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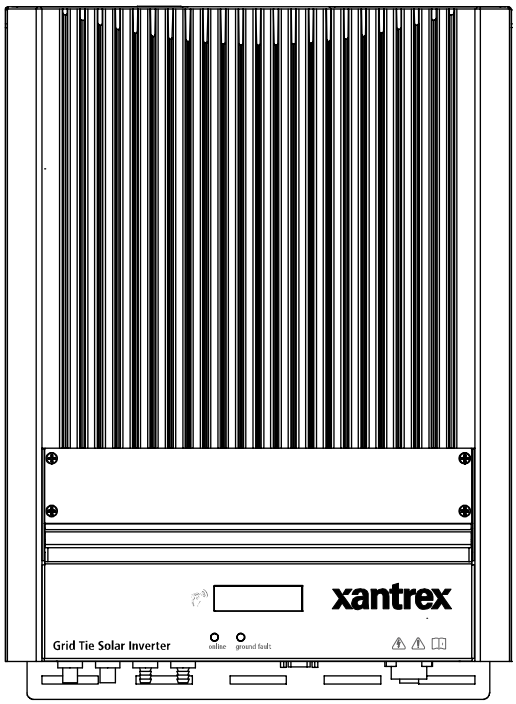

GT3.0 E

Owner's Manual

Xantrex Grid Tie Solar Inverter

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Smart choice for power

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Xantrex Grid Tie Solar Inverter

Owner's Manual

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Date and Revision

February 2005 Revision A

Part Number

975-0197-01-01

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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, detailed planning and setup information. It provides procedures for installing the inverter and information about operating and troubleshooting the unit. It does not provide details about particular brands of photovoltaic (PV) panels. You need to consult individual PV manufacturers for this information.

Audience

The manual is intended for anyone who needs to install and operate the GT Inverter. Installers should be fully educated on the hazards of installing electrical equipment. Certified electricians or technicians are recommended.

Organization

This manual is organized into 6 chapters and an appendix.

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

Chapter 2, "Installation", provides information about planning for and installing the GT Inverter. It contains information to help you plan wire routes, ensure your PV array provides necessary power, and find a suitable location for installation.

Chapter 3, "Wiring the Inverter", provides procedures for making DC and AC wiring connections, and grounding the GT Inverter and the PV array.

Chapter 4, "Starting the Inverter", contains information on starting up the Xantrex Grid Tie Solar Inverter and performing a functional test.

Chapter 5, "Monitoring the Inverter", contains information for understanding the LCD screens and the LED indicators.

Chapter 6, "Maintenance and Troubleshooting", contains information about how to provide general maintenance for the Xantrex Grid Tie Solar Inverter. It also provides information about troubleshooting the unit.

Appendix A, "Specifications", contains information about the electrical and environmental specifications of the Xantrex Grid Tie Solar Inverter.

Conventions Used

The following conventions are used in this guide.

WARNING

Warnings identify conditions that could result in personal injury or loss of life.

CAUTION

Cautions identify conditions or practices that could result in damage to the unit or other equipment.

Important: These notes describe things that are important for you to know, but not as serious as a caution or warning.

Abbreviations Used

GT	Grid Tie
GUI	Graphical User Interface
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MPPT	Maximum Power Point Tracking
PC	Personal Computer
PV	Photovoltaic
STC	Standard Test Condition
Vac	Volts AC
Vdc	Volts DC
V_{MP}	Voltage at Maximum Power
V_{OC}	Open Circuit Voltage
V_{SC}	Short Circuit Voltage

Symbols Used

	Alternating Current (AC)
	Direct Current (DC)
	In this guide: Important information, warnings, or cautions. On the product: Important information, warnings or cautions with further explanation in the product guide.
	Caution, risk of electric shock.
	FOR AUTHORIZED SERVICE PERSONNEL: Before opening cover, disconnect DC and AC power and wait 30 minutes to allow internal voltages to reach safe levels. NOTE: there are no user-serviceable parts inside.
	Refer to the operating instructions.

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 instructions that shall be followed during the installation and maintenance of the Xantrex Grid Tie Solar Inverter.

1. Before installing and using the GT Inverter, read all instructions and cautionary markings on the inverter and in all appropriate sections of this guide.
2. To reduce risk of fire hazard, do not cover or obstruct the heat sink.
3. Observe the clearance recommendations as described on page 2–12. Do not install the GT Inverter in a zero-clearance or non-ventilated compartment. Overheating may result.
4. Use only accessories recommended or sold by the manufacturer. Doing otherwise may result in a risk of fire, electric shock, or injury to persons.
5. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the GT Inverter with damaged or substandard wiring.
6. Do not operate the GT Inverter if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the GT Inverter is damaged, see the Warranty section.
7. Do not disassemble the GT Inverter. It contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the GT Inverter yourself may result in a risk of electrical shock or fire and will void the factory warranty.
8. To reduce the risk of electrical shock, disconnect both AC and DC power from the GT Inverter before attempting any maintenance or cleaning or working on any circuits connected to the inverter. Turning off controls will not reduce this risk. Internal capacitors remain charged for up to 30 minutes after disconnecting all sources of power.
9. The GT Inverter must be provided with an equipment-grounding conductor connected to the AC ground.

Regulatory Compliance

The GT3.0-SP-QC-230 and GT3.0-DE-QC-230 are CE Marked for the following Directives and standards:

- Low Voltage Directive 73/23/EEC, per EN50178 “Electronic Equipment for Use in Power Installations”.
- EMC Directive 89/336/EEC, per:
  - EN61000-6-3 “Emission Standard for Residential, Commercial, and Light-Industrial Environments”
  - EN61000-6-1 “Immunity for Residential, Commercial, and Light-Industrial Environments”
  - EN61000-3-2 “Limits for Harmonic Current Emissions”
  - EN61000-3-3 “Limitations of Voltage Fluctuations and Flicker”.

The GT Inverter is designed for utility interactive operation. It has complete on-board over-current, over-temperature and anti-islanding protection. It monitors voltage and frequency of the utility grid and automatically stops supplying power whenever conditions on the utility grid deviate from standard levels (see Specifications).

The GT Inverter is equipped with a high frequency transformer that assures galvanic isolation between the DC side and the utility power grid.

In Germany, an external device such as the UfE ENS26 is required to comply with VDE0126.

In Spain, an external ground fault detection device is required to make the photovoltaic installation fully compliant with RD1663/2000.

Contents

Figures

Tables

1 Introduction

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

The topics in this chapter are organized as follows.

“About the Xantrex Grid Tie Solar Inverter”:

“Model Configurations”.

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.

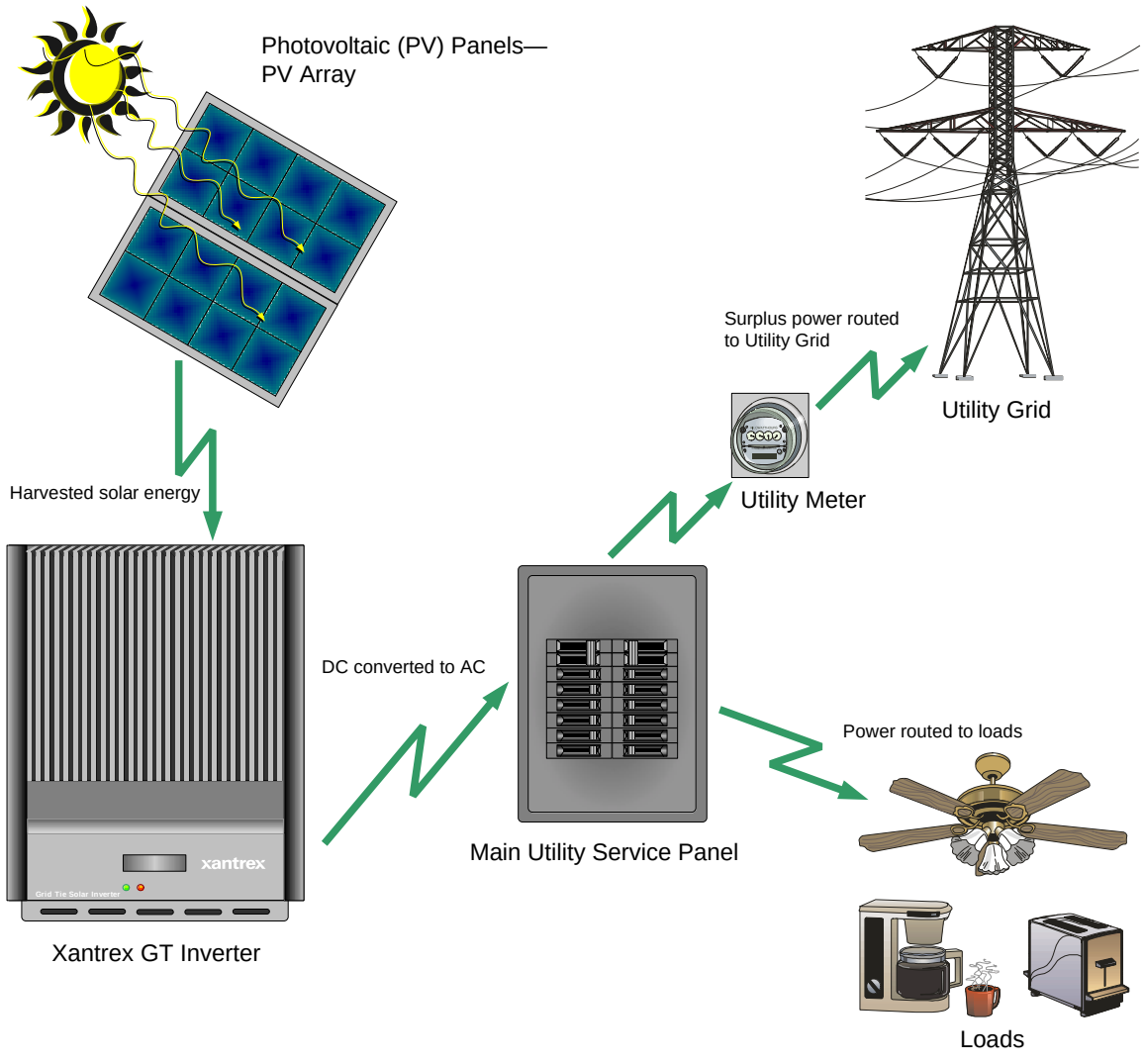

Figure 1-1 Basic System Overview

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 a 195 to 550 Vdc input voltage Maximum Power Point range.
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. 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—up to 95%.
Expandable	Multiple GT Inverters may be connected in a parallel configuration for increased net metering capacity or future system growth.
Communications protocol	The GT Inverter uses the Xanbus® Communications protocol, enabling it to communicate with other units connected in parallel within the system. For more information, see "Xanbus Network Technology" on page 3–8.

Standard Features

The GT Inverter has the following standard features:

- Sealed inverter section with multiple wiring options to facilitate a variety of installation requirements (e.g., hard-wired or with "quick connects");
- Liquid Crystal Display (LCD) to provide easy-to-read system status and daily cumulative energy production information;
- Two LED indicator lights to provide status and ground fault indication.

