACK** wire from the wiring/disconnect box into the **L1** terminal block connection inside the inverter.
   b) Insert the **RED** wire from the wiring/disconnect box into the **L2** terminal block connection inside the inverter.
   c) Insert the **WHITE** wire from the wiring/disconnect box into the **Neutral** terminal block connection inside the inverter.
   d) Torque terminal block connection screws to 1.0 Nm (8.9 in-lb).
8. Make sure all connections are correctly wired and secured, and then re-install the display front panel cover and wiring/disconnect box cover.
9. Follow the startup procedure as described on page 4–2.

Identifying Error/Fault Conditions and Solutions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Only qualified personnel equipped with appropriate personal protective equipment and following safe electrical practices should attempt to troubleshoot the GT Inverter.

Failure to follow these instructions will result in death or serious injury.

Most error or fault conditions will be identified by fault message screens on the GT Inverter's front panel LCD. These are described in the "Fault Mode" section on page 5–7 of this manual. Most of these fault conditions are self-correcting and require no action to remedy. See "Front Panel Display Screens and What They Mean" on page 5–2 for more information.

Table 6-1 is intended to assist in determining fault conditions that may require action to remedy.

Table 6-1 Troubleshooting the GT Inverter

Problem	Possible Cause	Solution
The inverter's LED indicators and display are blank and the inverter does not operate in sufficient sunlight.	DC/AC disconnect switch is OFF.	Turn on DC/AC disconnect switch and breakers in the sequence described in "Startup Procedure" on page 4–2.
The display reads `Inverter Offline` and `AC Voltage Fault`.	Utility service panel breakers are switched off.	Turn on utility panel breakers.
	AC grid voltage is not present or incorrect.	Check AC connections at the inverter's terminals. Make sure AC voltage within the range specified in "Output" in Appendix A is present.
The display reads `Inverter Offline` with sufficient sunlight.	DC breakers are switched off (if installed), or external DC fuses are blown (if installed).	Turn on any DC breakers and check any DC fuses.
	DC array voltage is not present.	Check DC connections at the inverter's positive and negative DC terminals. Check for incorrectly wired PV arrays.

Table 6-1 Troubleshooting the GT Inverter

Problem	Possible Cause	Solution
The display reads `Inverter Offline` and `DC Voltage Fault` with sufficient sunlight.	DC voltage is present but incorrect.	Check DC connections at the inverter's positive and negative DC terminals. Check for incorrectly wired PV arrays. Make sure a voltage within the operating voltage range is present at the inverter's terminals.
Only the inverter red LED is illuminated and the display reads `Ground Fault`.	Ground fault condition detected on the PV array.	The PV system should be checked and repaired. See Table 5-8 on page 5–7.
The *System* value (power being produced by the system) displayed on each inverter's LCD is different on inverters connected to the same daisy-chained network.	Inverters can display different *System* values when one of the inverters is set to a different baud rate than the rest. That particular inverter's baud rate screen shows Tx and/or Rx error (see Table 5-3 on page 5–5).	Check each inverter's baud rate and compare the settings. Change any inverters with an incorrect baud rate. Make sure to follow the recommended procedure supplied by Xantrex. See the Application Note, *Xantrex Grid Tie Solar Inverter Baud Rate Change Procedure* (976-0216-01-01 available on www.xantrex.com).

A Specifications

Appendix A contains specifications for the Xantrex Grid Tie Solar Inverter.

The topics in this appendix are organized as follows:

Electrical Specifications

GT5.0

Input

	GT5.0-NA-240/208 UL-05	GT5.0-NA-240/208-POS UL-05
Model number	864-1009-02	864-1011-02
Input voltage, Maximum Power Point range	Certified operating range: 240–550 VDC. (Unit is operable as low as 235 VDC.)	
Absolute maximum array open circuit voltage	600 VDC	
Maximum input current	22.0 ADC (240 V), 20.0 ADC (208 V)	
Maximum array short circuit current	24 ADC	
Reverse polarity protection	Short circuit diode	
Ground fault protection	GF detection, $I_{DIF} > 1$ A	

Output

Nominal output voltage	**240 V**	**208 V**
Maximum output power	5000 W	4500 W
Operating range, utility voltage (phase to phase)*	212–263 VAC	184–228 VAC
Operating range, utility voltage (phase to neutral)*	106.1–131.5 VAC	
Nominal output frequency	60 Hz	
Operating range, utility frequency*	59.3–60.5 Hz	
Startup current	0 Aac	
Maximum continuous output current	21 A	22 A
Maximum output fault current	30 A	
Maximum output overcurrent protection	30 A RMS	
Maximum utility backfeed current	0 A	
Total Harmonic Distortion	<3%	
Power factor	>0.99% (at rated power), >0.95% (full power range)	
Utility monitoring	AC voltage, AC frequency, and anti-islanding protection	
Output characteristics	Current source	
Output current waveform	Sine wave	

*Factory settings can be adjusted with the approval of the utility. This unit is provided with adjustable trip limits and may be aggregated above 30 kW on a single Point of Common Coupling. See “Adjustable Voltage, Frequency, and Reconnection Settings” on page A–12.

