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Planning and Installation Manual

GT100 Grid-Tied Photovoltaic Inverter

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About This Manual

Purpose

The purpose of this Planning and Installation Manual is to provide explanations and procedures for planning and installing the GT100 Grid-Tied Photovoltaic Inverter.

Scope

The Manual provides safety guidelines, detailed planning and setup information, and procedures for installing the inverter.

Audience

Anyone who plans to construct or install a system involving the GT100 Grid-Tied Photovoltaic Inverter. Installers must meet all local and state code requirements for licensing and training for the installation of Electrical Power Systems with AC and DC voltage to 600 volts.

Organization

This Manual is organized into four chapters and one appendix:

Chapter 1, “Introduction” provides information about the features and functions of the GT100 Grid-Tied Photovoltaic Inverter.

Chapter 2, “Planning” provides information to help plan the installation of the GT100 Grid-Tied Photovoltaic Inverter.

Chapter 3, “Installation” describes the procedures needed to install the GT100 Grid-Tied Photovoltaic Inverter. This section includes unpacking and moving instructions, mounting instructions, and cabling instructions.

Chapter 4, “Verification” provides a checklist to ensure the installation of the GT100 Grid-Tied Photovoltaic Inverter is correct and complete.

Appendix A provides the environmental and electrical specifications for the GT100 Grid-Tied Photovoltaic Inverter.

Conventions Used

The following conventions are used in this guide.

WARNING

Warnings identify conditions or practices 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 which are important for you to know, but not as serious as a caution or warning.

GT100 Models

This Planning and Installation Manual contains information for four models of the GT100 Grid-Tied Photovoltaic Inverter.

Two of the models are designed to operate with a 208 Vac utility input; one configured for a negative grounded PV array (GT100-208), and the other configured for a positive grounded PV array (GT100-208-PG).

- The model **GT100-208** Grid-Tied Photovoltaic Inverter (208 Vac input, negative grounded) will be referred to as the GT100-208 when it is being referenced individually.
- The model **GT100-208-PG** Grid-Tied Photovoltaic Inverter (208 Vac input, positive grounded) will be referred to as the GT100-208-PG when it is being referenced individually.

Additionally, two of the models are designed to operate with a 480 Vac utility input; one configured for a negative grounded PV array (GT100-480), and the other configured for a positive grounded PV array (GT100-480-PG).

- The model **GT100-480** Grid-Tied Photovoltaic Inverter (208 Vac input, negative grounded) will be referred to as the GT100-480 when it is being referenced individually.
- The model **GT100-480-PG** Grid-Tied Photovoltaic Inverter (480 Vac input, positive grounded) will be referred to as the GT100-480-PG when it is being referenced individually.

When all models are being referenced together, they will be referred to as the **GT100**.

Abbreviations and Acronyms

ANSI	American National Standards Institute
CCU2	Converter Control Unit 2
CFM	Cubic Feet per Minute
CW	Clockwise
DSP	Digital Signal Processor
FPGA	Field Programmable Gate Array
GUI	Graphical User Interface
IEEE	Institute of Electrical and Electronics Engineers
IGBT	Insulated Gate Bipolar Transistor
kcmil	1000 circular mils
LM	Liter per Minute
NFPA	National Fire Protection Association
PBX	Private Branch Exchange
PSL	Phase-Shift Loop
PV	Photovoltaic
UFCU	Universal Frontpanel Control Unit
VFD	Vacuum Fluorescent Display

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 - DO NOT DISCARD

This manual contains important safety instructions for the GT100 Grid-Tied Photovoltaic Inverter that must be followed during installation and maintenance procedures.

WARNING: Shock Hazard

Read and keep this Planning and Installation Manual for future reference.
Before operating and maintaining the GT100, read all instructions, cautionary markings, and all other appropriate sections of this manual. Failure to adhere to these warnings could result in severe shock or possible death. Exercise extreme caution at all times to prevent accidents.

WARNING: Shock Hazard

The GT100 Inverter Enclosure contains exposed high voltage conductors. The Inverter enclosure doors should remain closed with the latches tightened, except during maintenance or testing. These servicing instructions are for use by qualified personnel who meet all local and governmental code requirements for licensing and training for the installation of Electrical Power Systems with AC and DC voltage to 600 volts. To reduce the risk of electric shock, do not perform any servicing other than that specified in the installation instructions unless you are qualified to do so. Do not open the cabinet doors if extreme moisture is present (rain or heavy dew).

WARNING: Lethal Voltage

In order to remove all sources of voltage from the GT100, the incoming power must be de-energized at the source. This may be done at the main utility circuit breaker and by opening the AC Disconnect and the DC Disconnect Switch on the GT100. Review the system configuration to determine all of the possible sources of energy. In addition, allow five minutes for the DC bus capacitors to discharge after removing power. Follow the “Lockout and Tag” procedure on page xi to de-energize the GT100.

WARNING: Shock hazard

If a ground fault has occurred, there may be potential between TB4 and GND. The normally grounded pole may be energized and ungrounded.

Risks

WARNING: Shock hazard

Parts of the capacitor charge will still be energized for a maximum of five minutes after being disconnected.
Open doors only after the device is disconnected and discharged. Check whether the device is no longer live (DC voltage) including terminals TB3 and TB4.

WARNING: Explosion hazard

The IGBT module may explode in the event of a major malfunction. The GT100 enclosure doors should remain closed with the latches tightened, except during maintenance or testing.

WARNING: Crush hazard

The inverters have a specific balance point that correlates to their Center of Gravity and can topple down. Exercise care when moving the GT100.

WARNING: Amputation hazard

The inverters contain integrated ventilators including rotating ventilator wheels. Do not place fingers in ventilator.

WARNING: Burn hazard

Inverters contain components that become hot during normal operation. Do not touch.

CAUTION: EQUIPMENT DAMAGE

The GT100 incorporates an air supply and exhaust air area, which must remain unobstructed. The device can overheat and be destroyed if the installation instructions are not adhered to.

CAUTION: EQUIPMENT DAMAGE

Sensitive electronics inside the GT100 can be destroyed when touched and when electrostatically charged. Discharge via earth potential before touching and wear appropriate protective gear.

CAUTION: EQUIPMENT DAMAGE

No connections or disconnections are to be made at the terminal strips or internal connectors during operation.
Turn unit off before performing terminal work; wait five minutes (capacitor charge) and recheck to ensure internal components are no longer live.

General Safety Precautions

1. When installing the GT100 use only components recommended or sold by Xantrex. Doing otherwise may result in a risk of fire, electric shock, injury to persons, and will void the warranty.
2. Do not attempt to operate the GT100 if it has been dropped, or received more than cosmetic damage during transport or shipping. If the GT100 is damaged, or suspected to be damaged, see the Warranty section of this manual.
3. To reduce the risk of electrical shock, lock-out and tag the GT100 before attempting any maintenance, service, or cleaning.

Personal Safety

Follow these instructions to ensure your safety while working with the GT100.

Qualified Personnel

Only qualified personnel should perform the transportation, installation and initial operation and maintenance of the GT100 in accordance with National Electrical Code ANSI/NFPA 70, as well as all state and local code requirements. Follow all national accident prevention regulations.

Qualified personnel, within the meaning of these basic safety regulations, will be people who are familiar with the installation, assembly, start-up and operation of the GT100 and have the appropriate qualifications with respect to their functions.

Safety Equipment

Authorized service personnel must be equipped with standard safety equipment including the following:

- Safety glasses
- Ear protection
- Steel-toed safety boots
- Safety hard hats
- Padlocks and tags
- Appropriate meter to verify that the circuits are de-energized (1000 Vac and DC rated, minimum)

Check local safety regulations for other requirements.

Wiring Requirements

1. All wiring methods and materials shall be in accordance with the National Electrical Code ANSI/NFPA 70, as well as all state and local code requirements.
   - Use copper conductors only with an insulation rating of 90 °C.
2. The GT100 has a three-phase, four wire output.
3. The GT100 is interfaced with the AC utility grid at TB1 (TB1-A, TB1-B, TB1-C and TB1-N), located in the lower left side of the enclosure. These terminals require the use of a UL-approved crimp-on type ring terminal or a UL-approved compression-type lug certified for use with the chosen interface cables. Keep these cables together as much as possible and ensure that all cables pass through the same knockout and conduit fittings, allowing any inductive currents to cancel. For torque values, see Table A-5 on page A–5. See Figure 1-3 on page 1–5 for the location of these terminals.
4. The AC neutral terminals (H0 and X0), shall be left floating (not connected) on both the utility and inverter sides of the isolation transformer. See page 2–4 for details.
5. The GT100 is interfaced with the DC photovoltaic array at TB3, TB4 and TB5 (PV GND), located in the lower right side of the enclosure. Do not connect the grounded pole of the PV array directly to TB5 (PV GND); doing so will bypass the ground fault detector and violate the NEC. These terminals require the use of a UL-approved crimp-on type ring terminal or UL-approved compression-type lug certified for use with the chosen interface cables. Keep these cables together as much as possible and ensure that all cables pass through the same knockout and conduit fittings, allowing any inductive currents to cancel. For torque values, see Table A-6 on page A–5. See Figure 1-5 on page 1–8 and Table 1-1 on page 1–8 for the location and polarity of these terminals.
6. This product is intended to be installed as part of a permanently grounded electrical system as per the National Electrical Code ANSI/NFPA 70, as well as all state and local code requirements. A copper clad earth grounding electrode must be installed within 3 ft. (1 m) of the GT100 enclosure. The AC ground bus bar (TB2), located in the lower left side of the GT100 enclosure, must be used as the single point connection to the earth grounding electrode for the inverter system.
7. The equipment grounds on the GT100 are marked with ⏚
8. AC overcurrent protection for the utility interconnect (Grid-tie) must be provided by the installers as part of the GT100 installation.

CAUTION: Fire Hazard

In accordance with the National Electrical Code, ANSI/NFPA 70, connect only to a circuit provided with 400 amperes maximum branch circuit overcurrent protection for model GT100-208 and GT100-208-PG, and only to a circuit provided with 200 amperes maximum branch circuit overcurrent protection for model GT100-480 and GT100-480-PG.

Operational Safety Procedures

Never work alone when servicing this equipment. A team of two is required until the equipment is properly de-energized, locked-out and tagged, and verified de-energized with a meter.

Thoroughly inspect the equipment prior to energizing. Verify that no tools or equipment have inadvertently been left behind.

Lockout and Tag

Safety requirements mandate that this equipment not be serviced while energized. Power sources for the GT100 must be locked-out and tagged prior to servicing. A padlock and tag should be installed on each energy source prior to servicing.

WARNING: Shock Hazard

Review the system schematic for the installation to verify that all available energy sources are de-energized. DC bus voltage may also be present. Be sure to wait the full five minutes to allow the capacitors to discharge completely

The GT100 can be energized from both the AC source and the DC source. To ensure that the inverter is de-energized prior to servicing, lockout and tag the GT100 using the following procedure.

1. Turn the GT100 main ON/OFF switch (S3) to the OFF position. This stops the inverter from exporting power to the AC utility grid.
2. Open, lockout, and tag the incoming power at the utility main circuit breaker.
3. Open, lockout, and tag the AC Disconnect (CB1) on the left side of the GT100. See Figure 1-7 on page 1–10 for the location of the AC Disconnect.
4. Open, lockout, and tag the DC Disconnect Switch (S1) on the right side of the GT100. See Figure 1-7 on page 1–10 for the location of the DC Disconnect Switch.

CAUTION

Once the DC Disconnect Switch (S1) is open, there will be DC voltage on the PV Array side of the switch where TB3, TB4 and TB5(PV GND) are located. This voltage may be as high as the Open-Circuit Voltage of the PV Array and is limited to 600VDC per NEC 690.

Proceed to next page for Step 5.

5. Using a confirmed, accurate meter, verify all power to the inverter is de-energized. A confirmed, accurate meter must be verified on a known voltage before use. Ensure that all incoming energy sources are de-energized by checking the following locations at all line-to-line and all line-to-ground configurations.
   - **AC Utility Terminals: [TB1-A, TB1-B, TB1-C, TB1-N, and TB2(GND BUS)]**
     See Figure 1-3 on page 1–5 for the location of these terminals.
   - **PV Terminals: [TB3, TB4, and TB5 (PV GND)]**
     See Figure 1-5 on page 1–8 for the location of these terminals.

De-Energize/Isolation Procedure

The following procedure should be followed to de-energize the GT100 for maintenance.

WARNING

The terminals of the DC input may be energized if the PV arrays are energized. In addition, allow five minutes for all capacitors within the main Enclosure to discharge after disconnecting the GT100 from AC and DC sources.