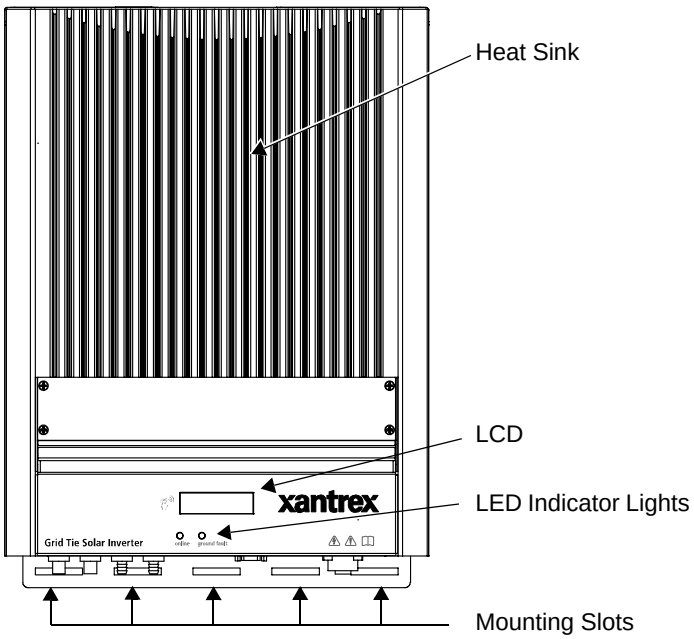

Figure 1-2 Main Features of the GT Inverter

Safety and Standards

Meets standards and requirements

The GT Inverter has complete on-board over-current, over-temperature and anti-islanding protections. GT Inverter models GT3.0-SP-QC-230 and GT3.0-DE-QC-230 are CE Marked per Low Voltage Directive 73/23/EEC (EN50178) and EMC Directive 89/336/EEC (EN61000-6-3, EN61000-6-1, EN61000-3-2, EN61000-3-3).

Model Configurations

The GT Inverter model number is in the format GT**x.x-aa-bb-ccc**, where:

- **x.x** Output Power: **3.0** KW
- **aa** Region: **NA** (North America)
  DE (Germany)
  SP (Spain)
- **bb** Wiring Box: **DS (**wiring box with AC/DC disconnect switch, North American models only)
  QC (Quick Connects and no wiring box, Europe only)
- **ccc** Output Voltage: **208** Vac/60 Hz (North America)
  230 Vac/50 Hz (Europe)
  240 Vac/60 Hz (North America).

Table 1-1 shows the different model configurations available.

Table 1-1 GT Inverter Models

Model Number	Output Power (x.x)	Output Voltage (ccc)	Wiring Box (bb)	
			DS	QC
GT3.0-NA-bb-208[1]	3.0	208	√	
GT3.0-aa[2]**-bb-230**		230		√
GT3.0-NA-bb-240		240	√	

1. *208 Vac/60 Hz model not available at this time*
2. *any region (aa) except NA*

Installation and wiring instructions are provided in Chapter 2, “Installation”, and Chapter 3, “Wiring the Inverter”.

2 Installation

Chapter 2, “Installation”, provides information about planning for and installing the GT Inverter. It contains information to help you plan wire routes, ensure your PV array provides necessary power, and find a suitable location for installation.

The topics in this chapter are organized as follows:

Installation Options

The GT Inverter may be installed as a single inverter for a single PV array of one or two PV strings, or in a multiple inverter configuration for multiple PV arrays (see Figure 2-1 for diagrams of both options).

Single Inverter Installation

In this configuration, a single inverter collects the harvested solar energy and routes the power to the main utility service panel to be used by the loads. Any surplus power not used by the loads will be injected into the utility grid.

Multiple Inverter Installations

If multiple inverters are used, each inverter must be wired to an independent PV array. In this configuration, each inverter collects the harvested solar energy from a separate PV array and routes the power to the main utility service panel to be used by the loads. Any surplus power not used by the loads will be injected into the utility grid.

Communications between inverters is optional, but can be enabled by installing communications cabling to the inverter RJ45 ports. See “Connecting the Communications Cable between Inverters” on page 3–12.

Planning the Installation

The following issues need to be considered when planning for an installation using the GT Inverter. See the specified sections for more information.

- “Inverter Location” on page 2–4
- “PV Array Requirements” on page 2–5
- “Grounding Requirements” on page 2–7
- “Routing the Wires” on page 2–8.

Ensure that you have obtained all permits required by local authorities or utilities before commencing installation.

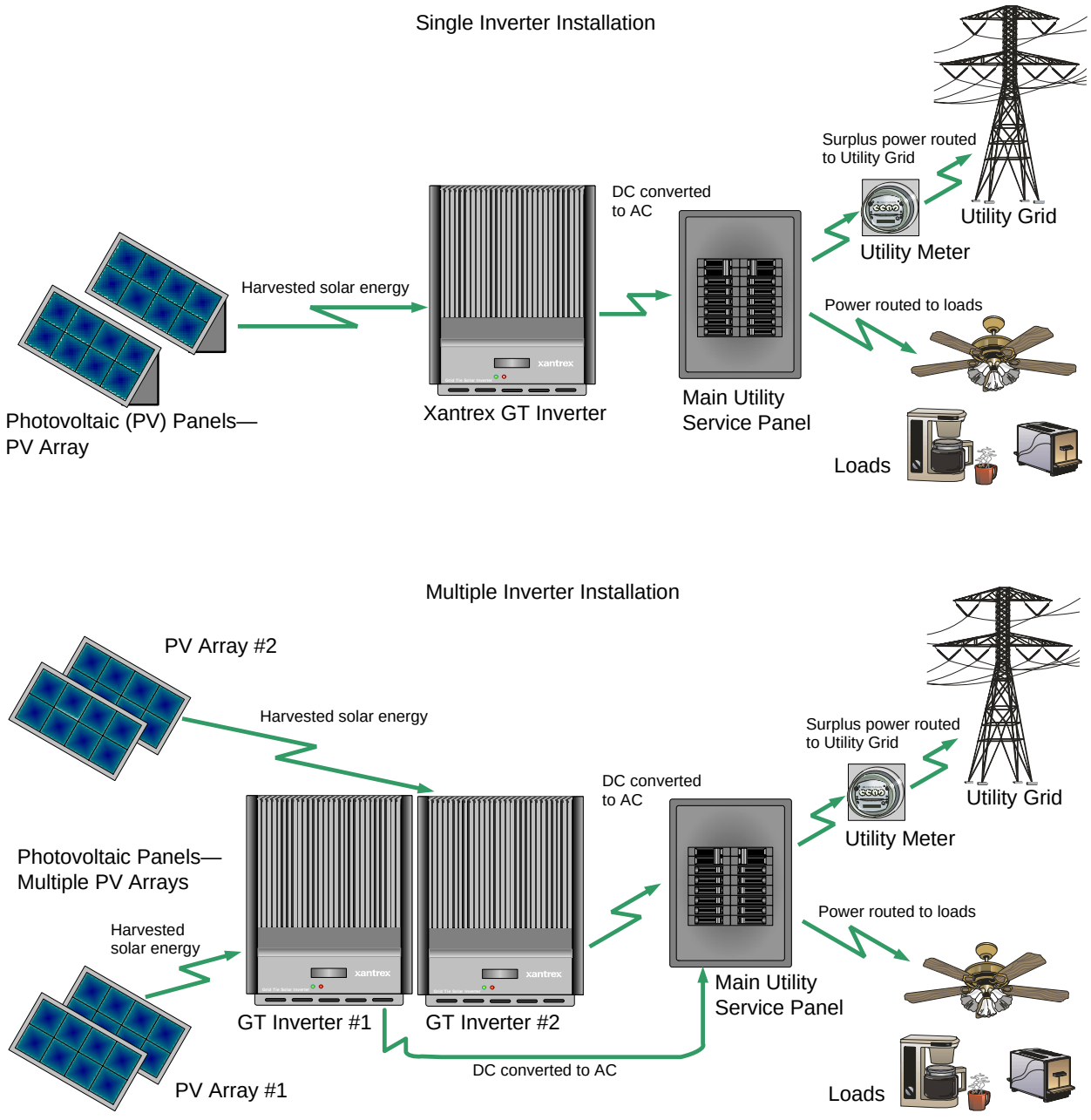

Figure 2-1 Installation Options Overview

Inverter Location

WARNING: Burn hazard

Do not install in a location where people can accidentally come into contact with the front of the inverter. High temperatures can be present on the face of the inverter, causing a potential burn hazard.

In extreme conditions, the GT Inverter chassis can reach temperatures that can cause skin burns if accidentally touched. Ensure that the GT Inverter is located away from normal traffic areas.

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

Fire Safety

- Do not install *anywhere* near combustible or flammable materials.

Indoor/ Outdoor

- The GT Inverter can be mounted indoors or outdoors. When installed outdoors, the GT Inverter must be mounted in a vertical orientation.
- In outdoor installations the GT Inverter should be located away from lawn sprinklers and other sources of spray.

Orientation

- The GT Inverter must be mounted vertically on a wall or pole.
- Do not mount the GT Inverter horizontally.

Temperature

- Ensure that the GT Inverter is mounted in a location where the ambient temperature range is -25 to 65 °C (-13 to 149 °F).
- At extreme hot or cold temperatures, the front panel LCD may not function normally. Above 45 °C (113 °F), the unit begins derating power. See “Environmental Specifications” on page A–5 and “Output Power vs. Ambient Temperature” on page A–3.

Ground Clearance

- Outdoors, the GT Inverter requires at least 100 cm (39 inches) of clearance between the bottom of the unit and the ground. This clearance helps prevent water from splashing onto the bottom of the unit.
- Indoors, it is recommended to use the same clearance to ensure visibility of the LCD.

Distance

- To minimize copper losses, ensure that 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 wire gauges used and PV array output voltages.

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 (such as under a tree).

PV Array Requirements

WARNING: Shock hazard

Whenever a PV array is exposed to sunlight, a shock hazard exists at the output wires or exposed terminals. To reduce the risk of shock during installation, cover the array with an opaque (dark) material before making any connections.

General Recommendations

It is important that the PV array is installed correctly to the manufacturer's specifications and to local code requirements.

Equipment and Installation Recommendations

Important: The PV array should be free of shade. This requirement includes even small obstructions such as vent pipes, chimneys and power lines. A small amount of shade can have a disproportionately high impact on system performance.

Equipment recommendations

- ***All electrical equipment should be approved for the voltage and current ratings necessary for the application.***
- All wiring should be sized correctly to minimize voltage drop.
- All exposed wires or conduits should be sunlight resistant.
- All required overcurrent protections should be included in the system and accessible for maintenance.

Installation recommendations

- All electrical terminations should be fully tightened, secured, and strain relieved as appropriate.
- All mounting equipment should be installed according to the manufacturer's specifications.
- All wires, conduit, exposed conductors and electrical boxes should be secured and supported according to code requirements.

Voltage and MPPT Requirements

MPPT operational window

Ensure that the PV array used in the system operates within the MPPT operational window (Table 2-1).

Table 2-1 MPPT Operational Window

Voltage	Effect of Array Voltage	Inverter Mode
< 195 Vdc	Operating voltage will be shifted to 195 Vdc; the array will not be at its maximum power point	Low power
195 to 550 Vdc	Maximum harvest of solar energy	MPPT window
550 to 600 Vdc	Will not allow maximum harvest of solar energy	Power derating
> 600	Will shut down and may cause damage to the inverter; stops selling surplus energy	Shutdown

By regulating the operating voltage of the solar modules, the MPPT software maximizes their output energy.

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

Maximum PV Power

The solar array should be sized such that its maximum power output does not exceed the limits of the MPPT operational window (195 to 550 Vdc). See "Guidelines for Matching PV Array Size to Xantrex Grid Tie Solar Inverter Input" on page 2–7.

Under no conditions should the array voltage exceed 600 V_{OC} (open circuit voltage).

Ensure that the Isc (short circuit current) rating of the array at the lowest expected temperature does not exceed the 19 Adc rating of the inverter.