Efficiency

	240 V	**208 V**
Maximum peak efficiency	95.9%	95.5%
CEC efficiency	95.5%	95.0%
Night-time tare loss	1 W	

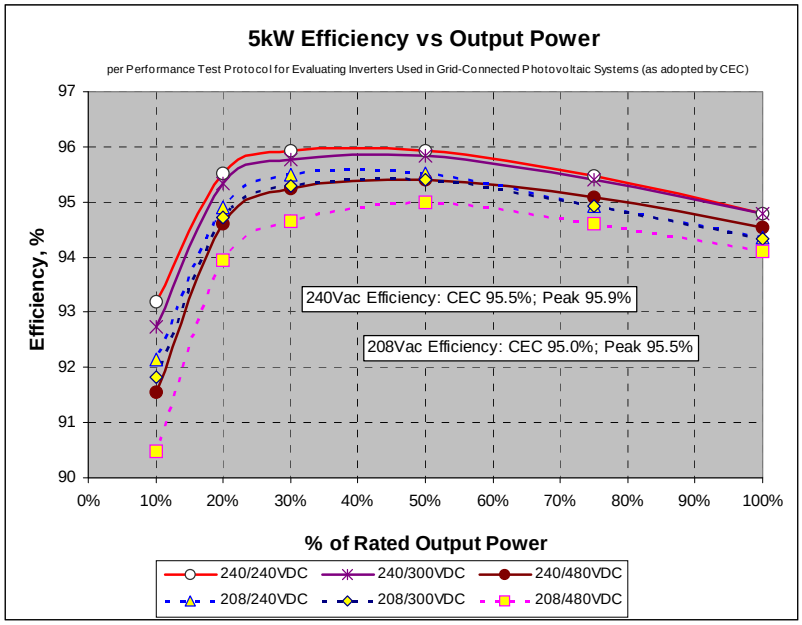

Figure A-1 GT5.0 Typical Efficiency

GT4.0

Input

	GT4.0N-NA-240/208 UL-05	GT4.0-NA-240/208 UL-05	GT4.0-NA-240/208-POS UL-05
Model number	864-1008-02	864-1007-02	864-1010-02
Input voltage, Maximum Power Point range	Certified operating range: 240–480 VDC. (Unit is operable as low as 235 VDC and as high as 550 VDC.)	Certified operating range: 195–550 VDC. (Unit is operable as low as 193 VDC.)	Certified operating range: 195–550 VDC. (Unit is operable as low as 193 VDC.)
Absolute maximum array open circuit voltage	600 VDC		
Maximum input current	18 ADC (240 V), 17 ADC (208 V)	22 ADC (240 V), 21 ADC (208 V)	
Maximum array short circuit current	24 ADC		
Reverse polarity protection	Short circuit diode		
Ground fault protection	GF detection, $I_{DIF} > 1$ A		

Output

Nominal output voltage	**240 V**	**208 V**
Maximum output power	4000 W	3800 W
Operating range, utility voltage (phase to phase)*	212–263 VAC	184–228 VAC
Operating range, utility voltage (phase to neutral)*	106.1–131.5 VAC	
Nominal output frequency	60 Hz	
Operating range, utility frequency*	59.3–60.5 Hz	
Startup current	0 Aac	
Maximum continuous output current	16.7 A	18.3 A
Maximum output fault current	25 A	
Maximum output overcurrent protection	25 A RMS	
Maximum utility backfeed current	0 A	
Total Harmonic Distortion	<5%	
Power factor	>0.99% (at rated power), >0.95% (full power range)	
Utility monitoring	AC voltage, AC frequency, and anti-islanding protection	
Output characteristics	Current source	
Output current waveform	Sine wave	

*Factory settings can be adjusted with the approval of the utility. This unit is provided with adjustable trip limits and may be aggregated above 30 kW on a single Point of Common Coupling. See “Adjustable Voltage, Frequency, and Reconnection Settings” on page A–12.