To isolate the GT100:

1. Turn the main ON/OFF switch (S3) to the OFF position.
2. Open the utility connection circuit breaker.
3. Open the AC Disconnect (CB1).
4. Open the DC Disconnect Switch (S1).
5. Install lockout devices on the utility connection circuit breaker, AC and DC disconnect switch.

Interconnection Standards Compliance

The GT100 complies with FCC Part 15 Class A requirements.

The GT100 is designed to meet NEC Article 690 and UL1741-2005 *Static Inverters And Charge Controllers For Use In Photovoltaic Power Systems*, which includes testing for IEEE 1547.1-2005, IEEE 929-2000 and IEEE 519-2000.

Intended Use

The GT100 may only be used in connection with PV modules. It is not suitable for any other application areas.

Contents

2 Planning

3 Installation

4 Verification

A Specifications

Figures

Tables

1 Introduction

Chapter 1, “Introduction” provides information about the features and functions of the GT100 Grid-Tied Photovoltaic Inverter.

Description of the GT100

The GT100 Grid-Tied Photovoltaic Inverter is a utility interactive, three-phase power conversion system for grid-connected photovoltaic arrays with a power rating of 100 kW. Designed to be easy to install and operate, the GT100 automates start-up, shutdown, and fault detection scenarios. With user-definable power tracking that matches the inverter to the array and adjustable delay periods, users are able to customize startup and shutdown sequences. Multiple GT100 inverters are easily paralleled for larger power installations.

Power Conversion System

The GT100 power conversion system consists of a pulse-width modulated (PWM) inverter, switch gear for isolation and protection of the connected AC and DC power sources. Housed in a rugged NEMA 3R rated, corrosive resistant, powder-coated steel enclosure, the GT100 incorporates sophisticated Insulated Gate Bipolar Transistors (IGBTs) as the main power switching devices. An advanced, field-proven, Maximum Peak Power Tracker (MPPT) integrated within the GT100 control firmware ensures the optimum power throughput for harvesting energy from the photovoltaic array.

Advanced Design Features

The advanced design of the GT100 includes an EMI output filter and the main AC contactor located electrically on the utility side of the isolation transformer to minimize transformer tare losses when the unit is not operating.

The GT100 also includes an Inrush Limit assembly to prevent nuisance Utility Circuit Breaker trips when the isolation transformer is energized.

A sophisticated control scheme optimizes the operation of the GT100 cooling fan as needed for increased overall system efficiency.

Additionally, the GT100 integrated controller contains self-protection features including over and under voltage and frequency safeguards in compliance with UL 1741 Rev 2005.

Anti-islanding

An integral anti-island protection scheme prevents the inverter from feeding power to the grid in the event of a utility outage.

Auto-Phase Rotation

The GT100 includes the ability to auto-sense and correct for a “mis-phased” connection at the AC Interface terminals. In the event the power conductors from the utility is not phased correctly at the AC Interface terminals, the GT100 will sense the discrepancy and automatically correct for a clockwise (A-B-C) phase rotation.

Local Display and Remote Graphic User Interface

The GT100 includes a local user interface comprised of an ON/OFF switch, keypad, and 4-line, 80 character VFD display.

A user-friendly, Xantrex GT View Graphic User Interface (GUI) provides a remote interface for operator interrogation of GT100 system status, control, metering/data logging and protective functions within the GT100. The status, control, and logging features are supported by an optional modem via an RS232 connection for remote monitoring. Alternatively, a user selectable RS485/Modbus connection is also available for remote plant monitoring.

Physical Characteristics

The GT100 is assembled in a single NEMA-3R, corrosive resistant, powder-coated enclosure that includes two access doors to house the electronics described above. Internally, the GT100 is compartmentalized to include sections for the AC Interface (left side), the Power Electronics (upper middle), the Isolation Transformer (lower middle), and the DC Interface (right side). The single enclosure is constructed and delivered as one complete assembly.

These sections are identified in Figure 1-2.

Figure 1-1 Main Inverter (Open Enclosure View)

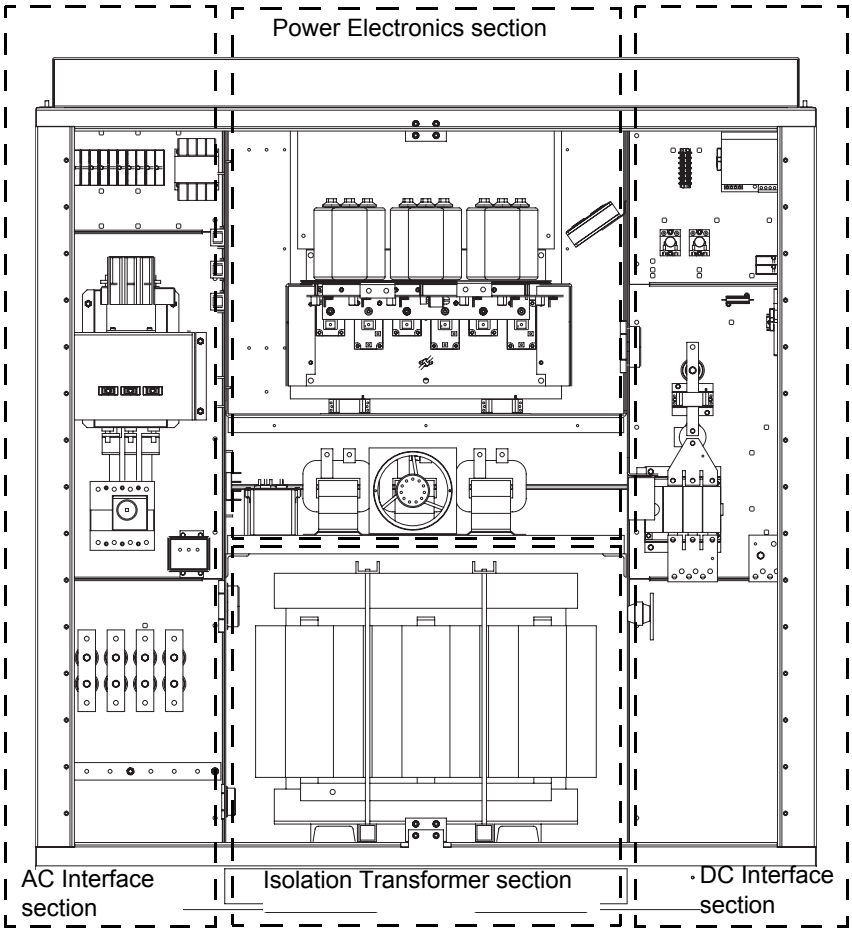


Figure 1-2 GT100 Major Sections

AC Interface

The AC Interface serves as the connection for the utility (see Figure 1-2 to locate the AC Interface). This compartment (section) houses the AC Terminals (TB1-N, -A, -B, and -C), AC Disconnect, AC Contactor, and EMI Filter. Additionally, the Inrush PCB assembly, control power transformer, control fuses, and AC sensing circuitry are also housed in this section.

AC Utility Terminals

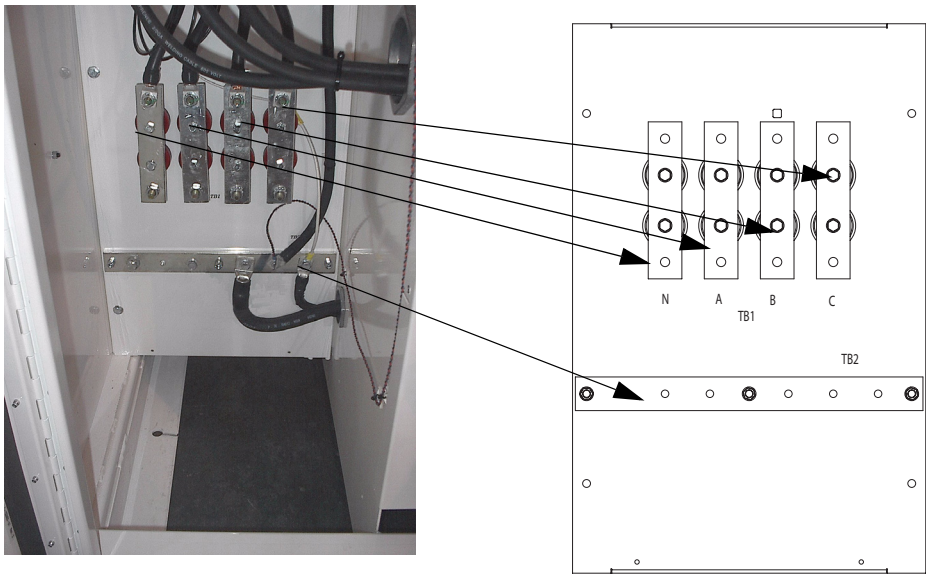


Figure 1-3 AC Utility Terminals

Each terminal provides space for two cables with a M10 bore diameter (see Table A-5 on page A–5 for torque requirements).

Auxiliary Control Interface

The GT100 has provisions within the AC Interface for installing auxiliary control signals that include a remote Emergency Stop and a remote Enable/Disable signal. Two pairs of dry contact circuits at the TB7 terminal are used for control of these input signals. Circuit termination and signal type are identified in Table A-7 on page A–5.

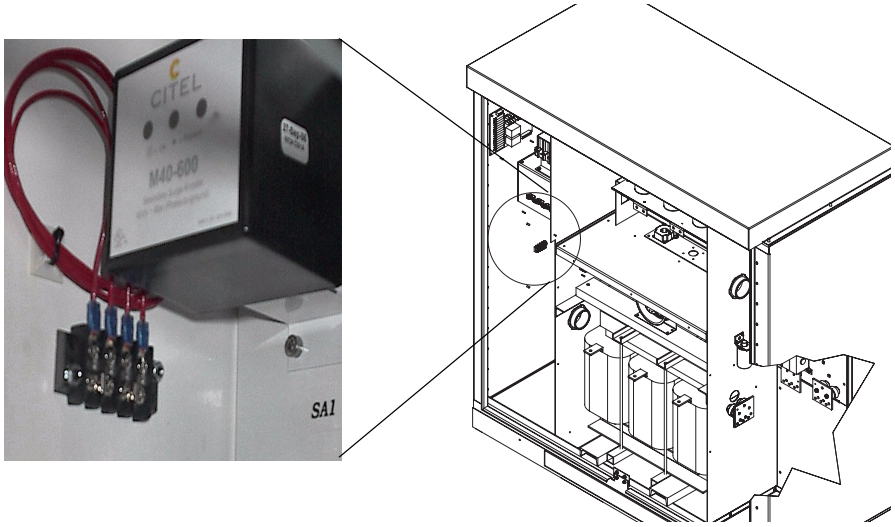


Figure 1-4 Remote Control Terminal Connections

Communications Circuit

The GT100 can be remotely accessed through an RS232 serial port or through an RS485/Modbus connection. Xantrex offers modems that can be connected to the RS232 port for remote monitoring. The remote user has the ability to control and monitor the status of the inverter through this connection.

Alternatively, a user selectable RS485/Modbus connection is also available for remote plant monitoring. The CCU2 Controller board within the GT100 may be configured for RS485 serial communication using the Modbus protocol. This enables users to monitor and control the inverter from a dedicated plant wide monitoring system.

Power Electronics

The GT100 Power Electronics section contains the converter control unit (CCU2) and the power electronics matrix. Also found within the Power Electronics section are the Hall-effect current transducers, and an internal air circulation fan.

Converter Control Unit (CCU2)

The CCU2 is a Digital Signal Processor (DSP) based control board that performs numerous control and diagnostic functions associated with GT100 operation. Its most significant tasks are control of GT100 electromechanical components and power electronics converters, communication with the Universal Front Panel Control Unit, and system sensors. The CCU2 also contains the necessary DC power supplies to support its operation.

Power Electronics Matrix

The power electronics converter matrix consists of switching transistors (IGBTs), transistor gate drive electronics, laminated DC bus structure, DC capacitors and an aluminium extrusion heatsink with cooling fan. The fan is located behind the matrix assembly, and forces air down through the heatsink.

The PV array is tied logically to the matrix DC bus within the DC Interface section. The embedded CCU2 control unit manages the transfer of power between the DC bus and the utility grid.

DC Interface

The DC Interface serves as the connection interface between the PV array and the GT100 (see Figure 1-2 on page 1–4 to locate the DC Interface). This section houses the DC Disconnect Switch and DC contactor. Additionally, the PV Ground Fault Detection circuitry, DC surge arrestor, Solid State Relays, and 48Vdc Power Supply are also housed in this section.