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

For determining the number of panels required in the PV string (panels connected in series), you must ensure that the following three requirements are met:

1. To avoid damage to the inverter, ensure that the PV array output will never exceed 600 Vdc under any conditions.
2. Do not exceed the maximum array short circuit-current rating marked on the inverter.
3. To achieve maximum energy harvest from your array, ensure that the V_{MP} (voltage at maximum power) does not drop below 195 Vdc or increase above 550 Vdc under most conditions.

Guidelines to help you meet these requirements:

- Consider the expected V_{OC} of the string under all possible conditions. The panel manufacturer provides a V_{OC} rating per panel, but it is usually rated at 25 °C (77 °F). Panel voltage increases in cold temperatures—the panel manufacturer should be able to provide a coefficient of voltage increase per degree.
- Panel voltage decreases in high temperatures. This will affect the panels' V_{MP}. Again, the manufacturer's coefficient must be used with the highest expected temperature to determine the minimum V_{MP}.

Once you know the specifications of your panels, all these factors will help determine the maximum and minimum number of panels that can be used.

Visit the **Support** page at **www.xantrex.com** to use an online PV array sizing tool.

Grounding Requirements

WARNING: Shock hazard

The GT Inverter must be grounded by connection to a grounded permanent wiring system.

AC Grounding

AC grounding is governed by local codes. Consult the local utility for specific grounding requirements.

DC Grounding

The GT Inverter is designed to work with ungrounded PV arrays.

Lightning Protection

Reduce the risk of lightning damage by using a single-point grounding system. In this system, all ground lines terminate at the same point. This point normally is the main utility ground installed by the utility company to provide a ground for the house wiring. This ground usually consists of a copper rod driven 1.5 to 2.5 meters (6 to 8 feet) into the earth.

Routing the Wires

Typical configurations

Determine all wire routes to and from the GT Inverter. Typical routing configurations include:

- AC wiring from the GT Inverter to the main utility service panel
- DC input wiring from the PV array to the GT Inverter

All wiring and installation methods should conform to applicable electrical and building codes.

For all installations, local utilities may have additional requirements.

WARNING: Shock hazard

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

Planning AC Wire Routing

AC connections include all the wires and connectors between the GT Inverter AC terminals and the main utility service panel. Pre-plan these routes carefully before installing the components.

Planning DC Wire Routing

DC connections include all the wires and connectors between your PV array and the DC terminals of the GT Inverter. Pre-plan these routes carefully before installing the components.

Preparing for the Installation

Ensure your local utility is consulted for any requirements for connecting to or returning power to the grid. Obtain all permits necessary to complete the installation. Consult your local and national electrical codes for more information.

Wiring

Important: In this manual “wiring” and “wires” are used in reference to both AC and DC wiring/cabling and wires/cables.

Wire size and length will be determined by the location of each component and their relative distance to each other. Wire sizes may also be affected by whether or not conduit is used.

Wiring should be sized such that the maximum voltage drop at full power from the PV array to the inverter is 2% or less.

Important: Ensure that wiring is not undersized. Undersized wiring can result in significant power losses and reduction in system efficiency.

AC Circuit Breaker Requirements

The main utility service panel must dedicate a double pole 20-Amp breaker (230 volts AC) to operate each GT Inverter installed.

AC and DC Disconnects

Depending on the installation, external AC and/or DC disconnects may be required, and they may need to be in a location easily accessible to utility or fire personnel. Consult local codes and authorities for additional information.

Mounting the Inverter

Overview

WARNING: Fire, shock and energy hazards

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

General installation steps

Installing of the GT Inverter includes these main steps:

1. Mounting the GT Inverter and installing accessories (this chapter)
2. Making the DC connections from the PV array to the GT Inverter (“Connecting the DC Wiring” on page 3–2)
3. Making the AC connections from the GT Inverter to the main utility service panel (“Connecting the AC Wiring” on page 3–5)

Figure 2-2 summarizes these steps.

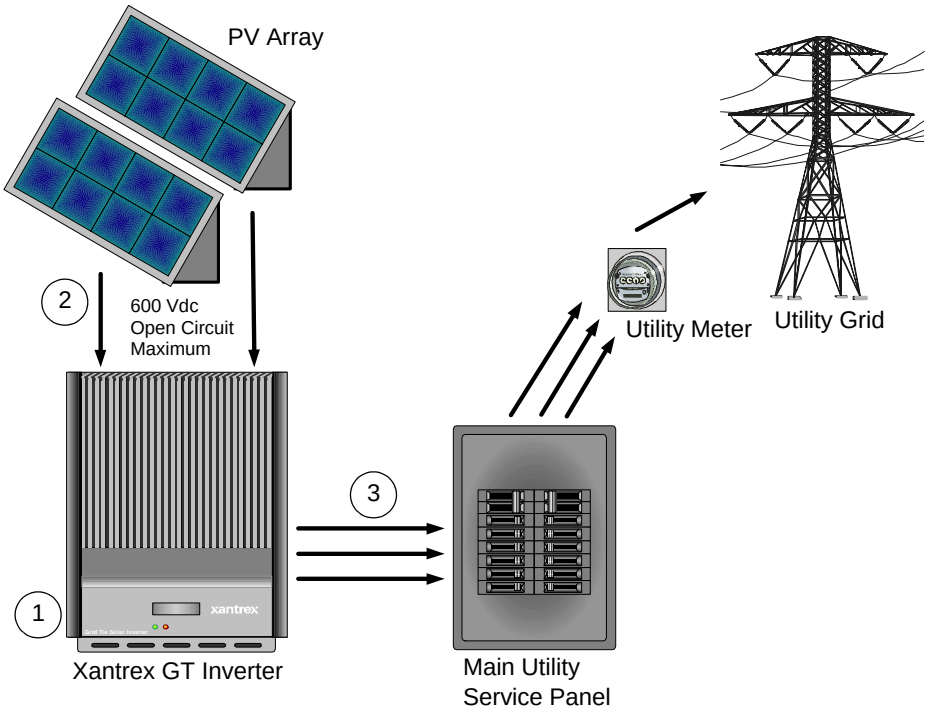

Figure 2-2 Installation Overview

This chapter describes the first step: mounting the inverter and installing accessories.

Mounting steps

Instructions for mounting the GT Inverter are described in the following sections:

- “Installing the Mounting Bracket” on page 2–12
- “Mounting the Inverter on the Bracket” on page 2–16

Tools and Materials Needed

- Assorted screwdrivers, drill, etc.
- Level
- Mounting support material, such as plywood or poles
- Wood screws, anchors for screws, depending on mounting surface.

Dimensions

The dimensions of the inverter and the mounting bracket are shown in Figure 2-3.

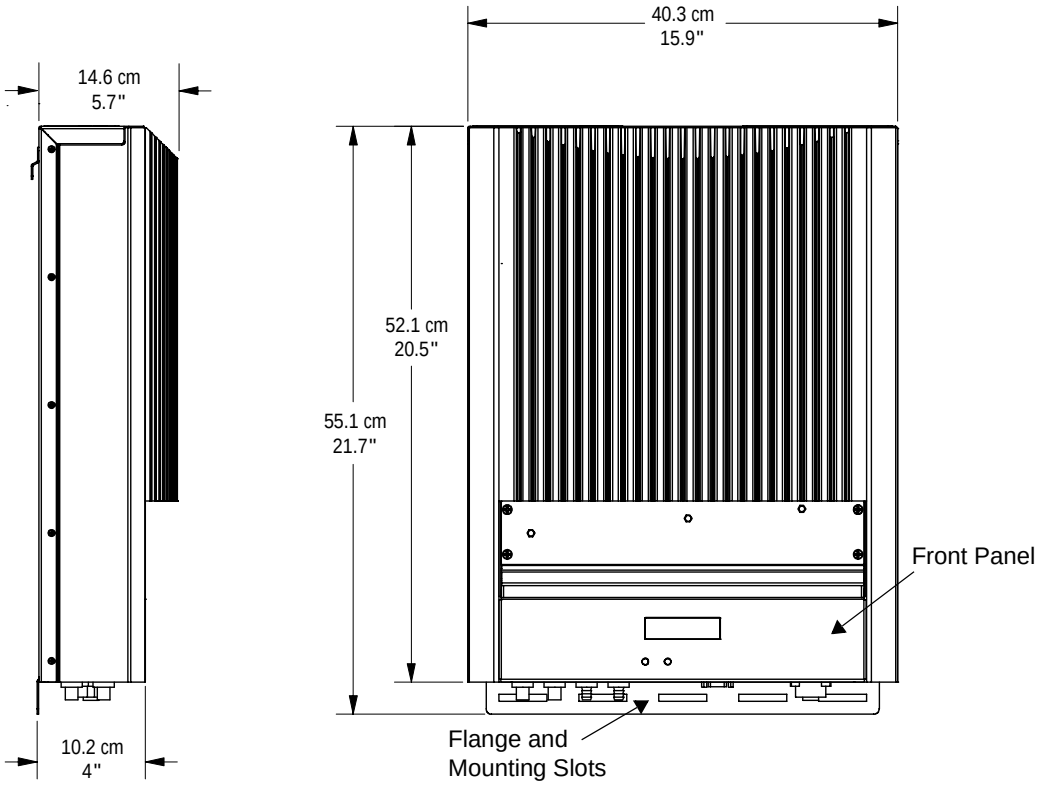

Figure 2-3 GT Inverter Dimensions

Installing the Mounting Bracket

The mounting bracket for the GT Inverter allows the unit to be easily mounted and removed for servicing. It has one hook that matches a corresponding hook on the back side of the inverter.

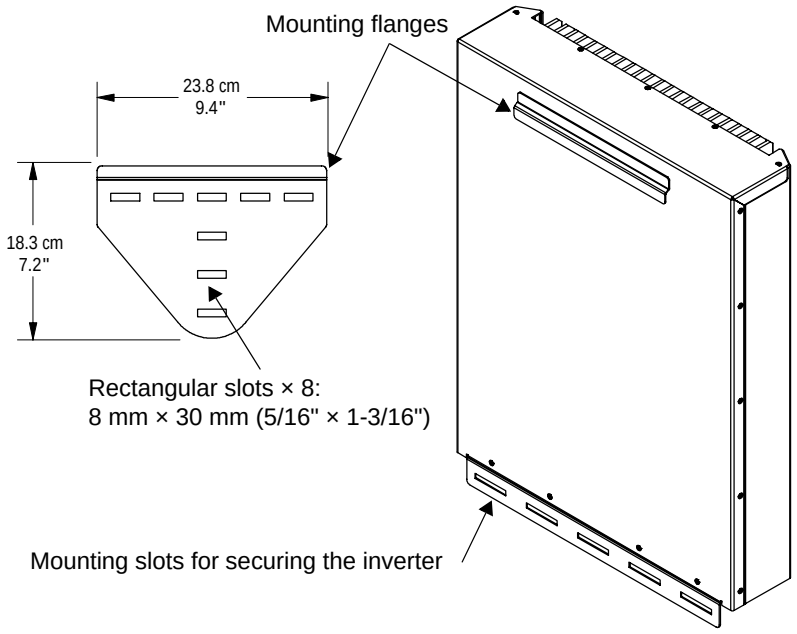

Figure 2-4 Mounting Bracket and GT Inverter

Clearance Requirements

For optimal and safe operation, ensure there is adequate clearance around the inverter. The minimum clearance recommendations in Table 2-2 assume a vertical mounting. If clearances are less than these recommendations are used, additional power reduction may occur at high ambient temperatures.