Efficiency

	GT4.0N-NA-240/208 UL-05		**GT4.0-NA-240/208 UL-05 GT4.0-NA-240/208-POS UL-05**	
Output voltage	**240 V**	**208 V**	**240 V**	**208 V**
Maximum peak efficiency	96%	95.7%	95.9%	95.6%
CEC efficiency	95.5%	95%	95%	95%
Night-time tare loss	1 W			

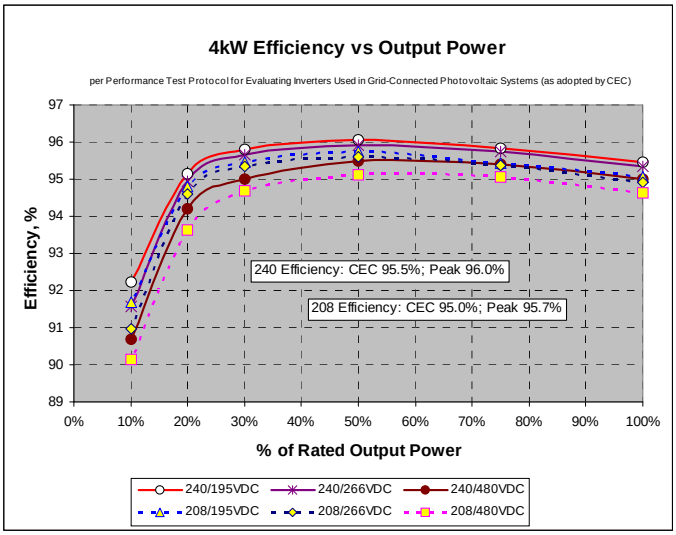

Figure A-2 GT4.0N Typical Efficiency

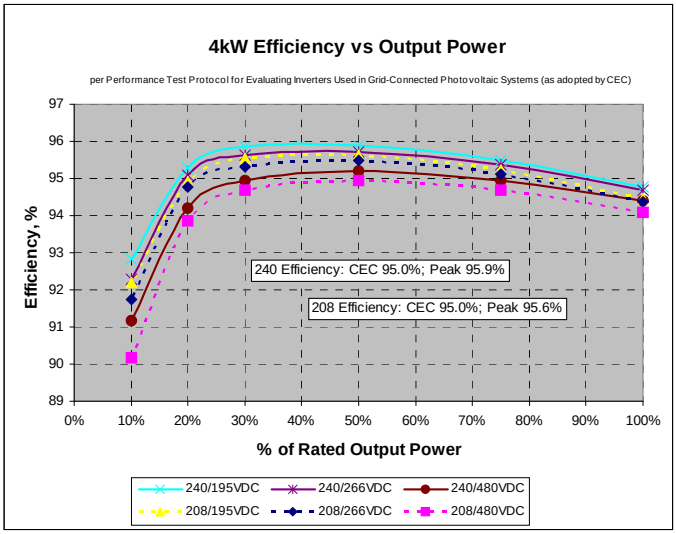

Figure A-3 GT4.0 Typical Efficiency

GT3.8

Input

Model number	864-1032-02
Input voltage, Maximum Power Point range	Certified operating range: 195–550 VDC. (Unit is operable as low as 193 VDC.)
Absolute maximum array open circuit voltage	600 VDC
Maximum input current	20.8 ADC (240 V), 19.5 ADC (208 V)
Maximum array short circuit current	24 ADC
Reverse polarity protection	Short circuit diode
Ground fault protection	GF detection, $I_{DIF} > 1$ A

Output

Nominal output voltage	**240 V**	**208 V**
Maximum output power	3800 W	3500 W
Operating range, utility voltage (phase to phase)*	212–263 VAC	184–228 VAC
Operating range, utility voltage (phase to neutral)*	106.1–131.5 VAC	
Nominal output frequency	60 Hz	
Operating range, utility frequency*	59.3–60.5 Hz	
Startup current	0 Aac	
Maximum continuous output current	15.8 A	16.8 A
Maximum output fault current	25 A	
Maximum output overcurrent protection	20 A RMS	25 A RMS
Maximum utility backfeed current	0 A	
Total Harmonic Distortion	<5%	
Power factor	>0.99% (at rated power), >0.95% (full power range)	
Utility monitoring	AC voltage, AC frequency, and anti-islanding protection	
Output characteristics	Current source	
Output current waveform	Sine wave	

*Factory settings can be adjusted with the approval of the utility. This unit is provided with adjustable trip limits and may be aggregated above 30 kW on a single Point of Common Coupling. See “Adjustable Voltage, Frequency, and Reconnection Settings” on page A–12

Efficiency

Output voltage	**240 V**	**208 V**
Maximum peak efficiency	95.9%	95.6%
CEC efficiency	95%	95%
Night-time tare loss	1 W	