DC Terminals

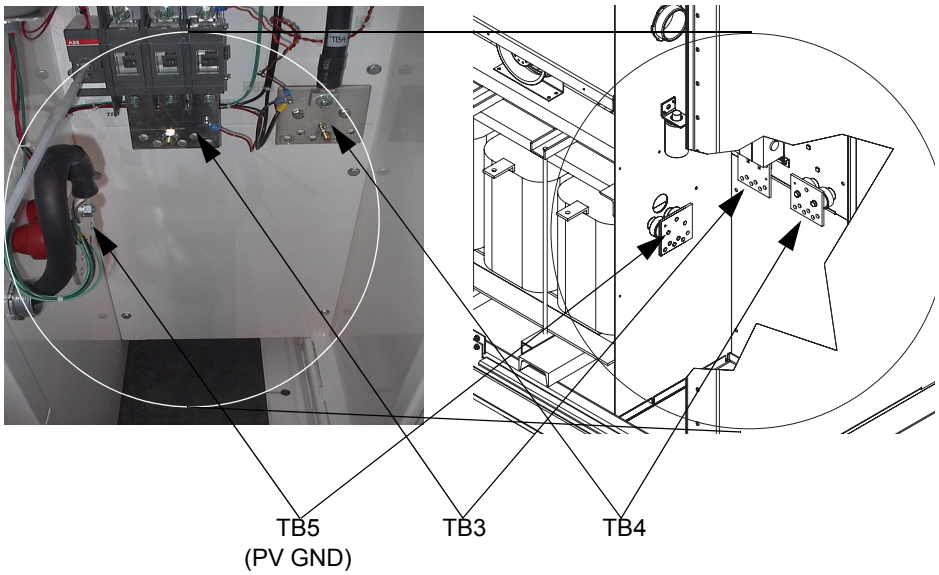


Figure 1-5 DC Terminals

The terminals provide space for six holes with space for twelve cables with a M10 bore diameter per pole (see Table A-6 on page A–5 for torque requirements).

The table below describes the DC terminal polarity for each GT100 model.

Table 1-1 DC Terminal Polarity

Model	TB3	TB4	TB5
GT100-208	PV+	PV–	PV GND
GT100-208-PG	PV–	PV+	PV GND
GT100-480	PV+	PV–	PV GND
GT100-480-PG	PV–	PV+	PV GND

Circuit Diagram

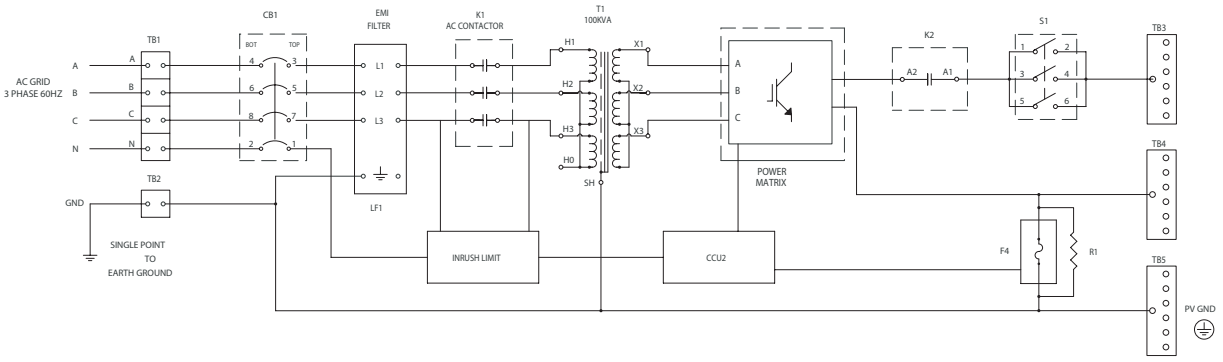


Figure 1-6 GT100 Circuit Diagram

Operator Interface Controls

Operator interface controls are located on the left front door of the main Inverter Enclosure. These controls include an ON/OFF Switch, 4-line VFD display and keypad called the Universal Frontpanel Control Unit (UFCU) used to manipulate and view system operation and status. The keypad is comprised of 20 touch-sensitive keys that provide a means to navigate through the menus and alter user-changeable settings. Additionally, there is an AC Disconnect switch handle and DC Disconnect switch handle on the AC Interface door (left) and the DC Interface door (right) respectively.

Figure 1-7 GT100 Operator Interface Components

On/Off Switch

The GT100 incorporates a maintained position ON/OFF switch located on the left front door, under the UFCU. Under normal operating conditions, the ON/OFF switch is in the ON position. Turning the switch to the OFF position will initiate an immediate controlled shutdown of the GT100 and open both the main AC and DC contactors within the unit. The main AC and DC contactors cannot be closed unless the switch is in the ON position. The GT100 is prevented from being restarted until the ON/OFF switch is turned back to the ON position.

WARNING: Shock Hazard

Turning the ON/OFF switch to the OFF position does NOT remove all hazardous voltages from inside the inverter. Before attempting to service the GT100, follow the de-energize Lockout and Tag procedure on page xi.

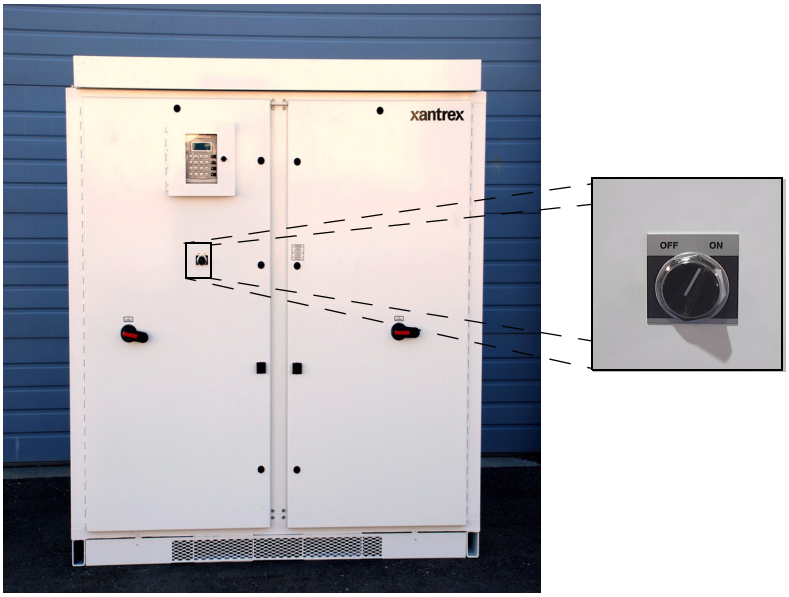


Figure 1-8 On/Off Switch

Emergency Stop (E-STOP)

Provisions are supplied for adding a remote emergency stop. Circuit termination and signal type are identified in Table A-7 on page A–5

Auxiliary Enable/Disable

The GT100 also has provisions for installing an auxiliary Enable/Disable switch in series with the local control. Circuit termination and signal type are identified in Table A-7 on page A–5

AC Disconnect and DC Disconnect Switch

Both enclosure doors of the GT100 are equipped with lockout hasps for personnel safety. The enclosure doors should not be opened while the GT100 is operating.

The switch handles and shafts provide a mechanical door interlock for both the AC and DC Interface sections. The doors cannot be opened when the switches are in the ON position.

Although the Main ON/OFF switch (S3) is recommended for an orderly shutdown, the DC Disconnect switch is equipped with an auxiliary contact block which enables the switch to be used as a load break DC disconnect. In the event the DC Disconnect switch is opened while the GT100 is processing power from the PV array, the early-break contact block will signal the CCU2 (Converter Control Unit) to stop processing power prior to opening the DC Disconnect switch.

Additionally, opening the DC Disconnect switch will cause the GT100 to execute an immediate orderly shutdown, open both the main AC and DC contactors, and report a PV disconnect fault on the VFD of the UFCU.

Both GT100 enclosure doors must be closed and locked during normal operation.

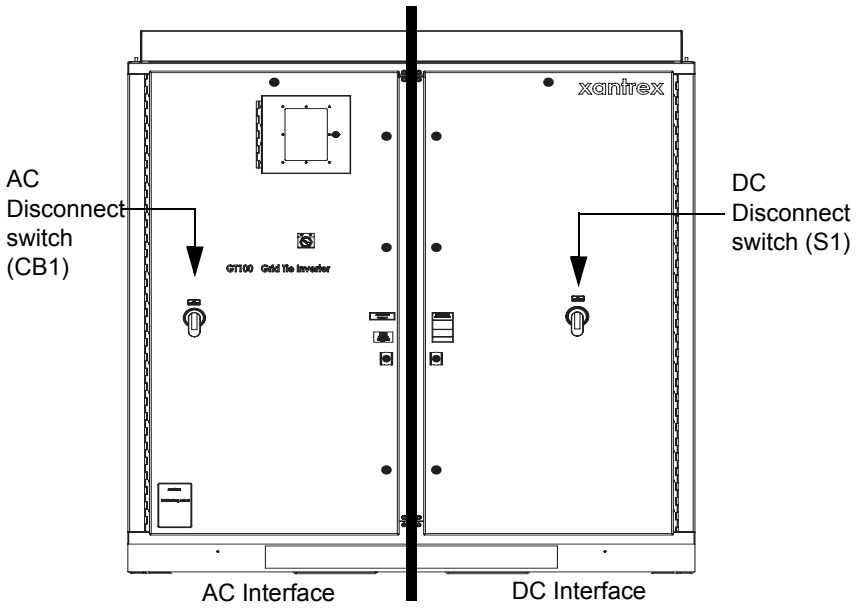


Figure 1-9 AC and DC Disconnect Switches

Communication Features and Methods

The GT100 provides three types of information to the user:

- system status and/or fault information,
- data logging information, and
- oscillography.

System status and fault information can be accessed using the Universal Front Panel Control Unit (UFCU), via an RS232 connection to a PC or via an RS485/Modbus connection to a remote monitoring system. Data logging and oscillography is available via the RS232 or the RS485/Modbus connection.

The GT100 communicates system status information to the user using the following methods.

- The Front Panel Control Unit (UFCU) Display
- PC Connection (Remote) - GT View Graphic User Interface (GUI) Software required (may require additional hardware)
- External Monitoring - (Optional) via an RS485/Modbus connection for remote plant monitoring.

System Status and Fault Reporting

Basic system status and all fault conditions rising from within the GT100 are reported to the UFCU. The 4-line VFD will display a hexadecimal value and a brief text description of the fault. Additionally, the CCU2 stores the time and details of all faults in non-volatile memory for later retrieval.

The fault value is also made available to the GT View Graphic User Interface (GUI) via the RS485/Modbus protocol and will include a more extensive description of the fault.

The UFCU keypad is located on the left door to manipulate and view system operation and status. The keypad is comprised of 20 membrane switch keys that provide a means to navigate through the menus and alter user-settable settings.

See the GT100 Grid-Tied Photovoltaic Inverter Operation and Maintenance Manual (Document Part #: 153378) for details.