Table 2-2 Inverter Clearance Requirements

Location	Minimum Clearance
Above	30 cm (12 inches)
Below: • Inverter • Bracket	Outdoors: • 100 cm (39 inches) • 130 cm (51 inches) Indoors: the same clearances are recommended but not required.
In front	Sufficient room to allow for easy access to read the display and to prevent accidental contact with hot surface.
On sides	Single inverters require 15 cm (6 inches) to prevent thermal derating. Multiple units can be mounted with less clearance between them, but the outer sides require 15 cm (6 inches). However, when three or more units are mounted side by side, units in the middle may produce slightly less power at higher ambient temperatures.

WARNING: Shock hazard

Before drilling holes to mount the GT Inverter, ensure there are no electrical wires or plumbing in this area.

WARNING: Personal injury

The GT Inverter weighs approximately 19 kg (41 lb). Always use proper lifting techniques during installation to prevent personal injury.

WARNING: Explosion hazard

Do not store combustible or flammable materials *anywhere* near the inverter.

Surfaces for Mounting

The GT Inverter weighs approximately 19 kg (41 lb). The supporting surface must be strong enough to handle 75 kg (160 lb). If the supporting surface is not strong enough to handle that weight, then supporting material such as a sheet of plywood can be used to enhance the strength of the mounting surface.

The GT Inverter can be mounted to a vertical surface such as wallboard, wood siding, concrete wall or pole assembly.

Mounting on poles or rails

- See “Mounting on Poles or Rails” on page 2–14. Ensure the bottom of the unit is a minimum of 100 cm (39 inches) from the ground if mounted outdoors.

Mounting to wallboard with support

- Installation onto wallboard requires either the use of a supporting material such as plywood or securing the mounting screws to supporting wall studs. Use at least two screws and anchors to secure the unit to the supporting material.

Mounting to siding using wall studs

- If mounting to exterior siding using a wall stud for support, the plywood backing will not be needed. Use at least two lag screws to secure the unit to the supporting material. Ensure the screws enter the stud at least 4 cm (1.5 inches) to adequately support the weight of the unit. After securing the bracket, the screws or bolts and washers should protrude no more than 6 mm (1/4 inch) from the bracket surface.

Mounting to concrete surface

- If mounting the unit on a concrete surface using anchors with no supporting material, use four screws and anchors, instead of two, to adequately secure the unit and distribute the weight.

Important: Other than the mounting bracket, no mounting hardware is supplied with the GT Inverter. It is recommended to use 6 mm (1/4 inch) diameter fasteners. However, because mounting surfaces can vary, installers must select appropriate hardware for each installation.

Important: Local codes may impose additional mounting requirements in earthquake or other high-risk areas.

Mounting on Poles or Rails

To mount the unit using poles:

1. Ensure that poles or rails are securely assembled in place. If using horizontal rails, two rails are required: one for the mounting bracket and another for securing the bottom edge of the inverter (see Figure 2-5).
2. Connect the mounting bracket vertically to the pole or rail:
   - Be sure to use at least two bolts to secure the bracket to the support.

Important: It is recommended to use 6 mm (1/4 inch) diameter fasteners. However, because mounting surfaces can vary, installers must select appropriate hardware for each installation.

   - Position the lower edge of the bracket a minimum of 130 cm (51 inches) above the floor or ground.
3. If using a single vertical pole, ensure that the inverter is secure and unable to rotate around the pole.

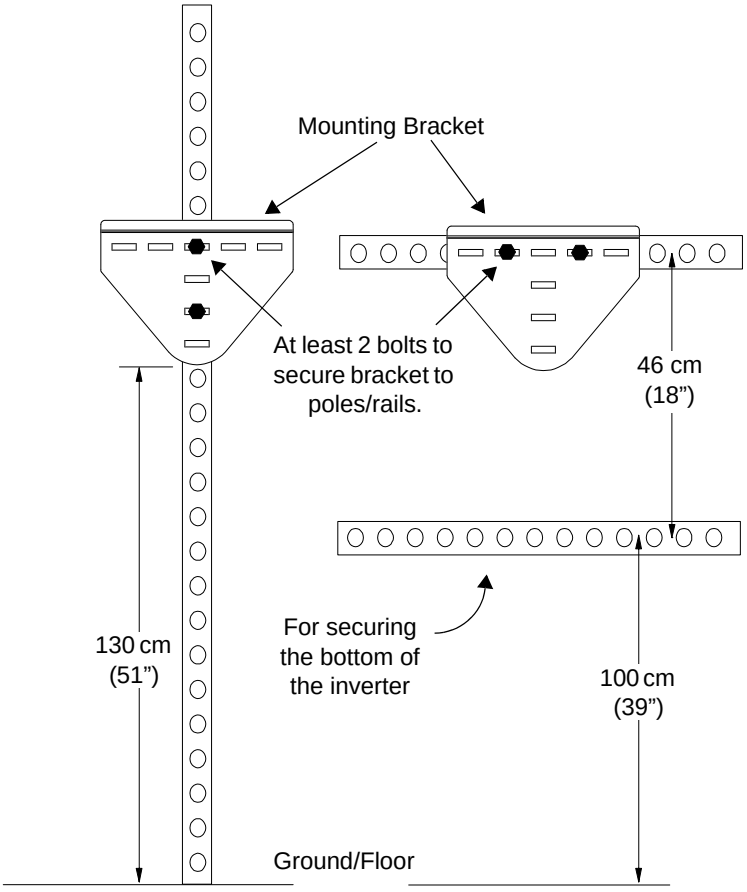

Figure 2-5 Examples of Mounting on a Pole or Rails

Mounting on Wallboard, Siding or Concrete

To mount the GT Inverter to wallboard, siding, or concrete:

1. Locate the area where the GT Inverter is to be installed.
2. Install backing support material if required.

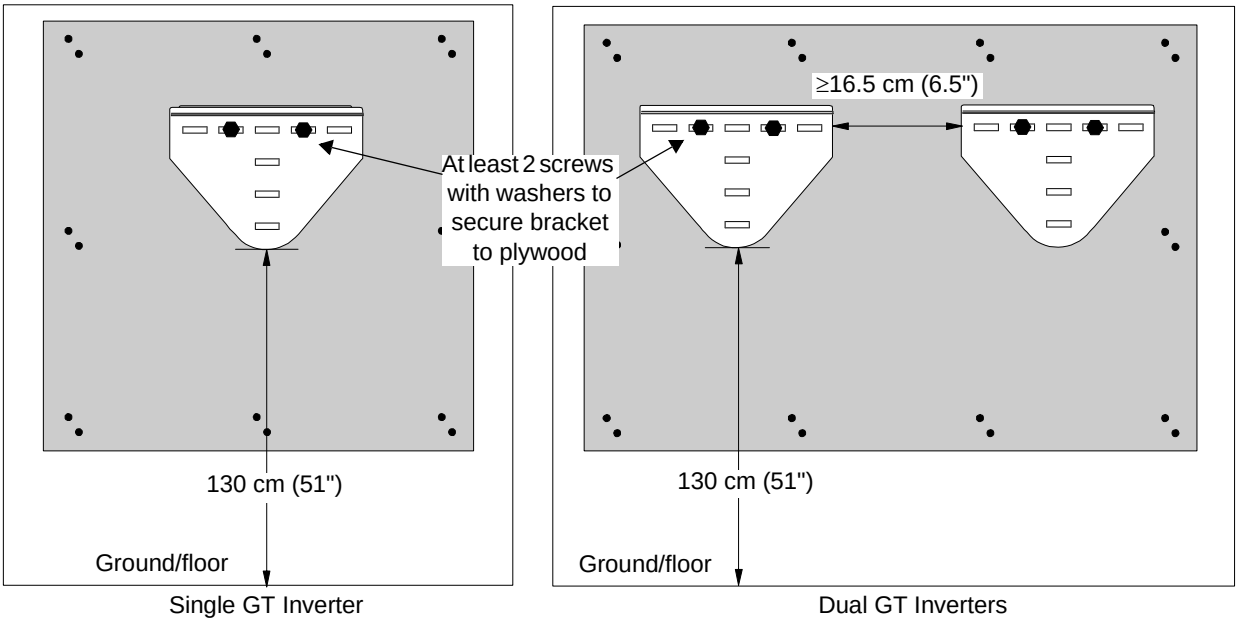

Figure 2-6 Installing the Mounting Bracket using Plywood Support

3. Using a level, place the mounting bracket against the wall surface so that the bottom edge of the bracket is at least 130 cm (51 inches) above the ground. See Figure 2-6.
4. Mark the location for mounting screws if using a wall stud for support. At least four mounting screws and anchors are needed for concrete installations or wallboard installations where no wall studs are available for support.

Important: Other than the mounting bracket, no mounting hardware is supplied with the GT Inverter. It is recommended to use 6 mm (1/4 inch) diameter fasteners.

5. Remove the bracket and drill the holes using an appropriately sized drill bit. Drill appropriately sized holes for screws or anchors.
6. Secure the bracket to the supporting surface using at least two screws and washers.

Mounting the Inverter on the Bracket

Mounting a Single Inverter

To mount the inverter on the mounting bracket:

1. Place the GT Inverter's mounting hook, located on the back of the enclosure, over the bracket and ensure the inverter is seated properly, as shown in Figure 2-7.
2. After the unit is correctly seated on the bracket hook, locate the mounting slots at the bottom of the unit, and mark the location on the wall for securing screws.
3. Remove the inverter and drill pilot holes in the wallboard or siding for the securing screws.
4. Reinstall the GT Inverter on the bracket and secure the bottom of the unit with appropriate screws or anchors, and tighten.

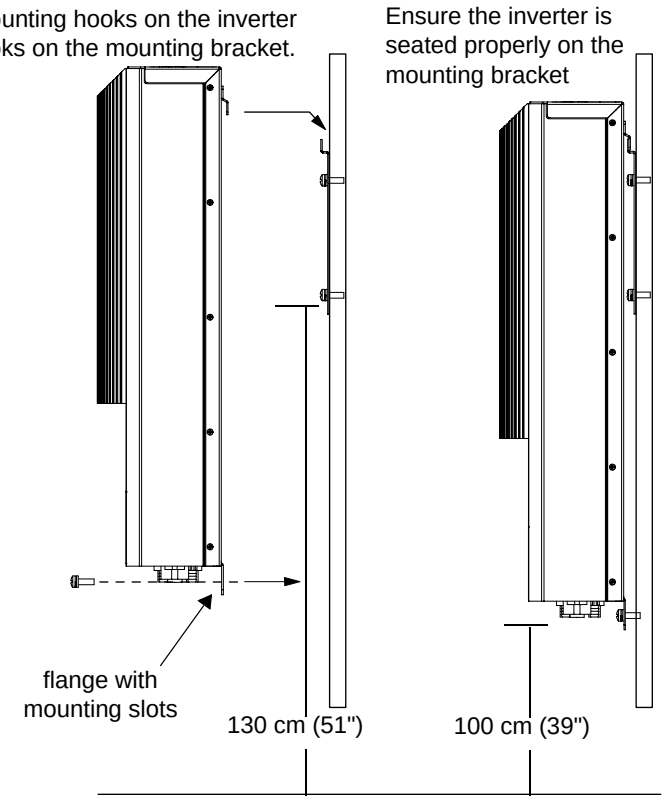

Figure 2-7 Proper Placement of the Inverter on the Mounting Bracket

Mounting Multiple Inverters in Parallel

As shown in Figure 2-6, inverters can be mounted side by side on wallboard or a plywood support.

3 Wiring the Inverter

Chapter 3, “Wiring the Inverter”, provides procedures for making DC and AC wiring connections, and grounding the GT Inverter and the PV array.

The topics in this chapter are organized as follows:

Connecting the DC Wiring

The GT Inverter is equipped with four PV quick connects (two positive, two negative) for connecting up to two PV strings.