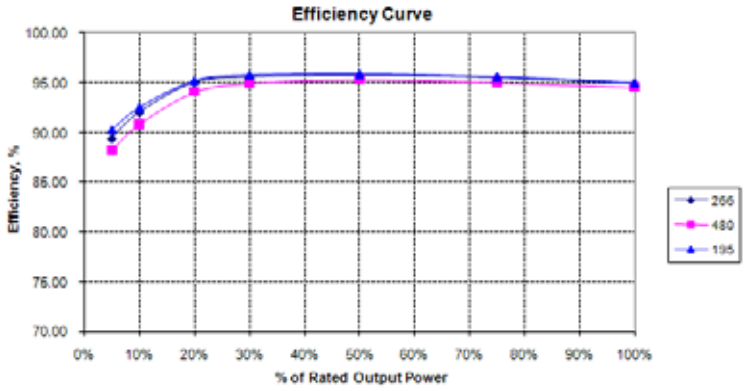

Figure A-4 GT3.8 240 VAC Typical Efficiency

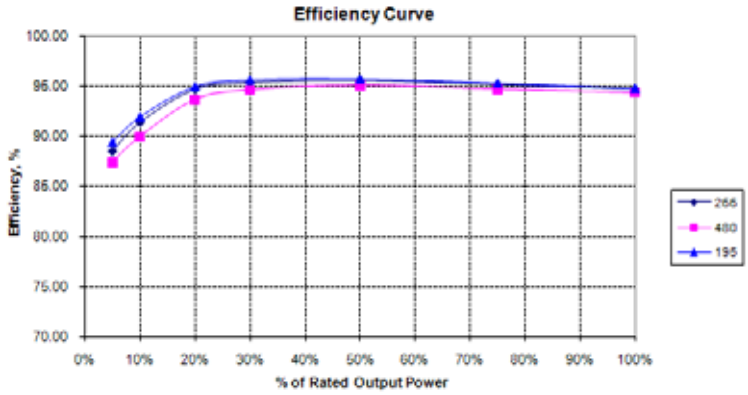

Figure A-5 GT3.8 208 VAC Typical Efficiency

GT3.3

Input

	GT3.3N-NA-240/208 UL-05	GT3.3-NA-240/208 UL-05	GT3.3-NA-240/208-POS UL-05
Model number	864-1006-02	864-1004-02	864-1005-02
Input voltage, Maximum Power Point range	Certified operating range: 200–400 VDC. (Unit is operable as high as 550 VDC.)	Certified operating range: 195–550 VDC. (Unit is operable as low as 193 VDC.)	
Absolute maximum array open circuit voltage	600 VDC		
Maximum input current	17.5 ADC (240 V), 16.5 ADC (208 V)	18 ADC (240 V), 17 ADC (208 V)	
Maximum array short circuit current	24 ADC		
Reverse polarity protection	Short circuit diode		
Ground fault protection	GF detection, I_{DIF} > 1 A		

Output

Nominal output voltage	240 V	208 V
Maximum output power	3300 W	3100 W
Operating range, utility voltage (phase to phase)*	212–263 VAC	184–228 VAC
Operating range, utility voltage (phase to neutral)*	106.1–131.5 VAC	
Nominal output frequency	60 Hz	
Operating range, utility frequency*	59.3–60.5 Hz	
Startup current	0 Aac	
Maximum continuous output current	13.8 A	14.9 A
Maximum output fault current	20 A	
Maximum output overcurrent protection	20 A RMS	
Maximum utility backfeed current	0 A	
Total Harmonic Distortion	<5%	
Power factor	>0.99% (at rated power), >0.95% (full power range)	
Utility monitoring	AC voltage, AC frequency, and anti-islanding protection	
Output characteristics	Current source	
Output current waveform	Sine wave	

*Factory settings can be adjusted with the approval of the utility. This unit is provided with adjustable trip limits and may be aggregated above 30 kW on a single Point of Common Coupling. See “Adjustable Voltage, Frequency, and Reconnection Settings” on page A–12.

Efficiency

	GT3.3N-NA-240/208 UL-05		GT3.3-NA-240/208 UL-05 GT3.3-NA-240/208-POS UL-05	
Output voltage	**240 V**	**208 V**	**240 V**	**208 V**
Maximum peak efficiency	95.9%	95.6%	95.8%	95.6%
CEC efficiency	95.5%	95%	95%	95%
Night-time tare loss	1 W			