Types of status information include:

- Current Operating State or Goal State
- Fault Code (if applicable)
- Inverter State
- Line Voltage and Current
- Inverter Matrix Temperature
- Inverter Power
- PV State
- PV Voltage and Current
- PV Power
- Grid Frequency
- Peak Power Tracker Enabled

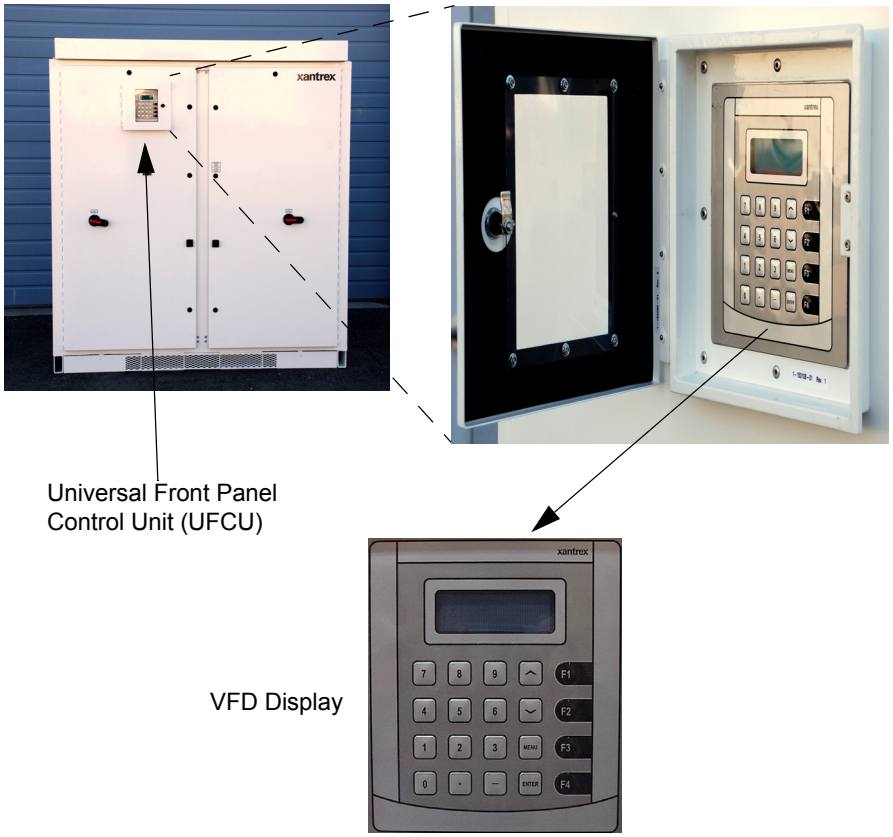


Figure 1-10 VFD Display and UFCU Location

Data Logging

The GT100 inverter stores data values and software metrics for debugging. The firmware maintains a data log located in the CCU2 non-volatile memory with a capacity of 25840 32-bit words. The GT100 records the 17 parameters listed below, and logs them into a circular buffer, such that the earliest records shall be overwritten once the capacity of the buffer is exceeded. The log capacity is 25840 / 20 = 1292 records (each record has 2 words for timestamp and 18 words for parameters). Data logging requires the use of a PC connection using the GT View Graphic User Interface (GUI) software or via the RS485/Modbus connection.

The following is the list of parameters which values shall be stored in the data logging records:

- Inverter Vab
- Inverter Vbc
- Inverter Vca
- I Phase A
- I Phase B
- I Phase C
- Grid Freq
- Real Power
- PV Voltage
- PV Current
- PV Power
- System State
- Fault Code
- Intake air Temp.
- Matrix Temp.
- Analog input
- Fan speed control

Oscillography

The GT100 includes a graphic data analysis tool known as Oscillography. The inverter firmware continuously records, in the CCU2 non-volatile memory, 500 samples of data at 1 millisecond intervals. Of these, 250 samples are taken right before a fault occurs and 250 samples are taken after the fault. Once a fault occurs and the 250 samples are logged, the log stops and goes into DONE status. The log will start recording again as soon as the fault is cleared. Oscillography requires the use of a PC connection using the GT View Graphic User Interface (GUI) software or via the RS485/Modbus connection.

The following is the list of parameters which instant values shall be stored in the oscillography records:

- Vab - Grid voltage phase A to phase B
- Vbc - Grid voltage phase B to phase C
- Vca - Grid voltage phase C to phase A
- Ia - Grid current phase A
- Ib - Grid current phase B
- Ic - Grid current phase C
- Grid Hz - Grid frequency
- DC_V - PV array voltage
- DC_I - PV array current
- Fault - hexadecimal code of the fault

Optional Equipment

The following options are available for purchase for use with the GT100 to enhance its capability. Contact a Xantrex distributor for further information on installation options.

Communication Modems

Xantrex offers modems that can be connected to the RS232 serial port for remote monitoring of the inverter. Please check with Xantrex on available modem types.

The remote user has the ability to control and monitor the status of the inverter through this connection.

PV Combiner Enclosure

The GT100 is available with an optional fused sub-array combiner. The combiner is integrated in the inverter enclosure and allows for multiple runs from the PV Arrays to the inverter directly into a fuse for circuit protection. Please check with Xantrex on available fuse sizes.

2 Planning

Chapter 2, “Planning” provides information to help plan the installation of the GT100 Grid-Tied Photovoltaic Inverter.

Overview of GT100 Installation

WARNING: Shock Hazard

Installations of this equipment should only be performed by qualified technicians. Installers must meet all local and state code requirements for licensing and training for the installation of Electrical Power Systems with AC and DC voltage to 600 volts.

Planning	Planning for a system requires complete understanding of all the components that are involved to successfully install the GT100 to meet the required national, state, and local codes.
Definition	A power system (such as the GT100) is a collection of devices designed to supply AC power to the utility grid from a DC solar energy (PV) source.
Components	All types of grid-tied inverter installations, residential or industrial, share common components. This chapter describes each component and suggests the minimum requirements for a safe installation.
Location	The GT100 Grid-Tied Photovoltaic Inverter meets certification for both indoor and outdoor installation. Anchor the GT100 to a level, concrete floor or pad.
Clearance	Adequate ventilation and service access must be taken into consideration when installing the GT100. See “Environmental Requirements” for specific clearance requirements and ambient temperature requirements.
Conduits and Conductors	All external conduits and conductors are to be supplied by the installer. See Figure 2-3, “Conduit Entries Above Ground, Multiple Views” on page 2–7 for recommendations on enclosure penetration locations and cable routing. All interconnect wiring and power conductors interfacing to the GT100 must be in accordance with the National Electric Code ANSI/NFPA 70, and any applicable local codes. Large gauge wire must conform to the minimum bend radius specified in the NEC, Article 373-6B, Ninth Edition. Take care to keep the wire bundles away from any sharp edges which may damage wire insulation over time. All conductors shall be made of copper, and rated for 90 °C (minimum). If the installation of the GT100 is to be outdoors, all interconnect conduit and fittings must be NEMA 3R rated as required by the NEC.

PV Planning

To determine the number of photovoltaic panels that are required for the PV power plant, please use the PV planning tool from the Xantrex website:

http://www.xantrex.com/support/gtsizing/index.asp

Environmental Requirements

The following environmental conditions must be established and maintained to ensure the safe and efficient operation and servicing of the GT100. Adequate space must be provided around the unit for ventilation and access during servicing. If locating the unit indoors, ambient air temperature cannot exceed the maximum temperature for which the unit is rated. See Table A-1, “Environmental Specifications” on page A–2.

- Maintain a minimum clearance of 800 mm (31.5 in) in front and 305 mm (12 in) above of the GT100 Enclosure, plus local safety requirements for maintenance and serviceability. The GT100 has a zero (0 mm) clearance requirement at the rear and sides of the enclosure. Figure 2-3, “Conduit Entries Above Ground, Multiple Views” on page 2–7.
- External cabling interfacing with the GT100 may enter from either the bottom, lower sides, or lower rear of the enclosure. The GT100 may be placed over a foundation hole which holds the cables, or placed on top of a hollow platform which allows access to the bottom of the GT100.
- If the GT100 is to be installed indoors and external air is used for ventilation, the required liter per minute (L/M) rate must be no less than 37,500 L/M (1150 CFM). This assumes the temperature inside the building is allowed to rise 10 °C (18 °F) above the outside temperature. Therefore, the maximum allowable outside ambient temperature is 50 °C (50 °C minus 10 °C equals 40 °C Maximum Ambient Temperature) or 122 °F (122 °F minus 18 °F equals 104 °F Maximum Ambient Temperature). Additionally for indoor installations, the GT100 enclosure has provisions for an exhaust air duct to be attached, by means of a 355 x 200 mm (14 x 8 in) opening at the top of the enclosure. The GT100 enclosure rain hood must be removed in order to access the exhaust openings.
  If air conditioning is planned the heat load of the GT100 is 13,600 BTU/Hour at full load.

Ground Requirements

This product is intended to be installed as part of a permanently grounded electrical system per the National Electrical Code ANSI/NFPA 70, as well as all state and local code requirements. A copper clad earth grounding electrode must be installed within 1 m (3 ft.) of the GT100 Enclosure. This is to be the single point earth ground for the inverter system. The single point connection to the earth grounding electrode for the inverter system is to be made at the AC ground bus bar (TB2).

System Neutral Requirements

The GT100 is designed to be installed as a four-wire system. As required by the UL 1741 listing, a neutral conductor from the utility-interconnect must be terminated at TB1-N within the AC Interface to ensure that the AC voltage sensing circuit can perform an individual phase voltage (line-to-neutral) measurement. The function of the neutral connection is to provide a point of reference for measurement purposes that is essentially at ground potential. No power will flow through the neutral conductor.

Inverter Isolation Transformer

The GT100 includes a custom, high-efficiency, isolation transformer. The utility side windings of the isolation transformer are configured Wye and must match the voltage at the utility inter-tie. The GT100 is a balanced, three-phase, current-sourcing inverter and only operates with the presence of a stable utility voltage. The transformer is supplied with a neutral connection on both the Primary and Secondary windings. Connection of these neutral terminals will affect the operation of the GT100 and must be left floating or disconnected. Single-phase, grounded loads which may be present between the transformer and utility, will maintain their existing ground reference at the utility distribution transformer.

CAUTION: Equipment Damage

If the Isolation Transformer neutral (H0 and X0) terminals are tied to ground, they may cause irreparable damage to the GT100. Check local regulations for their requirements regarding the connection of these neutrals.

Electrical Diagrams

Since installations vary widely, a sample electrical diagram of the GT100 is provided in Figure 2-1. This diagram is to be used for system planning purposes only.

For more detailed information, refer to the schematic illustrations in the Operation and Maintenance Manual.

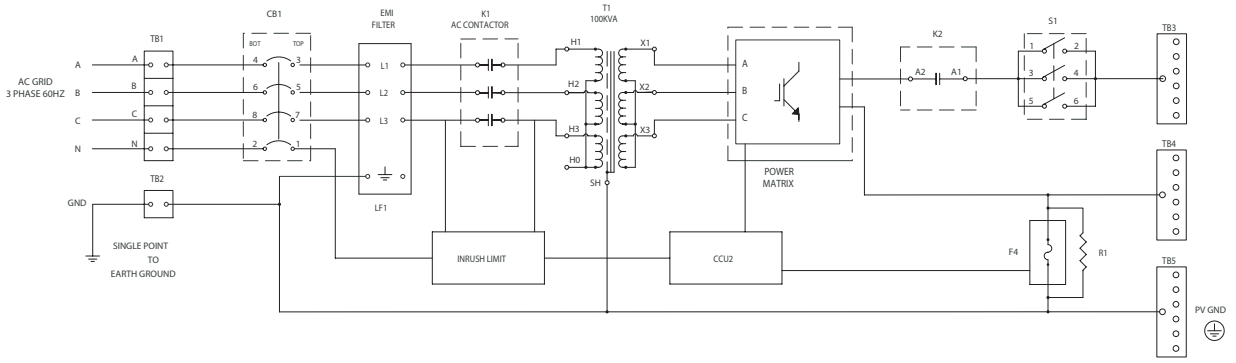


Figure 2-1 GT100 Electrical Diagram

Conduit Entry

For a typical GT100 installation, the recommended cable entry is from beneath the enclosure. Figure 2-2 below shows the maximum allowable areas (shaded) and locations in which electrical conduits should be located when cable entry is from beneath the enclosure.When routing cable and conduit, some installations may make it necessary to penetrate the enclosure from above ground. Figure 2-3 on page 2–7 shows the maximum allowable areas (shaded) and locations in which electrical conduits may penetrate the Enclosure of the GT100.