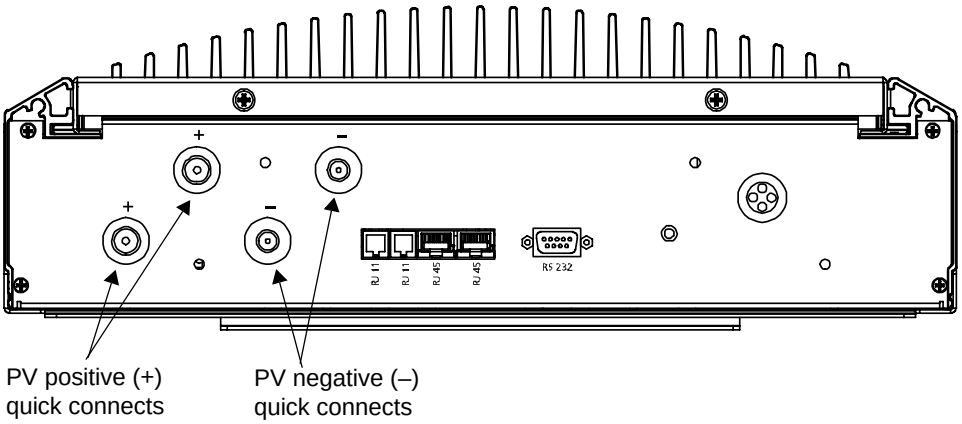

Figure 3-1 PV Quick Connect Location

WARNING: Shock hazard

Whenever a PV array is exposed to sunlight, a shock hazard exists at the output wires or exposed terminals. Cover the PV arrays with opaque material before commencing any wiring.

WARNING: Shock hazard

Before wiring the GT Inverter, ensure the **main breaker** in the primary utility breaker box is switched OFF. Switch this breaker ON only after all wiring is completed as instructed in the procedures.

CAUTION: Equipment damage

Improper wiring may cause permanent damage to the GT Inverter. Take special care to ensure the positive (+) and negative (–) wires from a single array connect to the same inverter.

Equipment Needed

- Conduit for wire runs and appropriate fittings/bushings
- Wire cutters/wire crimpers/wire strippers
- Digital Voltmeter
- Frequency counter (optional, for troubleshooting).

- Female and male DC cable connectors to mate with the Multi-Contact connectors PV-ADSP3/GWD (positive) and PV-ADBP3/GWD (negative) on the GT Inverter. You will need two connectors (one female and one male) for each PV string (you can connect up to two PV strings to the GT Inverter).

Connecting the PV Array

The following procedure is illustrated in Figure 3-2. If there will be more than one PV string, label the positive and negative wire pairs appropriately (for example: PV 1, PV 2).

To wire the PV array to the GT Inverter:

1. If necessary, install DC conduit from the PV string(s) to the GT Inverter.
2. Terminate the wires coming from the PV string(s) with appropriate quick connect connectors.

CAUTION: Equipment damage

Before connecting the PV array to the inverter, check to ensure correct polarity and that the voltage between the positive (+) and negative (–) is below 600 Vdc ($U_{PV} \leq 600$ Vdc).

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. This voltage must be less than 600 Vdc. Voltage over 600 Vdc will damage the inverter.
3. Cover the PV arrays with an opaque material again.

3. Connect the POSITIVE (+) wire from the #1 PV string to a GT Inverter PV positive (+) quick connect.
4. Connect the NEGATIVE (–) wire from the #1 PV string to a GT Inverter PV negative (–) quick connect.
5. If necessary, repeat for the #2 PV string. Double check that the wires are in the proper locations.

   If only one PV string connection is used, cover the unused PV quick connects with the seals provided.

WARNING: Shock hazard

Never connect or disconnect the PV modules from the GT Inverter under load (by pulling the PV quick connects before disconnecting the grid). Always disconnect the GT Inverter from the grid first. The GT Inverter will then stop pushing power to the grid and the quick-connect connectors will not be under load.

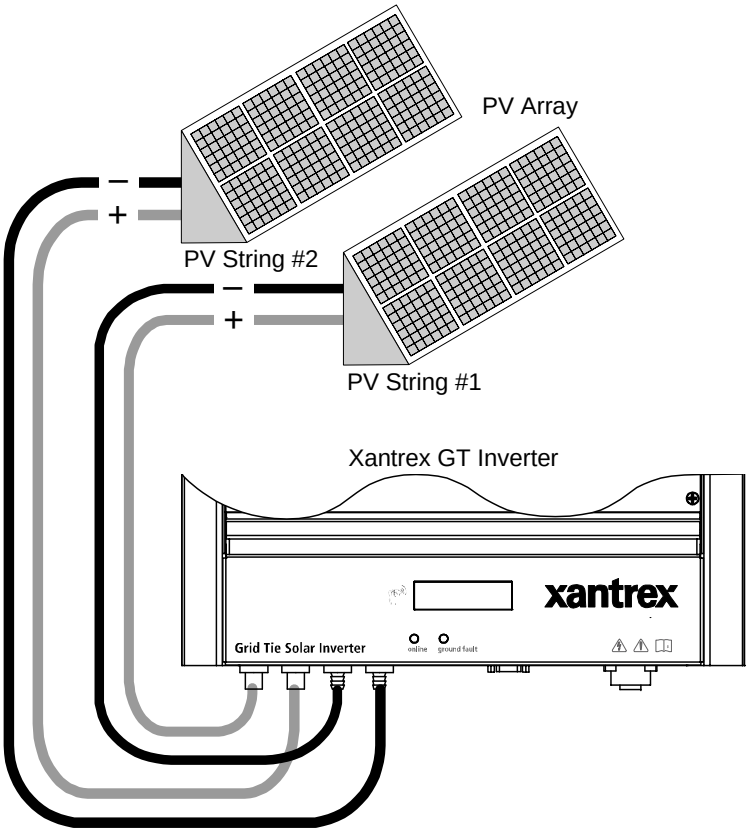

Figure 3-2 DC Connections for a Two-String PV Array

Important: Depending upon installation and local codes, fusing and/or a combiner box may be required. The installer must provide this equipment.

Connecting the AC Wiring

WARNING: Shock hazard

AC utility wiring to the GT Inverter unit is performed directly at the main breaker panel. This should be done only by a qualified installer or electrician.

WARNING: Shock hazard

Before wiring the GT Inverter, ensure the **main breaker** in the primary utility breaker box is switched OFF. Switch this breaker ON only after all wiring is completed as instructed in the procedures.

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.

The GT Inverter must be connected to the utility with three wires—one phase, one neutral, and one protective earth (ground).

Making AC Connections Using Quick Connects

The GT Inverter is equipped with a quick connect for making AC connections. To make AC connections using the quick connect, you must first prepare the wiring between your utility panel and the GT Inverter.

You will need:

- Wire strippers
- Small (3 mm or less) slot-head screwdriver

Preparing the wires

The AC wiring from the utility panel must be terminated with a Binder Female cable connector (Binder part number 693 2 99-4222-14-04) before being connected to the AC quick connect on the GT Inverter. See Figure 3-3.

To prepare the AC wiring:

1. If necessary, strip 1 cm (3/8 inch) of insulation on the three wires from the utility panel.
2. Unscrew the female terminal from the casing of the female cable connector.
3. Unscrew the other components of the female cable connector.
4. Run the wires through the pressing screw, pinch ring, seal, and shell of the female cable connector.
5. On the female terminal, connect the protective earth wire to the terminal marked with the ground (⏚) symbol.

6. Connect the neutral wire to the terminal marked with 1.
7. Connect the Phase L wire to the terminal marked with 2.

   Terminal 3 is not used.
8. After ensuring all the wires are tightened in their terminals, screw the casing onto the female terminal.
9. Replace the remaining components of the female cable connector, ensuring a tight seal.
10. Tighten the pressing screw.

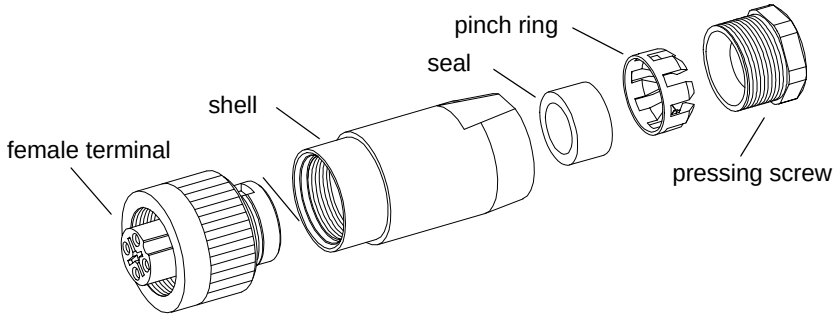

Figure 3-3 AC Connector (female)

Connecting to the GT Inverter

To connect the AC connector to the GT Inverter:

1. Line up the notch on the female cable connector with the connector on the GT Inverter.
2. Insert the cable connector into the connector on the GT Inverter.
3. Secure the connector by turning the outer ring.

Connecting Inverters in Parallel

GT Inverters can be connected in a parallel configuration for larger PV array systems. In this configuration, separate solar arrays are required for each GT Inverter unit. The output of each GT Inverter feeds a separate dual-pole 20-Amp circuit breaker (L1 and L2) in the main utility service panel.

When connecting inverters in parallel, complete the wiring and perform the commissioning procedure for each inverter one at a time. For wiring instructions, see “Connecting the DC Wiring” on page 3–2 and “Connecting the AC Wiring” on page 3–5. For the commissioning procedure, see page 4–2.

In multiple inverter installations, it is very important to ensure each individual 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. See Figure 3-4.

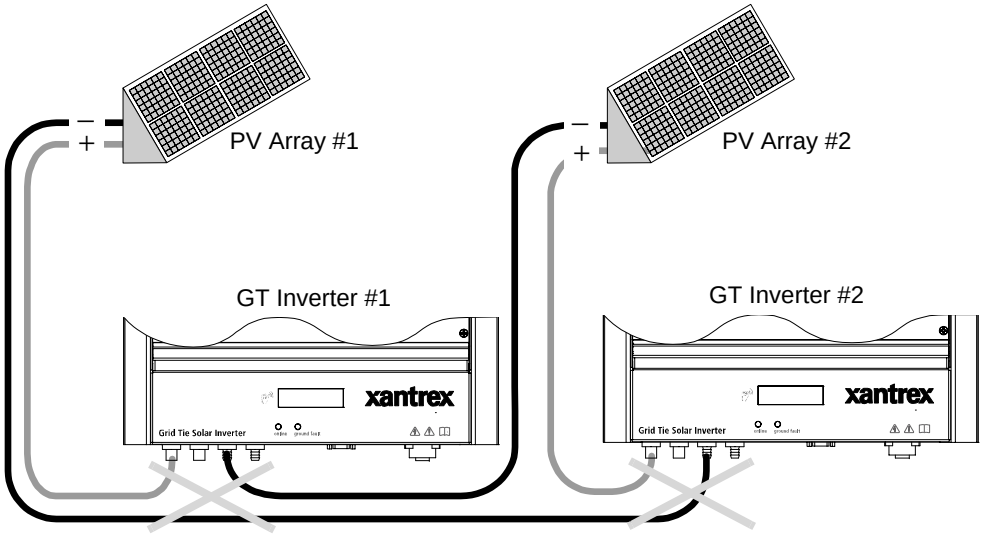

Figure 3-4 Improper multiple inverter connections

Communications Wiring for Inverters in Parallel

Communications wiring between GT Inverters mounted in parallel 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 still 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, each inverter in a system will display information only for the unit and its associated PV array.