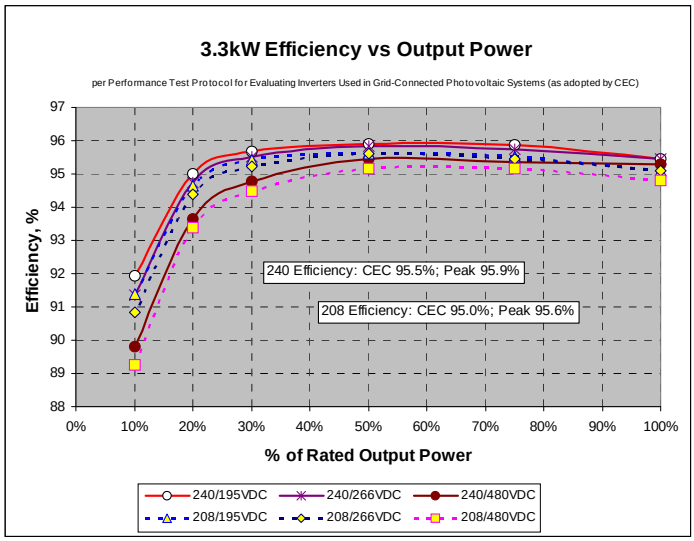

Figure A-6 GT3.3N Typical Efficiency

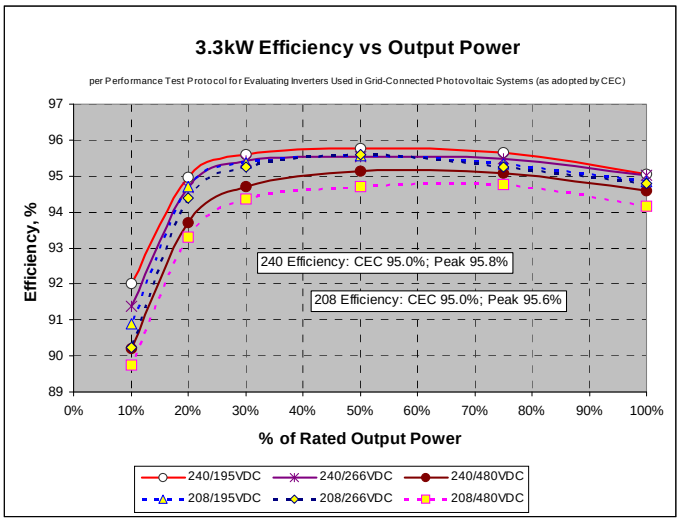

Figure A-7 GT3.3 Typical Efficiency

GT2.8

Input

	GT2.8-NA-240/208 UL-05	GT2.8-NA-240/208-POS UL-05
Model number	864-1001-02	864-1002-02
Input voltage, Maximum Power Point range	Certified operating range: 195–550 VDC. (Unit is operable as low as 193 VDC.)	
Absolute maximum array open circuit voltage	600 VDC	
Maximum input current	15.4 ADC (240 V), 14.9 ADC (208 V)	
Maximum array short circuit current	24 ADC	
Reverse polarity protection	Short circuit diode	
Ground fault protection	GF detection, I_{DIF} > 1 A	

Output

Nominal output voltage	**240 V**	**208 V**
Maximum output power	2800 W	2700 W
Operating range, utility voltage (phase to phase)*	212–263 VAC	184–228 VAC
Operating range, utility voltage (phase to neutral)*	106.1–131.5 VAC	
Nominal output frequency	60 Hz	
Operating range, utility frequency*	59.3–60.5 Hz	
Startup current	0 Aac	

Maximum continuous output current	11.7 A	13.0 A
Maximum output fault current	15 A	
Maximum output overcurrent protection	20 A RMS	
Maximum utility backfeed current	0 A	
Total Harmonic Distortion	<5%	
Power factor	>0.99% (at rated power), >0.95% (full power range)	
Utility monitoring	AC voltage, AC frequency, and anti-islanding protection	
Output characteristics	Current source	
Output current waveform	Sine wave	

*Factory settings can be adjusted with the approval of the utility. This unit is provided with adjustable trip limits and may be aggregated above 30 kW on a single Point of Common Coupling. See “Adjustable Voltage, Frequency, and Reconnection Settings” on page A–12.

Efficiency

	240 V	208 V
Maximum peak efficiency	95%	94.6%
CEC efficiency	94%	93.5%
Night-time tare loss	1 W	

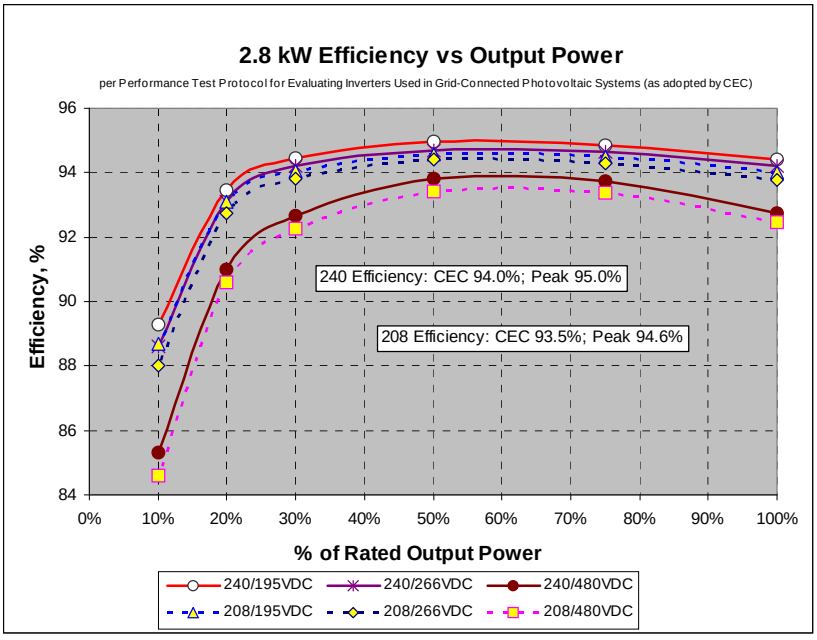

Figure A-8 GT 2.8 Typical Efficiency

Adjustable Voltage, Frequency, and Reconnection Settings

Utility disconnect settings can be adjusted using the GTConfigLite software tool. Permission from the utility must be granted before adjusting any of these settings.