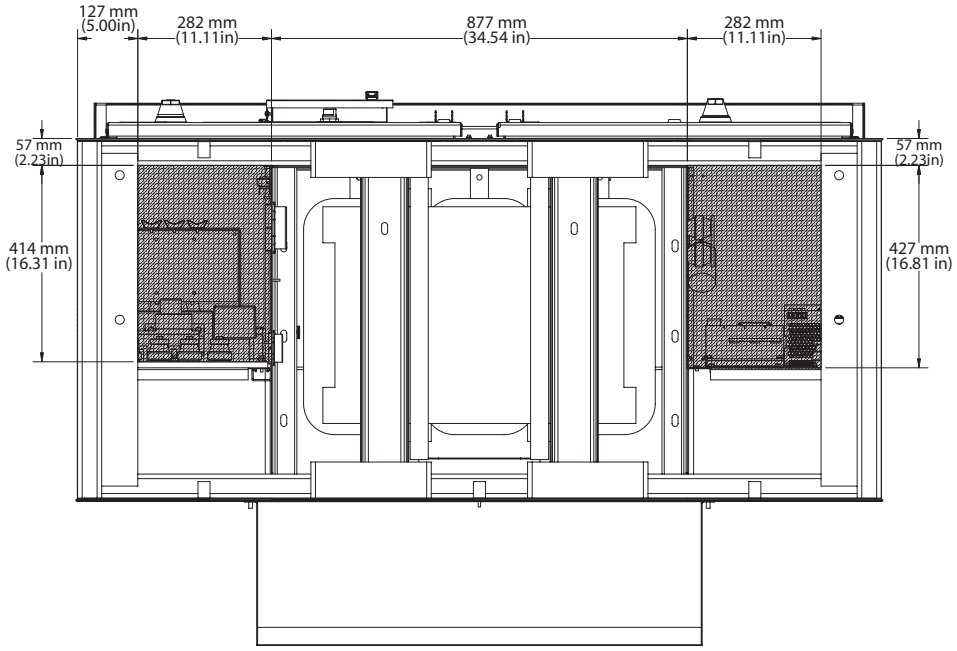


Figure 2-2 Conduit Entries Beneath Enclosure, Bottom View

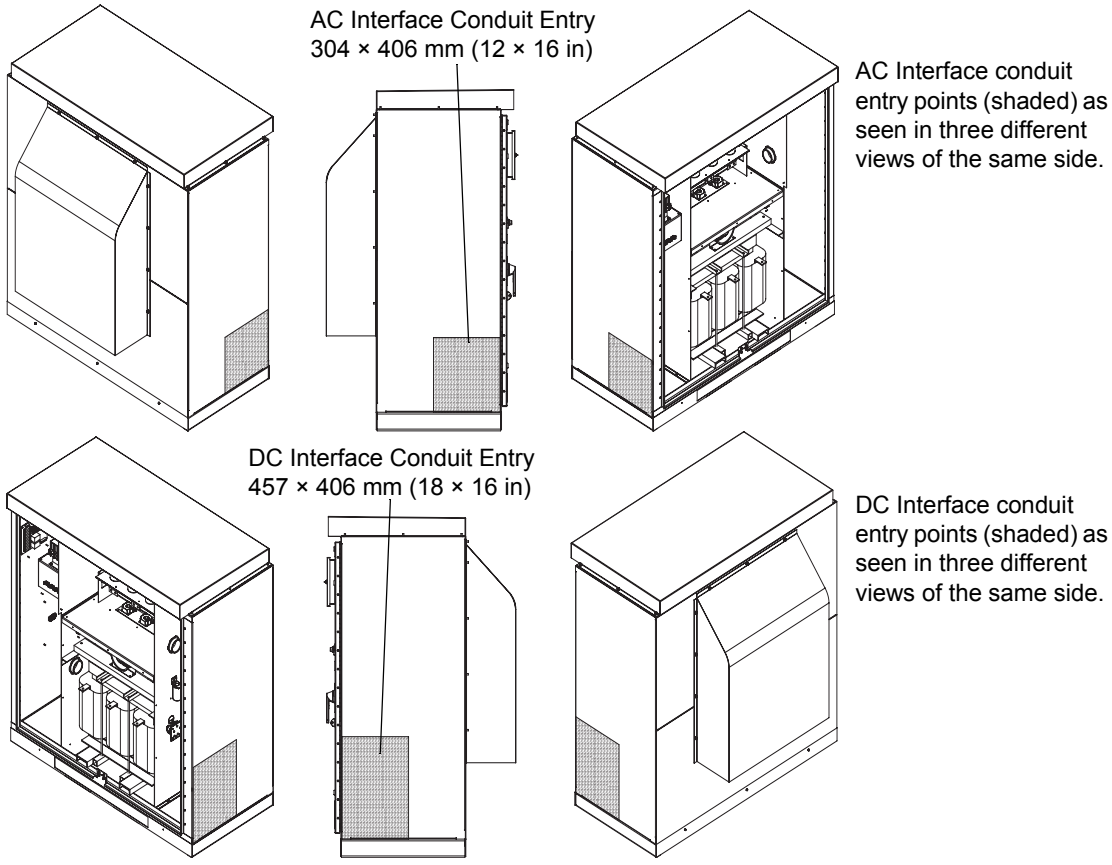


Figure 2-3 Conduit Entries Above Ground, Multiple Views

Anchoring the GT100

The GT100 must be anchored to a level concrete floor or pad. The concrete floor or pad, upon which the GT100 is anchored, must be structurally designed to meet any local, state, or national requirements for weight, seismic, and wind sheer if applicable.

Four 19 mm (0.75 in) holes are provided in the feet of the Enclosure for anchoring to the floor or pad. The floor or pad may be pre-drilled to accept masonry anchors or have pre-installed anchoring bolts. Alternatively, the GT100 can be installed or placed into position, and drilled afterwards for anchoring the enclosure.

Figure 2-4 below depicts the layout pattern of the anchoring holes for the GT100 inverter assembly.

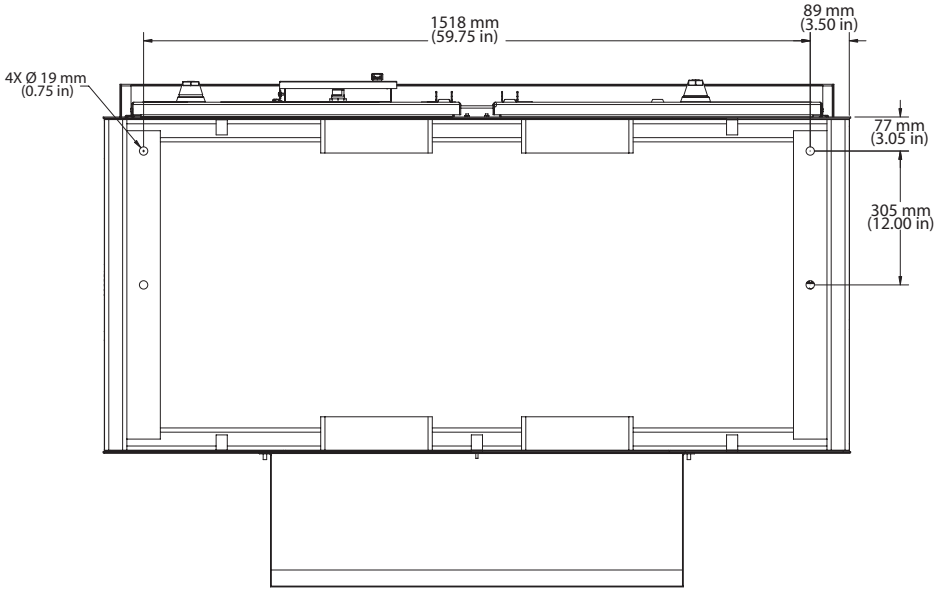


Figure 2-4 Main Inverter Anchor Bolt Pattern, Bottom View

3 Installation

Chapter 3, “Installation” describes the procedures needed to install the GT100 Grid-Tied Photovoltaic Inverter. This section includes unpacking and moving instructions, mounting instructions, and cabling instructions.

Unloading

WARNING: Heavy Equipment

The GT100 weighs approximately 1361 kg (3000 lb). Attempting to lift the equipment by other than the recommended lifting points may damage the equipment or present a personnel safety hazard and void the warranty. Keep all the doors closed and latched when moving the enclosures. Leaving the door latches unsecured may result in damage to the unit and void the warranty.

Moving the GT100

To move the GT100, use a forklift that has a sufficient lift capacity and has a 66 cm fork span or a crane with a minimum lift capacity of 2000 kg.

WARNING: Equipment is heavy

If lifted incorrectly, the GT100 could overbalance and cause personal injury.

CAUTION: Equipment Damage

To move the GT100, use a forklift that has a sufficient lift capacity and has a 66 cm fork span.

To move the GT100 by forklift:

1. Place the forks of the forklift below the shipping pallet at the points specified.
2. Pay attention to the balance point (center of gravity) of the GT100.
3. Lift the Enclosure from beneath the shipping pallet.

Unpacking the GT100

To unpack the GT100:

1. Remove the plastic wrapping material surrounding the GT100.
2. Remove and save the front and rear enclosure skirts.
3. Remove the GT100 anchor hardware that attaches to the shipping pallet.

Removing the Pallet and Moving the GT100

CAUTION: Equipment Damage

To move the GT100, use a forklift that has a sufficient lift capacity and a 66 cm fork span.

Use Figure 3-1 to locate the balance point or center of gravity (⌖ symbol).

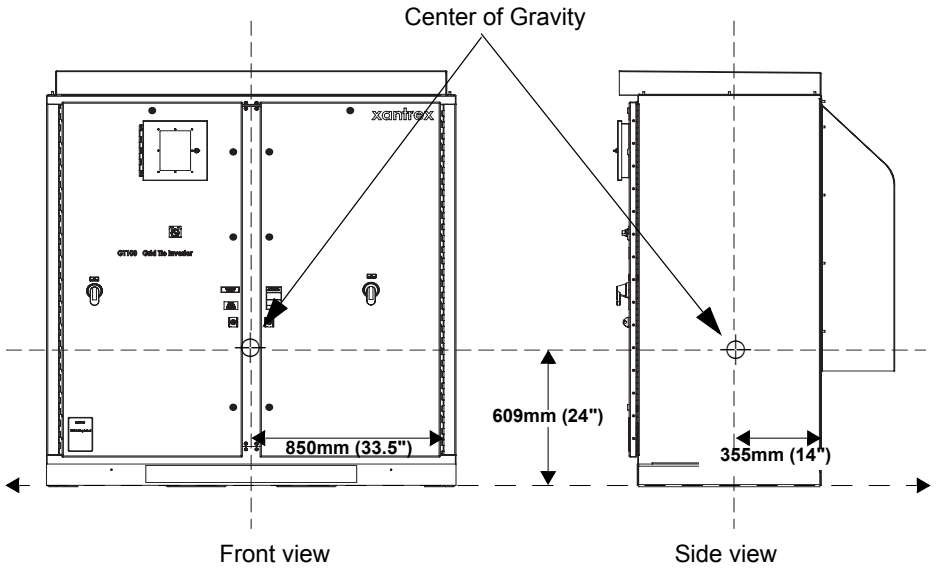


Figure 3-1 Center of Gravity

Moving with a Forklift

To move the GT100 using a forklift:

1. Place the forks of the forklift below the unit at the points specified in Figure 3-2 on page 3–4.
2. Lift the GT100 from beneath.
   Be sure to use a forklift with a 66 cm fork span.
3. Remove the shipping pallet from beneath the unit.
4. Once the shipping pallet is removed from the unit, use the same lifting locations to lift the unit into the place where it may be permanently located.

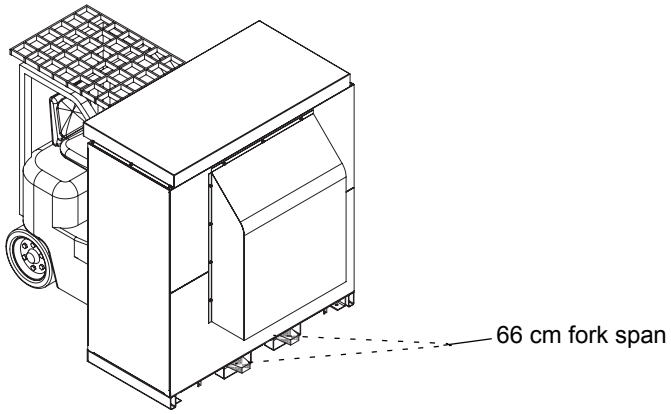


Figure 3-2 Forklift Lifting Locations - Underneath Unit

Moving with a Sling

To move the GT100 using a sling:

1. Place the lifting slings through the box tubing on the enclosure base at the points specified in Figure 3-3 on page 3–4.
2. Lift the GT100 from above.
3. Remove the shipping pallet from beneath the unit.
4. Once the shipping pallet is removed from the unit, use the same lifting locations to lift the unit into the place where it may be permanently located.

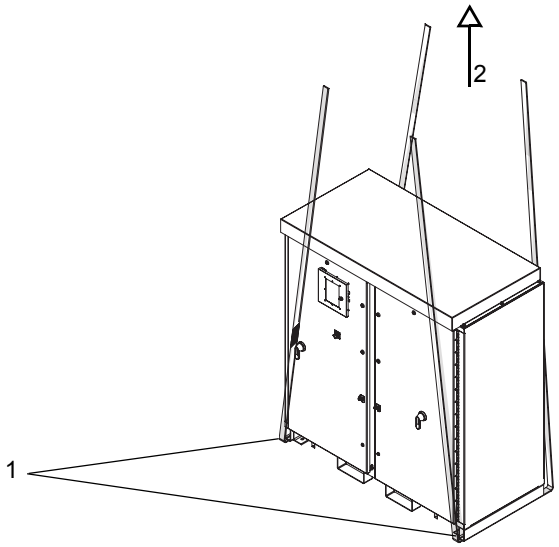


Figure 3-3 Moving with a Sling

Removing the Air Intake Duct

The Air Intake Duct may be removed from the rear of the GT100 enclosure if it is necessary to move the inverter through a standard 36-inch door opening and into location.