Xanbus Network Technology

GT Inverters are Xanbus-enabled devices. They use Xanbus (a communications protocol developed by Xantrex) to communicate with other inverters in parallel. Communications wiring between inverters is laid out in a “daisy chain” pattern, each device on the network linked together with separate lengths of cable, as shown in Figure 3-5.

For more information on installing a Xanbus network, see the *Xanbus System Installation Guide*, available at www.xantrex.com.

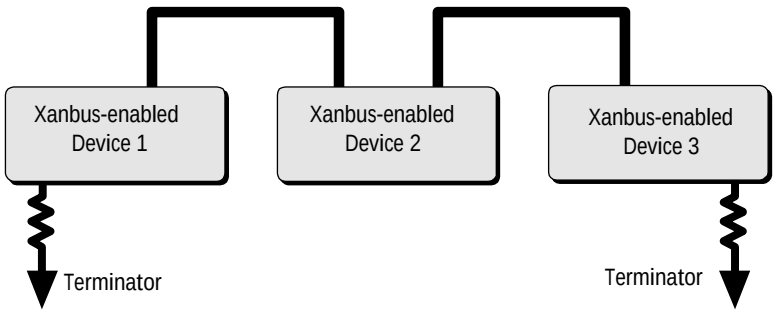

Figure 3-5 Daisy Chain Layout

CAUTION: Equipment damage

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.

Terminators

Male network terminators (Figure 3-6) are required at both ends of the network to ensure the communication signal quality on the network.

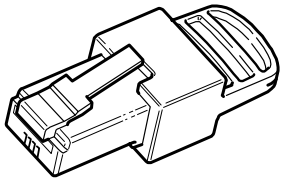

Figure 3-6 Male Network Terminator

GT Inverter Xanbus ports

Two RJ45 ports are provided on the GT Inverter for making network connections. See Figure 3-7 for the location of these ports.

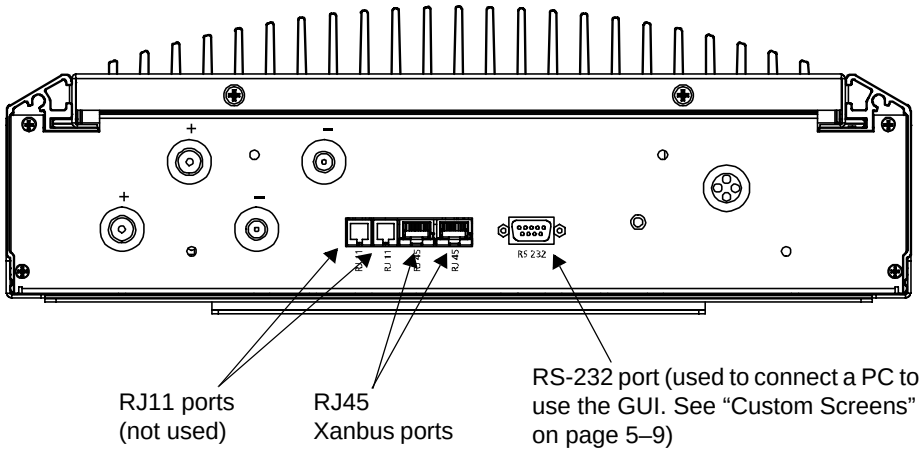

Figure 3-7 Location of Xanbus RJ45 Ports

Cabling Requirements

CAUTION: Equipment damage
Do not use crossover cable in a Xanbus system.

The network uses Category 5 (CAT 5) cable, a standard cable available from any computer supply store. The cable consists of eight conductors in four twisted pairs with an RJ45 modular connector wired to the T568A standard. Table 3-1 contains the arrangements of wire colors to pin numbers for the T568A standard.

Table 3-1 T568A Standard Wiring

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

RJ45 Connector Requirements

The network cable uses modular RJ45 connectors, as shown in Figure 3-8. The connector is suitable for cost-sensitive applications and is easily installed. The RJ45 connector should be a modular plug, 8-position, 8-contact for round, stranded, unshielded cable.

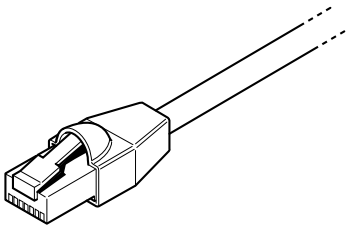

Figure 3-8 RJ45 Connector

Purchasing Network Components

Consult your system designer to determine what network components will be needed for your specific installation. Table 3-2 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** for information on purchasing network components.

Table 3-2 Network Components and Part Numbers

Network Component	Part Number
Network termination — Male (2 per pack)	809-0901
Network cable 3 ft. (0.9 m)	809-0935
Network cable 5 feet (1.5 m)	809-0936
Network cable 7 feet (2.0 m)	809-0937
Network cable 10 feet (3.0 m)	809-0938
Network cable 14 feet (4.3 m)	809-0939
Network cable 25 feet (7.6 m)	809-0940
Network cable 50 feet (15.2 m)	809-0941
Network cable 75 feet (22.9 m)	809-0942

Guidelines for Routing the Network Cables

WARNING: Shock hazard

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

To ensure maximum performance of your network, follow these guidelines when routing the network cables. Route the cables before installing Xanbus-enabled devices.

- Route the cables away from sharp edges that might damage the insulation. Avoid sharp bends in the cable—no less than a 10 cm (4 inch) radius.
- Allow for some slack in the cable tension.
- Keep the alignment of wire pairs inside the sheath as straight as possible.
- Allow separation between data and power cables (data cables should only cross a power cable at right angles).
- Do not staple the cable with metal cable staples. Use the appropriate hardware fasteners to avoid damage to the cable.

CAUTION: Unpredictable device behavior

Do not connect one end of the network to the other to make a ring.

Connecting the Communications Cable between Inverters

This procedure assumes only two inverters connected in parallel. However, there can be more than two inverters wired in this configuration.

To provide communication between inverters mounted in parallel:

1. Connect the communication cable to any RJ45 port in Inverter #1.
2. Pass the cable between Inverter #1 and Inverter #2, securing the cable appropriately.
3. Connect the communication cable to any RJ45 port in Inverter #2.
4. For more than two inverters in parallel, continue connecting cable as described above.
5. Insert male network terminators into the empty RJ45 ports in the inverters at the beginning and end of the network.

   After connecting communication cables and inserting terminators, there should be no empty RJ45 ports in any connected inverter.

4 Starting the Inverter

Chapter 4, “Starting the Inverter”, contains information on starting up the Xantrex Grid Tie Solar Inverter and performing a functional test.

The topics in this chapter are organized as follows:

Commissioning Procedure

To ensure that each GT Inverter is wired correctly, each inverter should be wired individually using the wiring procedures in Chapter 3, and turned on using this commissioning procedure. Once a single inverter has been commissioned, it should be turned off and the wiring and commissioning procedures should be performed for the next inverter. Repeat in this manner until all the inverters in the installation have been connected.

Perform this commissioning procedure step-by-step for each GT Inverter installed. Do not attempt to connect all wires to all inverters and turn on all at the same time.

CAUTION: Equipment damage

Improper wiring may cause permanent damage to the GT Inverter. Take special care to ensure the positive (+) and negative (–) wires from a single array connect to the same GT Inverter.

WARNING: Shock hazard

Hazardous voltages are present from two sources. Use extreme caution during startup procedure. Before applying power to the GT Inverter, ensure all AC and DC wiring is correct.

WARNING: Shock hazard

Ensure the protective earth (ground) wire from the inverter is connected to Earth before applying AC. Failure to do so could result in a shock hazard upon touching the enclosure. Consult the local utility for specific grounding requirements.

Starting the GT Inverter for the first time requires several steps. You will need to:

1. Ensure the AC breaker is off.
2. Ensure the correct multi-contact PV connectors are firmly plugged into the GT Inverter as described in “Connecting the DC Wiring” on page 3–2.
3. Ensure the AC quick connect is firmly inserted into the AC connector on the GT Inverter and the coupling ring is tight.
4. Connect the utility grid voltage by switching the AC circuit breaker on.
5. Monitor the startup sequence on the front panel LCD (see page 4–2).

   The GT Inverter starts automatically when it receives DC voltage within the correct range and it is connected to an acceptable grid.

   To monitor the startup sequence on the front panel LCD, check the GT Inverter LCD. The startup screens (see Table 5-1 on page 5–3) should appear for five seconds each, and then the “Reconnecting in *sss* seconds” special screen (see Table 5-10 on page 5–8) will appear until the protection timer countdown is completed.
6. Run the non-islanding test.

Non-Islanding Test

The non-islanding test is designed to verify correct operation of the Xantrex Grid Tie Solar Inverter both on initial operation and periodically through its life as required by the utilities. This test ensures that 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 non-islanding test as described in this procedure.

To run the non-islanding 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 ensure the green light on the front of the inverter goes out.

   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 will respond by beginning its countdown. The green light will remain off. A short time after applying AC, the green light will turn on and the inverter will begin to send power to the grid. The display will then return to showing the power being produced and the total kWh produced to date.

Important: The default voltage, frequency and reconnect delay values are programmed into the unit at time of shipment from the factory. No changes to these settings can be made in the field by the user. Only authorized personnel with the utility's permission may change these settings. Contact Xantrex Technology to gain permission and the procedure/equipment to make these changes.

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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 non-islanding test on the next inverter.

5 Monitoring the Inverter

Chapter 5, “Monitoring the Inverter”, contains information for understanding 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 liquid crystal display (LCD, see Figure 5-1) shows the first three screens described in Table 5-1, "Startup Screens on GT Inverter Front Panel Display" on page 5–3.

During waiting period

When the protection timer begins, the inverter displays "Reconnecting in *sss* seconds" (see Table 5-10, "Special Message Screens" on page 5–8).

During operation

When the protection timer stops, the GT Inverter begins selling 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 (e.g., at night) or a fault condition has been detected, the LCD shows a message screen to indicate that state. The specific fault condition will be identified. See Table 5-5, "Offline Mode Default Display" on page 5–5 and Table 5-8, "Fault Message Screens" on page 5–7.

Important: The values in the front panel LCD are not user adjustable.

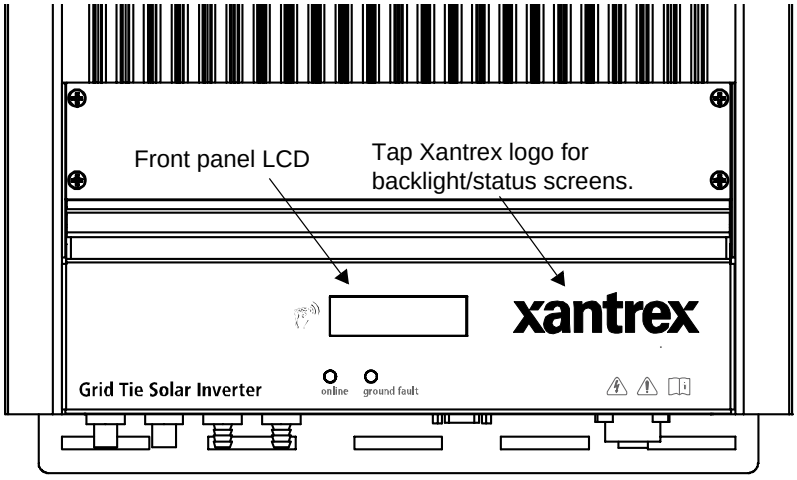

Figure 5-1 Front Panel LCD Location

Viewing more information

Additional screens of information about the performance of the GT Inverter can be displayed by tapping the Xantrex logo on the inverter 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

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 of these message screens are described in more detail in the following tables.