For more information about installing and using GTConfigLite, see the *GTConfigLite User's Guide* (Document Part Number 975-0260-01-01), available with the software.

Setting	Default Setting	Tolerance	Adjustment Range		
			Low	High	Tolerance
Phase-to-Neutral (rms) High Threshold Voltage	132.00	+0.5, –2.5 V	130.50	135.00	±1.5 V
Phase-to-Neutral (rms) Reconnect Voltage	127.20	±0.24 V	126.96	135.00	±1.5 V
Phase-to-Neutral (rms) Low Threshold Voltage	105.60	–0.5, +2.5 V	102.00	107.10	±1.5 V
Voltage (rms) High Clearing Time (ms)	1000	+0, –0.1 s	1000	2000	+0, –0.1 s
Voltage (rms) Low Clearing Time (ms)	2000		2000	5000	
Frequency High Threshold	60.50	±0.1 Hz	60.40	60.60	±0.1 Hz
Frequency Low Threshold	59.30		57.00	59.80	
Frequency High Clearing Time (ms)	160	See important **Note** below	160	200	+0, –0.1 s
Frequency Low Clearing Time (ms)	160		160	300000	
Reconnect Delay (ms)	305000	n/a	60000	305000	n/a

Note: Setting Frequency High Clearing Time or Frequency Low Clearing Time to 160 ms results in a GT Inverter clearing time of 90ms (+0.01 s, –0.02 s). This performance meets CSA 107.1 requirements for a grid interconnect disconnect time limit of six cycles for Canadian installations.

Output Power Versus Ambient Temperature

Once the heat sink on the inverter reaches a temperature limit, the GT Inverter reduces its energy output to make sure component ratings are not exceeded. The following shows the maximum continuous output power derating to be expected at higher ambient temperatures.

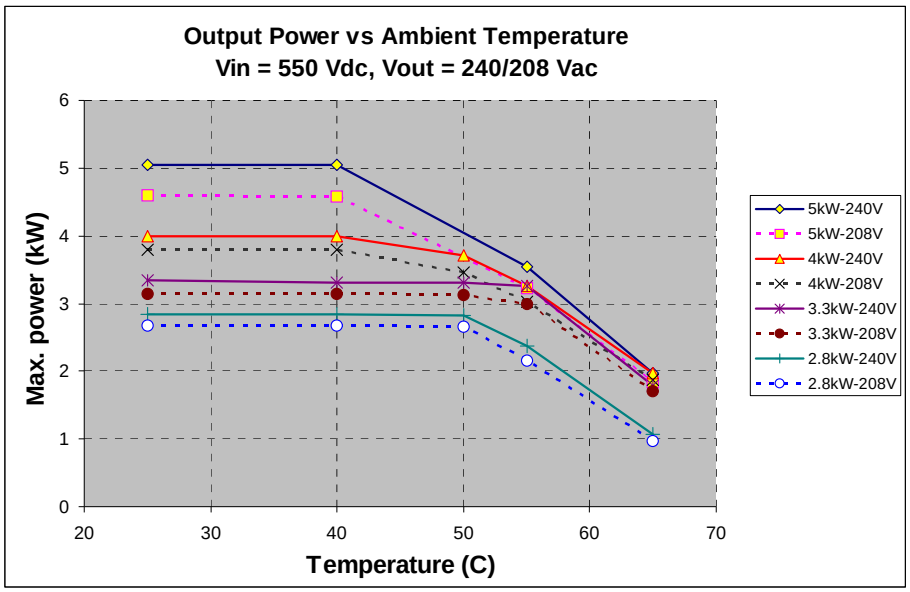

Figure A-9 Output Power vs. Ambient Temperature

Environmental Specifications

Operating temperature range	-25° to +65° C (-13° to +149° F)
Storage temperature range	-40° to +65° C (-40° to +149° F)
Power derating	See Figure A-9 on page A–13
Tolerable relative humidity limit	**Operating:** <95%, non-condensing **Storage:** 100% condensing

User Display

Type	alphanumeric liquid crystal display with backlight
Size	2 lines by 16 characters

Display Accuracy

Instantaneous Power	+/- (30 W + 1% of reading)
Voltage	+/- (1% of rating + 1% of reading)
Current	+/- (1% of rating + 1% of reading)
System Lifetime energy	+/- 5%