To remove the GT100 Air Intake Duct:

1. Remove and save the 8 mm nuts (11 total) that attach the Air Intake Duct to the rear of the GT100 enclosure.
2. Carefully remove the Air Intake Duct.
3. Once the GT100 is moved and installed, replace the Air Intake Duct, and tighten the 8 mm nuts (11 total).

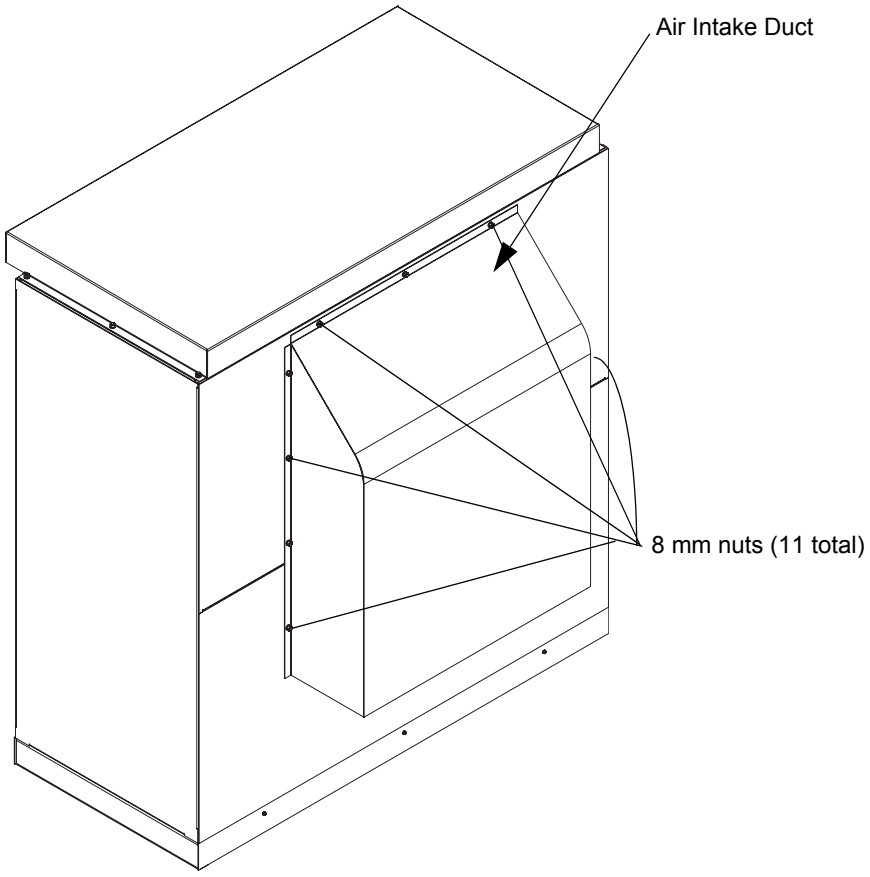


Figure 3-4 Removing the Air Intake Duct

Important: Before proceeding with the installation, determine the location and layout of the components, conduit penetration locations, conductor and conduit sizing, and method for anchoring the unit. Ensure adequate space is provided for clearance for ventilation and serviceability. Review Chapter 2, “Planning” if necessary before proceeding.

Removing the Rainhood

For indoor installations, the GT100 enclosure has provisions for an exhaust air duct to be attached, by means of a 355 × 200 mm (14 × 8 in) opening at the top of the enclosure. The GT100 enclosure rainhood must be removed in order to access the exhaust opening.

To remove the GT100 Rainhood:

1. Remove the 8 mm nuts (8 total) that attach the rainhood to the top of the GT100 enclosure.
2. Carefully remove the rainhood.

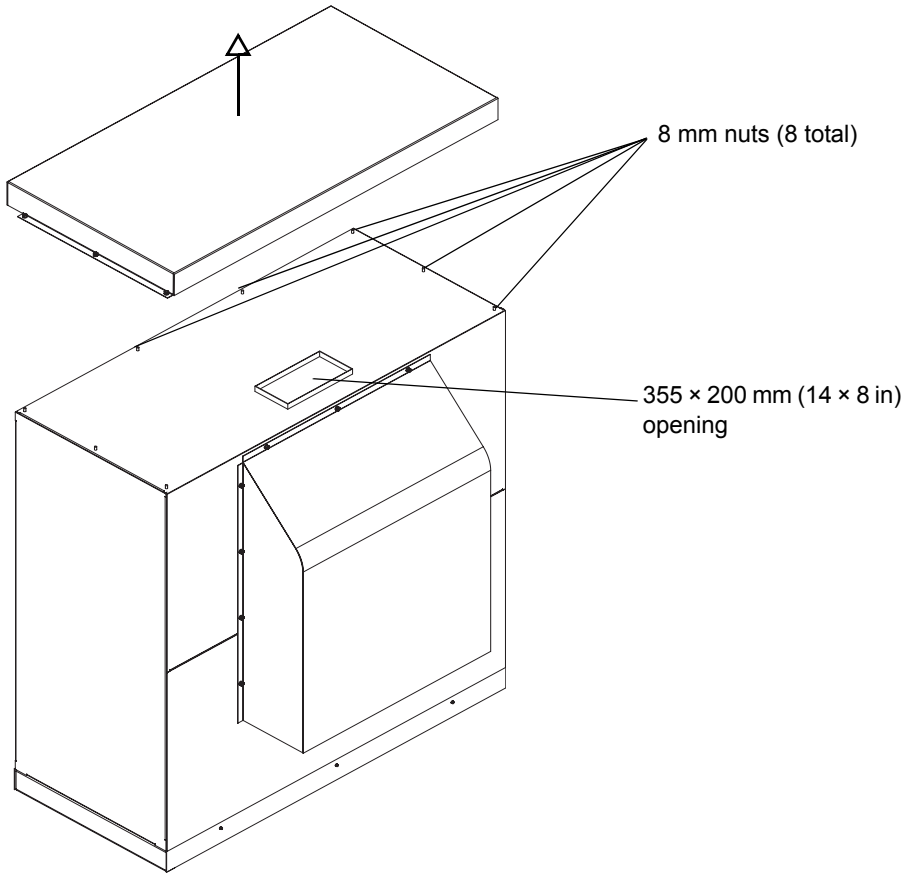


Figure 3-5 Removing the Rainhood

Mounting and Anchoring the Units

To mount and anchor the GT100:

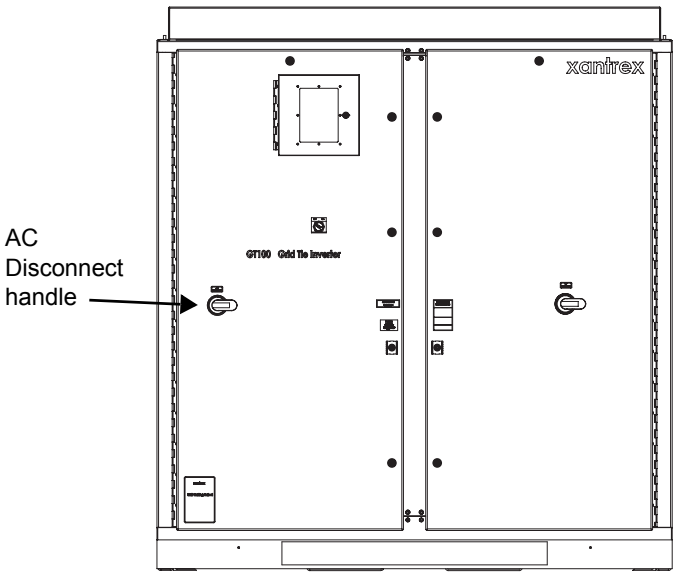
1. Predrill the floor or pad to accept masonry anchors, or ensure it has pre-installed anchoring bolts that will fit the 19 mm (0.75 in) mounting holes.

   Note: Alternatively, the GT100 can be installed or placed into position, and drilled afterwards for anchoring the enclosure. See Figure 2-4 on page 2–8.

2. Lift the GT100 from beneath with a forklift or above with a sling as shown in Figure 3-2 on page 3–4 and Figure 3-3 on page 3–4. Move the Enclosure into place.
3. Secure the Enclosure base to the floor with the appropriate anchoring hardware.
4. Install the skirts to the base of the GT100 using the M5 hardware provided.

   Note: The solid skirt is to be replaced at the rear of the GT100 enclosure base, and the perforated skirt is to be replaced at the front of the GT100 enclosure base.

Opening or Closing Access Doors



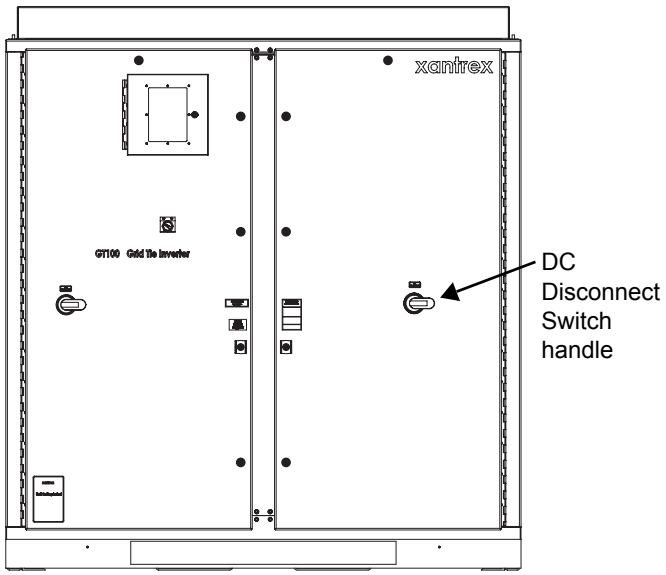
To Open Access Door:

1. Confirm that the AC Disconnect handle is placed in the OFF (Open) position prior to opening the door.
2. Using the key supplied with the unit, turn counterclockwise to unlock.
3. Pull open from right side.

To Close Access Door:

1. Confirm that the AC Disconnect handle is placed in the OFF (Open) position prior to closing the door.
2. Close the door.
3. Using the key supplied with the unit, turn clockwise to lock.

Figure 3-6 AC Interface Access Door



To Open Access Door:

1. Confirm that the DC Disconnect Switch handle is placed in the OFF (Open) position prior to opening the door.
2. Using the key supplied with the unit, turn counterclockwise to unlock.
3. Pull open from the left side.

To Close Access Door:

1. Confirm that the DC Disconnect Switch handle is placed in the OFF (Open) position prior to closing the door.
2. Close the door.
3. Using the key supplied with the unit, turn clockwise to lock.

Figure 3-7 DC Interface Access Door

Wiring - General

All wiring methods and materials shall be in accordance with the National Electrical Code ANSI/NFPA 70, as well as all state and local code requirements.. When sizing conductors and conduits interfacing to the GT100, both shall be in accordance with the National Electrical Code ANSI/NFPA 70, as well as all state and local code requirements..

WARNING: Shock Hazard

The GT100 Enclosure contains exposed high-voltage conductors. The Enclosure doors should remain closed with the latches tightened, except during installation, maintenance or testing. These servicing instructions are for use by qualified personnel who meet all local and state code requirements for licensing and training for the installation of Electrical Power Systems with AC and DC voltage to 600 volts. To reduce the risk of electric shock, do not perform any servicing other than that specified in the installation instructions unless you are qualified to do so. Do not open the cabinet doors if extreme moisture is present.

WARNING: Lethal Voltage

In order to remove all sources of voltage from the GT100, the incoming power must be de-energized at the source. This may be done at the main utility circuit breaker and by opening the AC Disconnect and the DC Disconnect Switches on the GT100. Review the system configuration to determine all of the possible sources of energy. In addition, allow 5 minutes for the DC bus capacitors, located within the cabinet, to discharge after removing power.

CAUTION: AC Phase Convention

When connecting external AC wires to the GT100, positive phasing sequence should be maintained throughout the installation process. Refer to the system schematics in the unit enclosure for proper phasing convention. The GT100 includes the ability to auto-sense and correct for a mis-phased connection at the AC Interface terminals. In the event the power conductors from the utility are not phased correctly at the AC Interface terminals, the GT100 will sense the discrepancy and automatically correct for a clockwise (A-B-C) phase rotation.

Important: Take care to keep the wire bundles away from any sharp edges which may damage wire insulation over time. Consult the NEC ANSI/NFPA 70 Code Book to ensure code compliance.