Startup Mode

During startup, the GT Inverter displays three message screens on its front panel LCD. These screens appear in the following order (Table 5-1).

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

Display*	Duration	Description
Xantrex GT3.0-SP-230	5 sec.	**Startup message 1:** Inverter name and model number
Flash = 01.01 ROM = 01.01	5 sec	**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.
Vh=253 Vl=195 Fh=51.0 Fl=49.0	5 sec	**Startup message 3:** Anti-islanding Utility Grid trip points. **Vh:** high voltage threshold **Vl:** low voltage threshold **Fh:** high frequency threshold **Fl:** low frequency threshold

* *all numbers in this and following tables are examples only.*

The protection timer begins its countdown 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 that can be displayed by tapping the Xantrex logo near the LCD to change the display.

Normal Operation default display

After the protection timer has completed its countdown and during normal operation, the GT Inverter displays the normal operation message screen shown in Table 5-2.

Table 5-2 Normal Operation Default Screen

Display	Description
System 2000W Today 9.875kWh	Power being produced by the system now. Cumulative energy produced by the system today.

If there is sufficient energy from the PV array, this 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, “Special Message Screens” on page 5–8).

More screens for all systems

Besides the default normal operation display, more system information messages can be viewed.

To view more Normal Operation information:

- Tap the Xantrex logo near the LCD 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 unit, then 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, then the LCD backlight turns off and the display reverts to the default system message screen.

Table 5-3 Normal Operation Screens for All GT Inverters

Tap	Display*	Description
1st time	System 2000W Today 2.500kWh	LCD backlight turns on for better readability and default Normal Operation screen is displayed.
2nd time	System Lifetime 305kWh	Lifetime energy produced by the GT Inverter system.
3rd time	Time Online Today hh:mm:ss	Length of time inverter has been online today, in hours (hh), minutes (mm) and seconds (ss).
4th time	Array Readings 350.5V 8.4A	Immediate DC voltage and current readings from the PV array.
5th time	Grid Readings 242.6V 60.0Hz	Immediate AC voltage and frequency readings from the Grid.

* *In a multiple unit system with communications 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 messages for multiple unit systems only

In addition, to the normal system message screens, additional screens specific to each GT Inverter unit can be displayed when the unit is connected with communications wiring 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 Xantrex logo near the LCD 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, then 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 in a Multiple Unit System

Tap	Display	Description
6th time	`Unit 1500W` `Today 1.250kWh`	Power being produced by this unit now. Cumulative energy produced by this unit today.
7th time	`Unit Lifetime` `150kWh`	Lifetime energy produced by this GT Inverter unit

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 Xantrex logo near the LCD. 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 Inverters

Tap	Display*	Description
1st time	Inverter Offline	LCD back light turns on for better readability and default Offline Mode screen is displayed.
2nd time	System 0W Today 2.50kWh	Power being produced by the system now. Cumulative energy produced by the system today.
3rd time	System Lifetime 305kWh	Lifetime energy produced by the system.
4th time	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 of 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 only displayed on multiple unit GT Inverter systems with communications wiring properly installed. If you continue to tap the unit, then the LCD continues to cycle through all of the available offline mode screens.

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

Tap	Display	Description
5th time	Unit 0W Today 1.25kWh	Power being produced by this unit now. Cumulative energy produced by this unit today.
6th time	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 (i.e., within 2 seconds). The GT Inverter fault message screens are shown in Table 5-8.

Fault Mode causes

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

Table 5-8 Fault Message Screens

Display	Description
DC Voltage Fault 145.5V	When the actual DC voltage is over or under the allowable range, 165 to 600 Vdc. Self-clearing, no action required. The PV array should be configured such that DC voltage does not fall below 195 Vdc or rise above 600 Vdc.*
AC Voltage Fault 280V	When the actual AC voltage is over or under the allowable range, as specified in "Output" on page A–2. This is a utility fault; it will clear itself when the AC voltage comes within the specified range.†
Frequency Fault 0.0Hz	When the actual Frequency is over or under the allowable range, as specified in "Output" on page A–2. This is a utility fault; it will clear itself when the frequency comes within the specified range.†
Over Temp Fault 81.4C 178.5F	When 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).
Ground Fault Reset System	When a grounding fault is detected (applicable only in North American installations). The ground fault fuse will be blown. The system must be shut down completely, the fault corrected, and the fuse replaced. The system can then be restarted. Troubleshooting a grounding fault should be performed by qualified personnel.
Unit Shutdown via Remote	Appears if the GT Inverter unit has been shut down via a computer connected to the RS-232 port.
Protection uP Not Responding	The protection processor 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 165 volts 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 Xantrex logo near the LCD. 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 time	Current fault message screen (see Table 5-8)	LCD backlight turns on for better readability.
2nd time	System 0W Today 2.500kWh	Energy being produced by the system now. Cumulative energy produced by the system today.
3rd time	System Lifetime 305kWh	Lifetime energy produced by the GT Inverter system.
4th time	Time Online Today hh:mm:ss	Length of time inverter was online today, in hours (hh), minutes (mm) and seconds (ss).
5th time	Array Readings 350.5V 8.4A	Immediate DC voltage and current readings of power from the PV array.
6th time	Grid Readings 242.6V 60.0Hz	Immediate AC voltage and frequency readings of power from the Grid.

* *In a multiple unit system with communications cables properly 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 that runs 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.

Table 5-10 Special Message Screens

Display	Description
System *3500W Today 15.56kWh	The "*" 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 *1800W 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 a computer connected to the RS-232 port inside the wiring box. 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.

A PC graphical user interface (GUI) that can be used for configuring custom screens is available for download at **www.xantrex.com**.

Status Indicator Lights

The GT Inverter is equipped with two status indicator lights (LEDs) located below the front panel LCD (Figure 5-2). These LEDs indicate the inverter's current 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 energy to the grid. No action required. Turns off when a fault state is detected.
RED	Ground fault condition detected (not used for ungrounded PV arrays). Check for any fault messages on the display (see Table 5-8), and refer also to Table 6-1, "Troubleshooting the GT Inverter" on page 6–4 to resolve the fault condition.

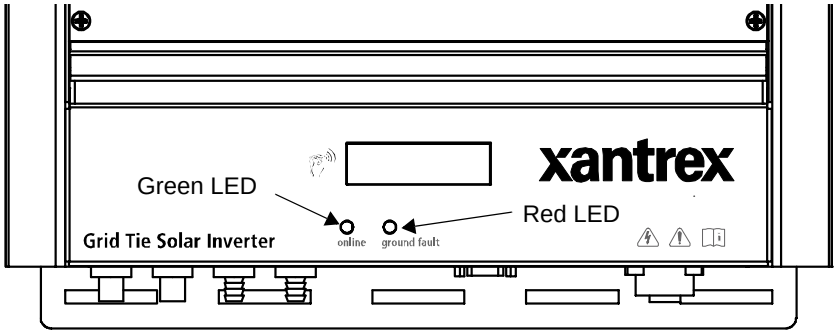

Figure 5-2 Location of Status Indicator Lights

6 Maintenance and Troubleshooting

WARNING: Electrical shock and fire hazard

Do not disassemble the GT Inverter. It does not contain any user serviceable parts. Attempting to service the unit yourself could result in electrical shock or fire.

Chapter 6, “Maintenance and Troubleshooting”, contains information about how to provide general maintenance for 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 will affect the amount of power that a properly installed and operating GT Inverter can produce.

PV Array Factors

PV array ratings

PV arrays are rated at ideal factory conditions, such as specified illumination (1000 W/m^2), spectrum of the light, and specified temperature (25 °C / 77 °F), that 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

Because of 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 heats up, its energy output goes down. 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.

Important: The GT Inverter will reduce its energy output to protect its electronic circuits from overheating and 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. Sunlight output decreases as the sun approaches the horizons (such as in winter in North America) due to the greater atmospheric air mass it must penetrate, reducing both the light intensity that strikes the array's surface and 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, in effect, 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 proportionate to 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

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

Performing General Maintenance

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

1. Keep the heat sink clear of dust and debris.

WARNING: Shock and fire hazard

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

2. Clean the PV array whenever it is visibly dirty, during a cool time of the day.
3. Periodically inspect the system to make sure that all wiring and supports are securely in place.
4. On a sunny day near noon on March 21 and September 21 of each year, review the output of the system and compare it with the previous year's reading. Maintain a log of system performance readings so that you can recognize when system performance becomes inconsistent.

Identifying Error/Fault Conditions and Solutions

Most error or fault conditions will be identified by fault message screens on the GT Inverter 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 user action to remedy.

See “Front Panel Display Screens and What They Mean” on page 5–3 for more information.

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

Table 6-1 Troubleshooting the GT Inverter

Problem	Cause	Remedy
• The inverter LED indicator lights do not illuminate, and the inverter does not operate in sufficient sunlight • The display reads “Inverter Offline” • The Vdc reading is 0.	Utility service panel AC or DC breakers are switched off. No AC grid or DC array voltage is present.	Turn on breakers in the sequence described in “Commissioning Procedure” on page 4–2. Check source of the AC voltage. Ensure that the inverter AC/DC Disconnect Switch is set ON. Check AC connections and ensure AC voltage within the range specified in “Output” on page A–2 is present. Check DC connections. Check the DC voltage on the positive and negative input terminals and ensure 195–550 Vdc is present. Check for incorrectly wired PV arrays or try again on a day with brighter sunlight intensity.
Only the inverter RED LED is illuminated.	Ground fault condition detected.	Check for any fault messages on the display (see Table 5-8 on page 5–7). System should be checked by a qualified electrician and repaired.

A Specifications

Appendix A, “Specifications”, contains information about the electrical and environmental specifications of the Xantrex Grid Tie Solar Inverter.

The topics in this appendix are organized as follows:

All specifications are subject to change without notice.

Electrical Specifications

Input

Input voltage, Maximum Power Point range	195 to 550 Vdc
Absolute maximum array open circuit voltage	600 Vdc
Maximum input current	16.6 A DC
Maximum array short circuit current	19 A DC
Recommended PV array power	Up to 3300 W
Reverse polarity protection	Short circuit diode

Output

		GT3.0 European	
	GT3.0 North American	**Germany (DE)**	**Spain (SP)**
Maximum output power	3000 W AC	3000 W AC	
Nominal output power over rated temp range	2500 W AC	2500 W AC	
Maximum utility backfeed current	20 A	20 A	
Nominal output voltage	240 V	230 V	
Operating range, utility voltage (default)*	211 to 264 Vac	195 to 250 Vac	195 to 253 Vac
Nominal output frequency	60 Hz	50 Hz	
Operating range, utility frequency (default)*	59.3 to 60.5 Hz	49.8 to 50.2 Hz	49 to 51 Hz
Maximum continuous output current	14.2 A	14.9 A	
Output overcurrent protection	20 A RMS	20 A RMS	
Total Harmonic Distortion (THD)	<5%	<5%	
Power factor	>0.9	>0.9	
Utility monitoring—islanding protection	Vac, fac as per UL1741	Vac, fac†	Vac, fac
Output characteristics	Current source		
Output current waveform	Sine wave		

* *Requires Utility permission and qualified service personnel to change settings.*

† *Requires external ENS26 device to meet VDE0126 requirements for impedance shift detection.*

Adjustable Disconnect Settings

The adjustable disconnect setting values vary depending on whether the inverter is a 208 Vac/60 Hz, 240 Vac/60 Hz, or 230 Vac/50 Hz model. Utility permission is required prior to changing the settings on the inverter.