Mechanical Specifications

	GT3.8, GT4.0, and GT5.0	GT2.8 and GT3.3
Outdoor enclosure	NEMA 3R, Rainproof	
Inverter dimensions (H × W × D)	not including handle: 31 ½ × 16 × 5 ¾ inches (798 × 403 × 145.8 mm) including handle projection: 31 ½ × 16 × 7 ½ inches (798 × 403 × 185.6 mm)	
Shipping dimensions (H × W × D)	38 3/16 × 22 ¾ × 10 3/16 inches (970 × 577 × 259 mm)	
Inverter weight	65 lb (29.6 kg)	56.0 lb (25.5 kg)
Shipping weight	72 lb (32.7 kg)	64.2 lb (29.2 kg)
Input and output terminals	AC and DC terminals accept wire sizes of 2.5 to 16 mm^2 (#14 to #6 AWG)	
Disconnect switch	Integrated switch, disconnects both AC and DC (meets NEC Article 690), rated @ 600 VDC / VAC	

Regulatory Approvals

The GT Inverter meets the following safety operating standards and code requirements:

- UL 1741 1st Edition 2005 Revision – Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources (Includes IEEE 1547 and 1547.1)
- CSA C22.2 No. 107.1-01 General Use Power Supplies

Note: This inverter is compliant with IEEE 1547 for those requirements referenced in UL1741 (2005), section 46.1.1:
A utility interactive inverter and interconnection system equipment (ISE) shall comply with the Standard for Interconnecting Distributed Resources With Electric Power Systems, IEEE 1547, and the Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems, IEEE 1547.1, excluding the requirements for Interconnection Installation Evaluation, Commissioning Tests, and Periodic Interconnection Tests.

Warranty and Return Information

Warranty

What does this warranty cover? This Limited Warranty is provided by Xantrex Technology Inc. (“Xantrex”) and covers defects in workmanship and materials in your Xantrex Grid Tie Solar Inverter. This warranty period lasts for 10 years from the date of purchase at the point of sale to you, the original end user customer, unless otherwise agreed in writing (the “Warranty Period”). You will be required to demonstrate proof of purchase to make warranty claims.

This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period. Subsequent owners also require original proof of purchase as described in “What proof of purchase is required?” on page WA–1.

What will Xantrex do? During the Warranty Period Xantrex will, at its option, repair the product (if economically feasible) or replace the defective product free of charge, provided that you notify Xantrex of the product defect within the Warranty Period, and provided that Xantrex through inspection establishes the existence of such a defect and that it is covered by this Limited Warranty.

Xantrex will, at its option, use new and/or reconditioned parts in performing warranty repair and building replacement products. Xantrex reserves the right to use parts or products of original or improved design in the repair or replacement. If Xantrex repairs or replaces a product, its warranty continues for the remaining portion of the original Warranty Period or 90 days from the date of the return shipment to the customer, whichever is greater. All replaced products and all parts removed from repaired products become the property of Xantrex.

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

How do you get service? If your product requires troubleshooting or warranty service, contact your merchant. If you are unable to contact your merchant, or the merchant is unable to provide service, contact Xantrex directly at:

Telephone:	1 866 519 1470 (toll free North America) 1 650 351 8237 (direct)
Fax:	1 604 422 2756 (direct)
Email:	customerservice@xantrex.com

Direct returns may be performed according to the Xantrex Return Material Authorization Policy described in your product manual. For some products, Xantrex maintains a network of regional Authorized Service Centers. Call Xantrex or check our website to see if your product can be repaired at one of these facilities.

What proof of purchase is required? In any warranty claim, dated proof of purchase must accompany the product and the product must not have been disassembled or modified without prior written authorization by Xantrex.

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

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

What does this warranty not cover? Claims are limited to repair and replacement, or if in Xantrex's discretion that is not possible, reimbursement up to the purchase price paid for the product. Xantrex will be liable to you only for direct damages suffered by you and only up to a maximum amount equal to the purchase price of the product.

This Limited Warranty does not warrant uninterrupted or error-free operation of the product or cover normal wear and tear of the product or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. This warranty does not apply to and Xantrex will not be responsible for any defect in or damage to:

a) the product if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment;
b) the product if it has been subjected to fire, water, generalized corrosion, biological infestations, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Xantrex product specifications including, but not limited to, high input voltage from generators and lightning strikes;
c) the product if repairs have been done to it other than by Xantrex or its authorized service centers (hereafter “ASCs”);
d) the product if it is used as a component part of a product expressly warranted by another manufacturer;
e) component parts or monitoring systems supplied by you or purchased by Xantrex at your direction for incorporation into the product;
f) the product if its original identification (trade-mark, serial number) markings have been defaced, altered, or removed;
g) the product if it is located outside of the country where it was purchased; and
h) any consequential losses that are attributable to the product losing power whether by product malfunction, installation error or misuse.