The model GT100 has a three-phase, four-wire output.

Conductor size should have been pre-determined when the conduit was installed. Prepare the appropriate length conductors for each connection.

Overcurrent Protection

Unless provided as part of the Xantrex supplied equipment; the AC overcurrent protection for the Utility Interconnect (Grid-tie) must be provided by the installer as part of the GT100 installation.

CAUTION: Equipment Damage

In accordance with the NEC, ANSI/NFPA 70 (Ninth Edition) the following branch-circuit overcurrent protection must be provided:

- GT100-208 and GT100-208-PG — 400A maximum
- GT100-480 and GT100-480-PG — 200A maximum

Conductor Termination

The GT100 has terminals and bus bars for making all wiring connections required for the installation. All terminals used for making AC and DC connections require the use of copper conductors with an insulation rating of 90 °C (194 °F) (or higher). For bolt size, and torque values for the AC terminals, see Table A-5 on page A–5. For bolt size, and torque values for the DC terminals, see Table A-6 on page A–5. All wiring methods and materials shall be in accordance with the National Electrical Code ANSI/NFPA 70, as well as all state and local code requirements..

AC Interface

The AC line terminals in the AC Interface (TB1-A, TB1-B, TB1-C, and TB1-N) have one bolt per bus and a maximum of two cables per bolt. These terminals require the use of crimp-on type ring-terminals or compression lugs.
See Figure 3-9 on page 3–13 for the location of these terminals.

The system/chassis ground terminal in the AC Interface (TB2-Ground) is six bolts per pole and a maximum of two cables per bolt. These terminals require the use of crimp-on type ring terminals or compression-type lugs.
See Figure 3-9 on page 3–13 for the location of this terminal.

The Auxiliary Control Interface terminals are one wire per terminal (TB7-1, TB7-2, TB7-3, and TB7-4). These terminals require the use of crimp-on type ring-terminals or compression lugs.

See Figure 3-10 on page 3–13 for the location of these terminals.

DC Interface

The DC terminals in the DC Interface [TB3, TB4, and TB5 (PV GND)] have six bolts per pole and a maximum of two cables per bolt. These terminals require the use of crimp-on type ring-terminals or compression lugs.
See Figure 3-11 on page 3–14 for the location of these terminals.

Important: Keep these cables together as much as possible, and ensure that all cables pass through the same knockout and conduit fittings, thus allowing any inductive currents to cancel.

Grounding

System Grounding

Install a copper clad grounding electrode within 1 m (3 ft) of the GT100 Enclosures per the National Electric Code ANSI/NFPA 70. The AC ground bus bar within the AC Interface must be used as the single point of connection to the earth grounding electrode for the inverter system.

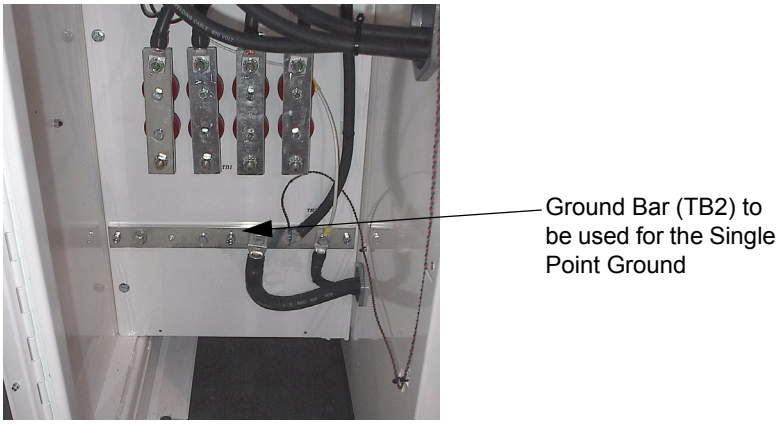


Figure 3-8 Single-point Ground; Ground Bar

Chassis Ground

The chassis ground is a copper bus bar in the AC Interface and has six bolts for terminating the ground. The ground conductor size depends on the size of the main circuit breaker. NEC Table 250.122 (Ninth Edition) requires that the ground conductor be at least #3 AWG for a 400 A circuit breaker (GT100-208 and GT100-208-PG) and at least #6 AWG for a 200 A circuit breaker (GT100-480 and GT100-480-PG).

The equipment ground on the GT100 is marked with 

System Neutral

The GT100 is designed to be installed as a four-wire system. As required by the UL 1741 listing, a neutral conductor from the utility-interconnect must be terminated at TB1-N within the AC Interface to ensure that the AC voltage sensing circuit can perform an individual phase voltage (line-to-neutral) measurement. The function of the neutral connection is to provide a point of reference for measurement purposes that is essentially at ground potential. No power will flow through the neutral conductor.

Wiring - Specific

This section provides information for connecting the AC and DC conductors and the ground conductors. Table A-5 and Table A-6 on page A–5 show the specifications of the AC and DC wiring.

To connect the AC utility to AC Interface:

1. Open the door to the AC Interface.
2. Connect the AC power conductors at the TB1-A (A phase), TB1-B (B phase), and TB1-C (C phase) terminals using the M10 hardware. Cables to these terminals must use a crimp-on type ring terminal or compression-type lug. See Figure 3-9 for the location of these terminals.
3. Terminations for the neutral (TB1-N) and ground (TB2) conductors within the AC Interface at the groundbar are made with 10 mm hardware. Cables to these terminals must use a crimp-on type ring terminal or compression-type lug. See Figure 3-8 on page 3–11 and Figure 3-9 on page 3–13 for the location of these terminals.
4. Close the door to the AC Interface.

To connect the Auxiliary Control Interface within the AC Interface:

1. Open the door to the AC Interface and remove the factory-installed jumpers.
2. Route the Auxiliary Control Interface conductors through the conduit from the source to the AC Interface.
3. Connect the ACAuxiliary Control Interface conductors at the TB7 terminal block. These conductors must use crimp-on type ring terminals or compression-type lugs. See Figure 3-10 for the location of these terminals.
4. Close the door to the AC Interface.

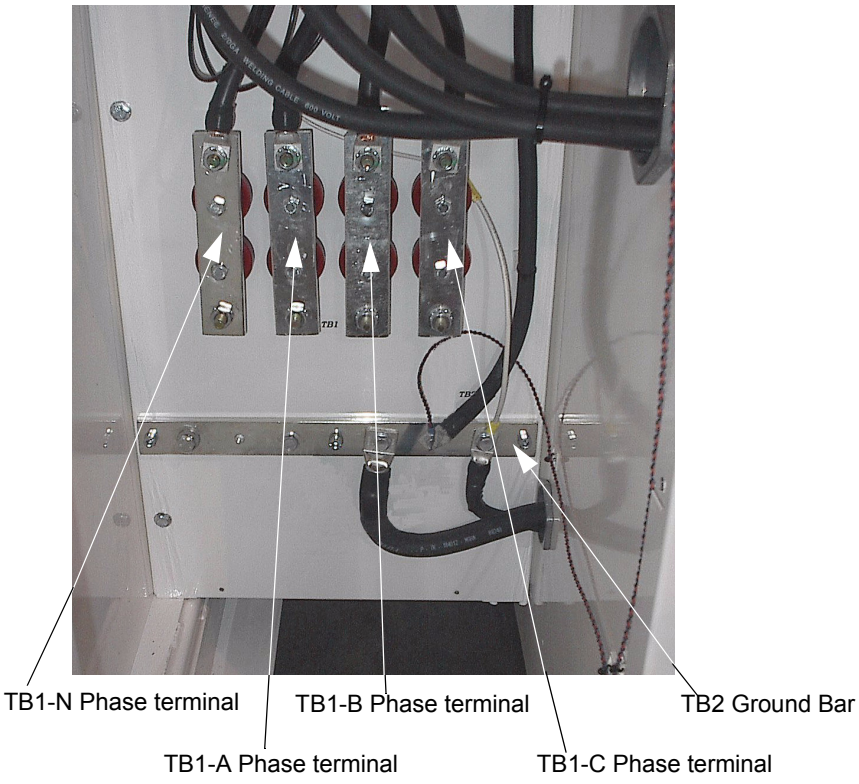


Figure 3-9 AC Terminal Connections from the Utility

Figure 3-10 Auxiliary Control Interface Terminal Connections

PV Array Connections

To make the connections from the PV Array/combiner to DC Interface:

1. Open the door to the DC Interface.
2. Route the PV Array cables conductors POSitive (PV+) and NEGative (PV-) through the conduit to the DC Interface, entering on the underside.
3. The DC power conductor terminations are made at the TB3, TB4, and TB5 (PV GND). See Figure 3-11 for the location of the terminals and Table 3-1 for DC Terminal polarity for each GT100 model.
4. Terminations for the POSitive, NEGative, Ground conductors within the DC Interface are made using the 10 mm hardware.
5. Close the door to the DC Interface.

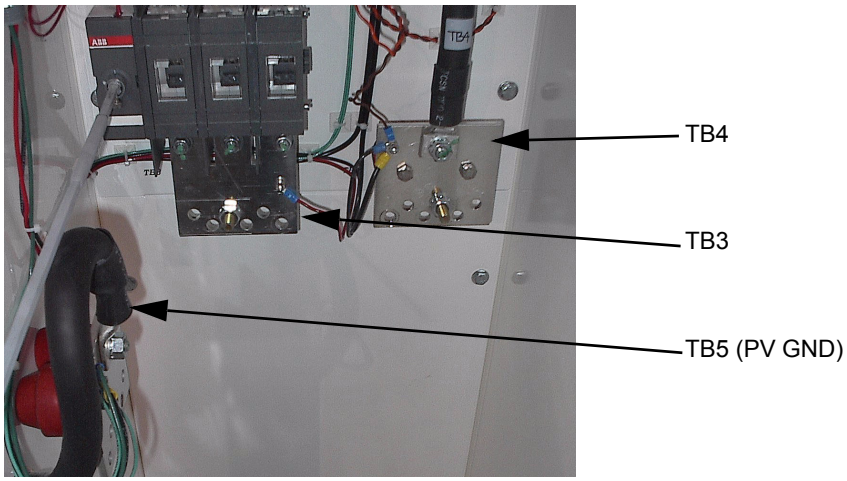


Figure 3-11 PV Array Cable Routing and Terminations

Table 3-1 DC Terminal Polarity

Model	TB3	TB4	TB5
GT100-208	PV+	PV–	PV GND
GT100-208-PG	PV–	PV+	PV GND
GT100-480	PV+	PV–	PV GND
GT100-480-PG	PV–	PV+	PV GND

Remote Communications

The GT100 has the ability to provide remote communications via optional modems for system monitoring or data logging through a personal computer using the Xantrex GT View Graphic User Interface (GUI) software. The GUI software provides a windows-based interface program that accesses, monitors, and controls the features and functions of the unit. The GUI also provides additional data logging and tracking features which are not available through the UFCU. If multiple inverters are networked together, the software is capable of tracking up to 50 inverters on the same network.

The PC can be connected to the unit remotely. Before installing the GUI software, it will be necessary to determine and establish the proper communication from a service provider.

PC Connection Methods

The personal computer can be connected by remote connection - through the optional modem communication kit to be installed in the AC Interface.

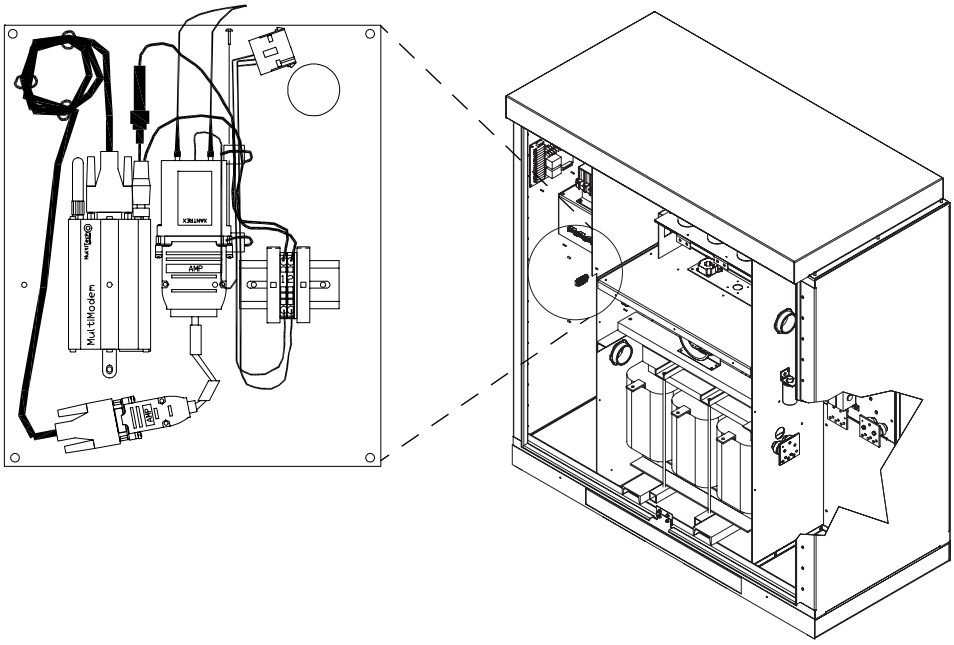


Figure 3-12 Modem Kit as Installed in the AC Interface

Modbus

A user selectable RS485/Modbus connection is also available for remote plant monitoring. The CCU2 Controller board within the GT100 may be configured for RS485 serial communication using the Modbus protocol.