The default values of these settings differ from the utility specifications on page A–2. These differences take into account the accuracy ranges listed in the table below, and are intended to ensure that utility specifications are always met.

	Default Values				Adjustment Range		
Setting	**208 Vac/ 60 Hz**	**240 Vac/ 60 Hz**	**230 Vac/ 50 Hz (DE)**	**230 Vac/ 50 Hz (SP)**	**From...**	**To...**	**Accuracy**
AC Low Voltage	186 Vac	214 Vac	195 Vac	198 Vac	180 Vac	269 Vac	+/– 3 Vac
AC High Voltage	225 Vac	261 Vac	250 Vac	250 Vac			
AC Low Frequency	59.4 Hz		49.8 Hz	49.1 Hz	46.0 Hz	62.0 Hz	+/– 0.1 Hz
AC High Frequency	60.4 Hz		50.2 Hz	50.9 Hz			
Reconnect Delay	305 sec.		10 sec.	180 sec.	0 sec.	600 sec.	+/– 5 sec.

Output Power Versus Ambient Temperature

Once the heat sink on the inverter reaches a maximum temperature limit, the GT Inverter reduces its energy output to ensure maximum component ratings are not exceeded.

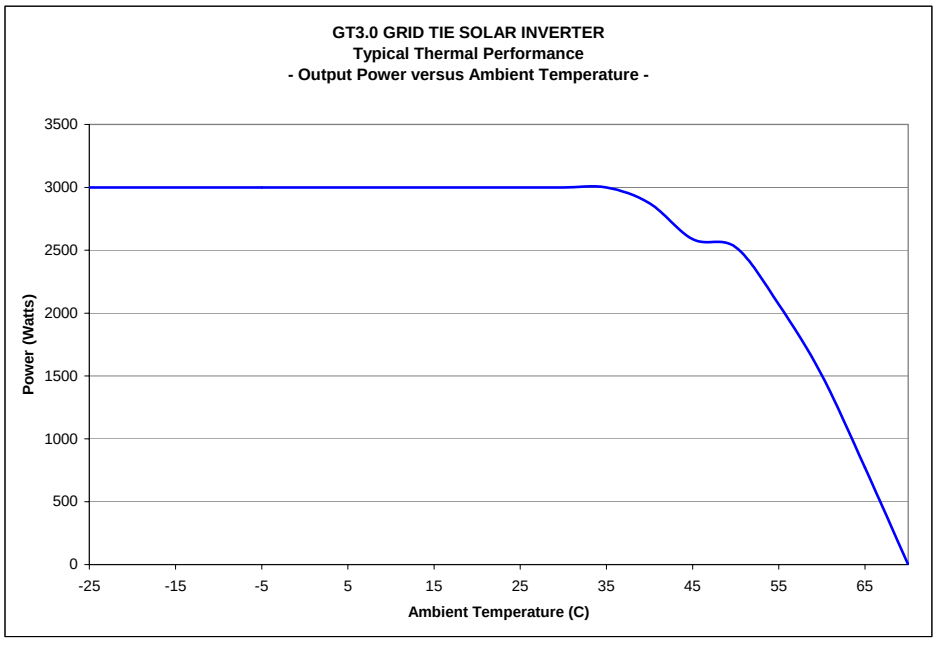

Figure A-1 Output Power vs. Ambient Temperature

Efficiency

Output Power (watts)	Max. Efficiency (%)
150 (5%)	83.54
300 (10%)	90.09
600 (20%)	93.49
900 (30%)	94.46
1500 (50%)	94.92
2250 (75%)	94.96
3000 (100%)	94.36

Euro efficiency	93.9%
Nighttime tare loss	1 W

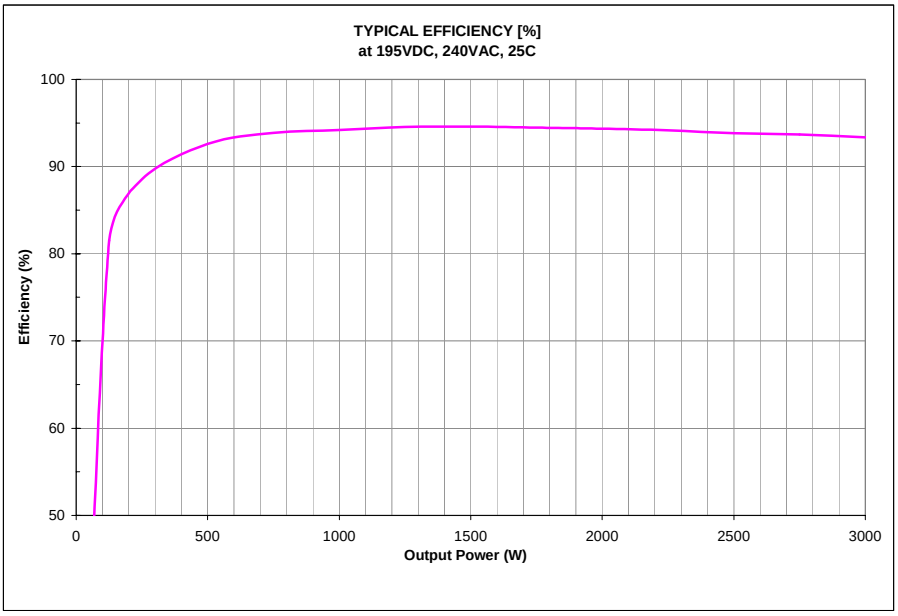

Figure A-2 Typical Efficiency

Environmental Specifications

Rated operating temperature range	-25 to +45 °C (-13 to +113 °F)
Tolerable operating temperature range	-25 to +65 °C (-13 to +149 °F)
Storage temperature range	-40 to +85 °C (-40 to +185 °F)
Power derating	Derating curve above +45 °C (+113 °F); see Figure A-1 on page A–3
Tolerable relative humidity limit	**Operating:** 100% condensing **Storage:** <95%, non-condensing

User Display

Type	alphanumeric liquid crystal
Size	2 lines by 16 characters
Backlight	yes

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

Inverter dimensions (H × W × D)	55.1 × 40.3 × 14.6 cm (21.7 × 15.9 × 5.7 inches)
Shipping dimensions (H × W × D)	69.2 × 51.8 × 26.2 cm (27.2 × 20.4 × 10.3 inches)
Inverter weight	18.7 kg (41 lb)
Shipping weight	24.9 kg (54.7 lb)
Input terminals	Multi-contact Quick Connect PV-ADSP3/GWD (male) PV-ADBP3/GWD (female)
Output terminals	Binder 693 Series male socket (mates with supplied female cable connector PG13,5 p/n 99-4222-14-04)

Warranty and Return Information

Warranty

What does this warranty cover and how long does it last? This Limited Warranty is provided by Xantrex Technology Inc. (“Xantrex”) and covers defects in quality in workmanship and materials (“Defects”) in your GT 3.0E Grid Tie Inverter. This warranty lasts for a period of five years (the “Warranty Period”) from the date of purchase at point of sale to you, the original end user customer. This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period.

What will Xantrex do? If there is a Defect, Xantrex will repair or replace the defective product free of charge, provided that:

(a) you have followed the service procedure below and have not been able to get a remedy from your dealer;

(b) you notify Xantrex, without undue delay, of the Defect within the Warranty Period; and

(c) Xantrex, through inspection, troubleshooting, or other means establishes the existence of a Defect 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, the warranty is suspended during the repair or replacement and continues for the remaining portion of the original Warranty Period or 90 days from the date of the completed repair activity, whichever is greater. All replaced products and all parts removed from repaired products become the property of Xantrex.

Xantrex covers both parts and labour necessary to repair the product. If the product was sold in Spain, Xantrex will cover costs for products returned directly to Xantrex via a Xantrex-selected non-expedited surface freight and packing.

How do you get service? If you are unable to contact your dealer, or if your dealer is unable to provide service, contact Xantrex directly at the following numbers:

EUROPE:

Telephone:	34 93 470 5330
Fax:	34 93 473 6093
Email:	support.europe@xantrex.com

If your dealer is unable to provide service, 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 to see if your product can be repaired at one of these facilities.

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 invoice or purchase receipt showing the product exchanged under warranty

What does this warranty not cover? This Limited Warranty does not cover normal wear and tear of the product or costs associated with replacing consumable items such as air filters, fuses, arrestors, etc. A shorter than normal life during the Warranty Period caused by excessive use or incorrect use is not considered a Defect. Please consult your Owner's Guide to determine the proper use of the product.

This warranty does not apply to and Xantrex will not be responsible for any damage to the product:

a) if it has not been used in accordance with the Owner's Guide supplied with the product, if it has been damaged during shipping, mishandled, neglected, improperly installed, physically damaged or altered (either internally or externally) or damaged from improper use or use in an unsuitable environment;

b) 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 high input voltage from generators and lightning strikes;

c) if repairs have been done to it other than by Xantrex or an Authorized Service Center;

d) if it is used as a component part of a product expressly warranted by another manufacturer; and

e) if its original identification (trade-mark, serial number) markings have been defaced, altered, or removed.

Exclusions

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, WHERE PERMITTED BY LAW, BE LIMITED IN DURATION TO THE PERIOD STIPULATED UNDER THIS LIMITED WARRANTY.

IN NO EVENT WILL XANTREX BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING WHETHER IN CONTRACT OR TORT INCLUDING, WITHOUT RESTRICTION, ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF MISUSE OR ABUSE OR THE INCORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT.

Limitations on Exclusions

This Limited Warranty does not affect your rights as prescribed by law and as established in the Law on Warranties for Consumer Goods (Spain) or the German Civil Code ("BGB"). In Germany, the legal provisions regarding suspension or expiration ("Ablaufhemmung"), suspension ("Hemmung") and recommencement of limitation periods remains unaffected.

Some countries 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.

For example, in Germany, the Exclusion above shall not apply in the case of mandatory liability, i.e. under the German Product Liability Act ("Produkthaftungsgesetz") or in the case of intent, gross negligence, and injury of life, body or health, or breach of a condition which goes to the root of the contract ("wesentliche Vertragspflichten"). However, claims for damages arising from a breach of a condition which goes to the root of the contract shall be limited to the foreseeable damage which is intrinsic to the contract, unless caused by intent or gross negligence or based on liability for injury of life, body or health. The Exclusion above in Germany also does not imply a change in the burden of proof to your detriment.

Exclusion for Documentation

WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, UNLESS SPECIFICALLY AGREED TO BY IT IN WRITING, XANTREX:

(A) MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION PROVIDED BY IT IN CONNECTION WITH THE PRODUCT; AND

(B) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSSES, DAMAGES, COSTS OR EXPENSES, WHETHER SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION.

THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER'S RISK.

Warning: Limitations On Use

Please refer to your Owner's Guide for limitations on uses of the product. Specifically, please note that the GT 3.0E Grid Tie Inverter is not intended for use in connection with life support systems or other medical equipment or devices and Xantrex makes no representation or warranty in connection with any use of the product for such purposes.

Xantrex Technology Inc.
8999 Nelson Way
Burnaby, British Columbia
Canada
V5A 4B5

Return Material Authorization Policy

Before returning a product directly to Xantrex you must obtain a Return Material Authorization (RMA) number and the correct factory “Ship To” address. 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, 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

When you ship:

1. 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.
2. 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.
3. Ship the unit prepaid to the address provided by your Xantrex customer service representative.

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.

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.

Model Number _____

Serial 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.

Inverter Details

Type of installation (e.g. Residential/Commercial) _____

Length of time inverter has been installed _____

AC wiring size and length _____

DC wiring size and length _____

Description of fault messages and/or 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

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975-0197-01-01

Printed in China