Disclaimer

Product

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

IN NO EVENT WILL XANTREX BE LIABLE FOR: (a) ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS, LOST REVENUES, FAILURE TO REALIZE EXPECTED SAVINGS, OR OTHER COMMERCIAL OR ECONOMIC LOSSES OF ANY KIND, EVEN IF XANTREX HAS BEEN ADVISED, OR HAD REASON TO KNOW, OF THE POSSIBILITY OF SUCH DAMAGE; (b) ANY LIABILITY ARISING IN TORT, WHETHER OR NOT ARISING OUT OF XANTREX'S NEGLIGENCE, AND ALL LOSSES OR DAMAGES TO ANY PROPERTY OR FOR ANY PERSONAL INJURY OR ECONOMIC LOSS OR DAMAGE CAUSED BY THE CONNECTION OF A PRODUCT TO ANY OTHER DEVICE OR SYSTEM; AND (c), ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF MISUSE OR ABUSE, OR THE INCORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT BY PERSONS NOT AUTHORIZED BY XANTREX.

Exclusions

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

Return Material Authorization Policy

For those products that are not being repaired in the field and are being returned to Xantrex, before returning a product directly to Xantrex you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. Products must also be shipped prepaid. Product shipments will be refused and returned at your expense if they are unauthorized, returned without an RMA number clearly marked on the outside of the shipping box, if they are shipped collect, or if they are shipped to the wrong location.

When you contact Xantrex to obtain service, please have your instruction manual ready for reference and be prepared to supply:

- The serial number of your product
- Information about the installation and use of the unit
- Information about the failure and/or reason for the return
- A copy of your dated proof of purchase

Record these details on page WA–4.

Return Procedure

Package the unit safely, preferably using the original box and packing materials. Please ensure that your product is shipped fully insured in the original packaging or equivalent. This warranty will not apply where the product is damaged due to improper packaging.

Include the following:

- The RMA number supplied by Xantrex Technology Inc. clearly marked on the outside of the box.
- A return address where the unit can be shipped. Post office boxes are not acceptable.
- A contact telephone number where you can be reached during work hours.
- A brief description of the problem.

Ship the unit prepaid to the address provided by your Xantrex customer service representative.

If you are returning a product from outside of the USA or Canada In addition to the above, you MUST include return freight funds and are fully responsible for all documents, duties, tariffs, and deposits.

If you are returning a product to a Xantrex Authorized Service Center (ASC) A Xantrex return material authorization (RMA) number is not required. However, you must contact the ASC prior to returning the product or presenting the unit to verify any return procedures that may apply to that particular facility and that the ASC repairs this particular Xantrex product.

Out of Warranty Service

If the warranty period for your product has expired, if the unit was damaged by misuse or incorrect installation, if other conditions of the warranty have not been met, or if no dated proof of purchase is available, your unit may be serviced or replaced for a flat fee.

To return your product for out of warranty service, contact Xantrex Customer Service for a Return Material Authorization (RMA) number and follow the other steps outlined in "Return Procedure" on page WA–3.

Payment options such as credit card or money order will be explained by the Customer Service Representative. In cases where the minimum flat fee does not apply, as with incomplete units or units with excessive damage, an additional fee will be charged. If applicable, you will be contacted by Customer Service once your unit has been received.

Information About Your System

As soon as you open your Xantrex Grid Tie Solar Inverter package, record the following information and be sure to keep your proof of purchase.

- ❒ Serial Number _____
- ❒ Product Number _____
- ❒ Purchased From _____
- ❒ Purchase Date _____

If you need to contact Customer Service, please record the following details before calling. This information will help our representatives give you better service.

- ❒ Type of installation _____
- ❒ Length of time inverter has been installed _____
- ❒ DC wiring size and length _____
- ❒ Description of indicators on front panel _____
- ❒ Description of problem _____

_____

_____

PV Details

Solar Panel Mount:		☐ Roof	☐ Pole	☐ Ground
Solar Panel Brand and Model:				
Nominal Voltage Range:		_____ VDC		
Peak Open Circuit Voltage:		_____ VDC		
Nominal Current Rating:		_____ Adc		
Maximum Current Rating:		_____ Adc		
Solar Tracker?		☐ Yes	☐ No	
String #1:	# of Panels:	_____	☐ Series	☐ Parallel
String #2:	# of Panels:	_____	☐ Series	☐ Parallel
String #3:	# of Panels:	_____	☐ Series	☐ Parallel
String #4:	# of Panels:	_____	☐ Series	☐ Parallel

Index

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P

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Xantrex Technology Inc.

1 866 519 1470 Tel toll free NA
1 650 351 8237 Tel direct

1 604 422 2756 Fax direct

customerservice@xantrex.com

www.xantrex.com

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