4 Verification

Chapter 4, “Verification” provides a checklist to ensure the installation of the GT100 Grid-Tied Photovoltaic Inverter is correct and complete.

Verification Procedure Summary

WARNING: Electrocution Hazard

This chapter describes specific steps to ensure the installation of the GT100 Grid-Tied Photovoltaic Inverter is correct and complete. Failure to adhere to these warnings could result in severe shock or possible death. Exercise extreme caution at all times to prevent accidents. These installation instructions are for use by those familiar and skilled with high voltage procedures.

WARNING: Shock Hazard

The GT100 Enclosure contains exposed high-voltage conductors. The Enclosure doors should remain closed with the latches tightened, except during installation, maintenance or testing. To reduce the risk of electric shock, do not perform any servicing other than that specified in the installation instructions unless you are qualified to do so.

WARNING: Lethal Voltage

In order to remove all sources of voltage from the GT100, the incoming power must be de-energized at the source. This may be done at the utility main circuit breaker and by opening the AC Disconnect and the DC Disconnect switches on the GT100. Review the system configuration to determine all of the possible sources of energy. In addition, allow five minutes for the DC bus capacitors, located within the cabinet, to discharge after removing power.

The following procedures are intended to verify correct installation and proper wiring of the GT100. Prior to performing the following verification steps on the GT100, review all safety requirements and procedures outlined in this manual and on any cautionary markings on the components within the system.

Inspect the following items prior to completion of the installation:

1. Visually inspect all the mechanical connections. This would include both electrical conduit fittings, as well as Enclosure anchoring and seismic bracing if required.
2. Visually inspect the electrical connections and verify proper tightness of all terminations.
3. Visually inspect the Isolation Transformer Wye/Wye connections and ensure the transformer neutral connection is left disconnected.
4. Perform corrective actions if required.

Visual Inspection of Mechanical Connections

To perform a visual inspection of the GT100 mechanical connections:

1. Ensure that the AC and DC Disconnect Switches, as well as any utility interconnect circuit breakers or main disconnect switches, are opened. ❒
2. Ensure all anchor bolts and any required seismic bracing is properly tightened and in place. ❒
3. Remove the latches and open the doors of the AC and DC Interface and inspect. ❒
4. Verify all wire conduit fittings and connections are properly tightened. ❒

Visual Inspection of Electrical Connections

To perform a visual inspection of the GT100 electrical connections:

1. Ensure that the AC Disconnect and DC disconnect switches, as well as any utility interconnect circuit breakers or main disconnect switches, are opened. ❒
2. Ensure all conductors and wiring connections interfacing with the GT100 are tightened to the correct torque value.
   For specific torque values, see Table A-5 on page A–5 and Table A-6 on page A–5. ❒
3. Verify the AC power conductors terminated at TB1-A, TB1-B, TB1-C, and TB1-N within the AC Interface are terminated correctly and properly sequenced. ❒
4. Verify DC power conductors terminated at TB3, TB4, and TB5 within the DC Interface are terminated correctly and properly polarized. ❒

Corrective Action

Perform after initial inspection (if required):

1. Correct any necessary repairs pertaining to the previous inspection steps.
2. Replace the latches and close the doors of the Inverter Enclosure.
3. Ensure that the AC Disconnect and DC Disconnect Switches, as well as any utility interconnect circuit breaker or main disconnect circuit breaker, are left open.

A Specifications

Appendix A provides the environmental and electrical specifications for the GT100 Grid-Tied Photovoltaic Inverter.

System Specifications

The GT100 has been designed for photovoltaic power systems, which operate within the following specifications.

CAUTION: Equipment Damage

Operation of the GT100 in a manner other than specified in this manual may cause damage to the GT100 and other system components and will void the terms of the warranty.

Environmental Specifications

Table A-1 Environmental Specifications

Specification	Value
Dimensions	1861.8 mm H x 1702.0 mm W x 1171.0 mm D (73.3 in. H x 67.0 in. W x 46.1 in. D)
Weight	1361 kg (3000 lbs)
Allowable Ambient Temperature Operating Storage	 -15 °C to 50 °C Maximum (5 °F to 122 °F) -40 °C to 50 °C Maximum (-40 °F to 122 °F)
Relative Humidity	to 95%, non-condensing
Elevation	2000 m (6600 ft)
Protection Class	NEMA 3R
Clearance (ventilation and serviceability) Top Front Sides Rear	 305 mm (12 in) 800 mm (31.5 in) (door clearance) plus local safety standards 0 mm (0 in) 0 mm (0 in)

Electrical Specifications

Table A-2 provides the AC and DC specifications for the GT100.

Table A-2 Electrical Specifications

Specification	GT100-480 and GT100-480-PG	GT100-208 and GT100-208-PG
Nominal AC Input Voltage (+10% to -12% acceptable range)	480 Vac (423 to 528 Vac)	208 Vac (184 to 228 Vac)
Maximum AC Output Current	137 A_{rms}	315 A_{rms}
Nominal AC Input Frequency (+0.5 to -0.7 Hz acceptable range)	60 Hz (57.0 to 60.5 Hz)	60 Hz (57.0 to 60.5 Hz)
Line Power Factor	>0.99	>0.99
Output Power	100 kW	100 kW
Sell Power Range	1 kW to 100 kW	1 kW to 100 kW
Peak Power Tracking Window	300 to 480 Vdc	300 to 480 Vdc
Maximum Open Circuit Voltage	600 Vdc	600 Vdc
Nominal DC Voltage	345 Vdc	345 Vdc
Maximum DC Current	347 A	347 A
DC Current Ripple	< 2% at rated power	< 2% at rated power
Maximum Array Short Circuit Current	460 A	460 A
DC Back-feed Current	0 A	0 A
AC Current Distortion	< 5% THD at rated power	< 5% THD at rated power
Efficiency	> 96.0%	> 95.0%
Standby and Night-time Tare Loss	< 100 W	< 100 W

Regulatory Specifications

Table A-3 provides the regulatory specifications for the GT100.

Table A-3 Regulatory Specifications

Standard	Regulation Met
General Standards	UL 1741 Rev 2005 UL 508C IEEE 1547 CSA 107.1-01
Emitted Interference	IEEE Std C37.90.2-1995 FCC Class A

Over Voltage, Under Voltage and Frequency Ranges

Table A-4 provides the over voltage, under voltage, over-frequency, and under-frequency detection limits for the GT100. These detection limits have been factory tested and deemed to be in compliance with UL 1741 Rev 2005 and IEEE 1547 requirements for utility interaction.

Table A-4 Over/Under Voltage and Over/Under Frequency Ranges

Vac Condition (% of Nominal)	GT100-480 and GT100-480-PG Voltage Range	GT100-208 and GT100-208-PG Voltage Range	Trip Time
Vac < 50% (Fast Under-voltage)	Vac < 240	Vac < 104	10 cycles
50% <=Vac < 88% (Under-voltage)	240 <= Vac < 423[a]	104 <= Vac < 184[a]	2 seconds
88% < Vac <= 110% (Nominal)	423 < Vac <= 528	184 < Vac <= 228	normal operation
110% < Vac < 120% (Over-voltage)	528 < Vac < 576[a]	228 < Vac < 249[a]	1 second
120% >= Vac (Fast Over-voltage)	576 >= Vac	249 >= Vac	10 cycles
f < rated -3.0 (Fast Under Frequency)	f < 57.0	f < 57.0	10 cycles
f < rated -0.7 (Under Frequency)	f < 59.3[a]	f < 59.3[a]	10 cycles[a]
f > rated +0.5 (Over Frequency)	f > 60.5	f > 60.5	10 cycles

[a] Adjustable, password-protected.

Bolt Sizing and Torque Requirements

Table A-5 provides acceptable bolt sizes, and torque values for AC terminal connections.

Table A-5 AC Terminal Bolt Size and Torque Values

AC Terminal Connections	Max. # of Conductors per Terminal	Bolt (Hardware) or Hole Size	Torque Requirements
PE (Enclosure Ground)	2	1 / M10	75 Nm (55 lb ft)
TB1-A, TB1-B, TB1-C and TB1-N	1	1 / .41 Thru M10	75 Nm (55 lb ft)

Table A-6 provides acceptable bolt sizes, and torque values to be connected to the GT100 DC terminal connections.

Table A-6 DC Terminal Bolt Size and Torque Values

DC Terminal Connections	Max. # of Conductors per Terminal	Bolt (Hardware) Size	Torque Requirements
TB3, TB4, and TB5	6	6 / .41 Thru M10	75 Nm (55 lb ft)

Table A-7 provides acceptable screw sizes, and torque values to be connected to the GT100 Auxiliary Control Interface terminal connections.

Table A-7 Auxiliary Control Interface Screw Size and Torque Values

Aux Control Connections	Max. # of Conductors per Terminal	Screw (Hardware) Size	Torque Requirements	Signal Type
TB7-1,2 Remote Emergency Stop	1	6-32 × 0.5, Pan Hd Phil (provided)	1.35 Nm (12 lb in)	N.C. Contact @15Vdc, 10mA
TB7-3,4 Aux Enable/ Disable	1	6-32 × 0.5, Pan Hd Phil (provided)	1.35 Nm (12 lb in)	N.C. Contact @15Vdc, 10mA

Dimensions

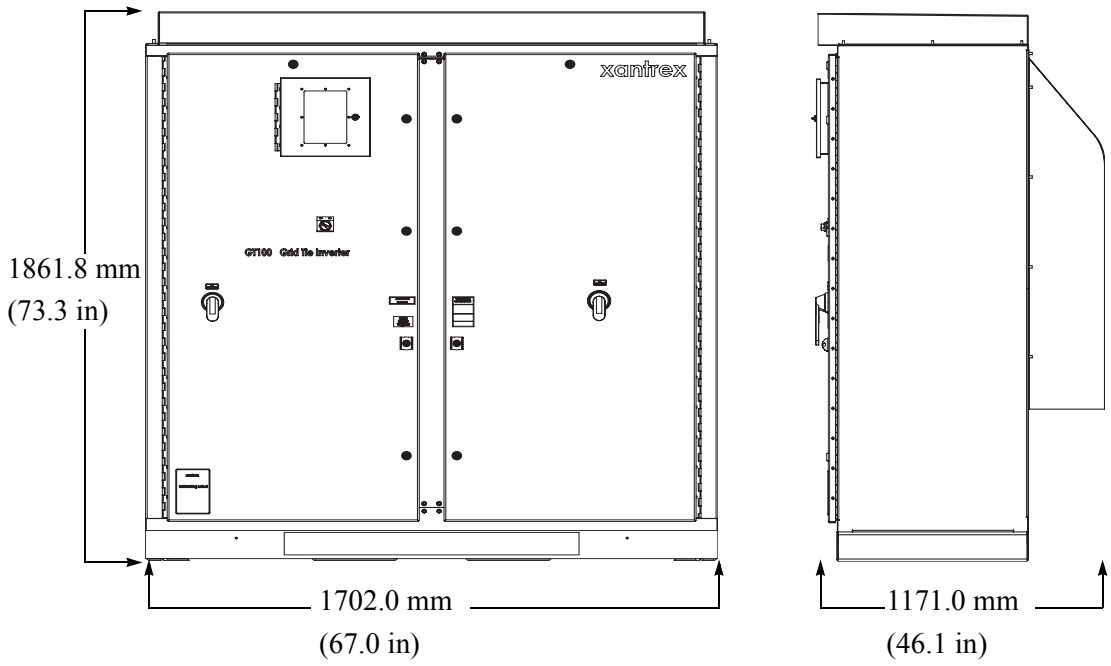


Figure A-1 GT100 Dimensions

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