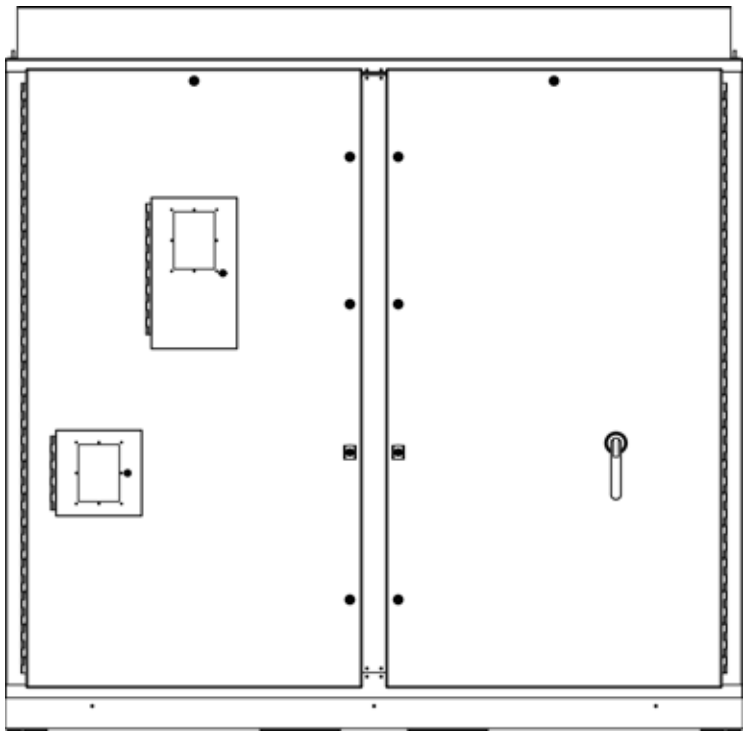
Xantrex™ GT500 MVX & Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters

Operation and Maintenance Manual



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Xantrex GT500 MVX & Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters

Operation and Maintenance Manual

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About This Manual

Purpose

The purpose of this Operation and Maintenance Manual is to provide explanations and procedures for operating, maintaining, and troubleshooting Schneider Electric Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters. Installation instructions are available in the Xantrex GT500 MVX and Xantrex GT500 MVX PG Grid-Tied Photovoltaic Inverter Planning and Installation Manual (Document Part Number 975-0553-01-01).

Scope

This Manual provides safety guidelines and information about operating and troubleshooting the unit.

Audience

This Manual is intended for anyone who needs to operate Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters. Operators must be familiar with all the safety regulations pertaining to operating high-voltage equipment as dictated by local code. Operators must also have a complete understanding of this equipment's features and functions. Do not use this product unless it has been installed by qualified personnel in accordance with the Xantrex GT500 MVX and Xantrex GT500 MVX PG Grid-Tied Photovoltaic Inverter Planning and Installation Manual (Document Part Number 975-0553-01-01).

Organization

This Manual is organized into four chapters and one appendix.

Chapter 1, "Introduction" provides information about the features and functions of Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters.

Chapter 2, "Operation" contains information on the basic operation of Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters.

Chapter 3, "Troubleshooting" contains information and procedures for troubleshooting Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters. It provides descriptions of common situations and errors that may occur and provides possible solutions for resolving fault conditions. It also provides instructions for clearing faults manually, if required.

Chapter 4, "Preventive Maintenance" contains information and procedures for performing preventive maintenance on Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters.

Appendix A provides the environmental and electrical specifications for Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters.

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.

Abbreviations and Acronyms

ANSI	American National Standards Institute	IEEE	Institute of Electrical and Electronics Engineers
CW	Clockwise	IGBT	Insulated Gate Bipolar Transistor
CCW	Counter Clockwise	NFPA	National Fire Protection Association
DSP	Digital Signal Processor	PV	Photovoltaic
GUI	Graphical User Interface		

Related Information

You can find more information about the manufacturer as well as its products and services at www.schneider-electric.com.

Important Safety Instructions

READ AND SAVE THESE INSTRUCTIONS – DO NOT DISCARD

This manual contains important safety instructions for Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters that must be followed during operation and maintenance. Read and keep this Operation and Maintenance Manual for future reference. Read and follow all WARNING and CAUTION markings in this manual and all labels on the Xantrex GT500 MVX and Xantrex GT500 MVX PG.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- To be installed and serviced only by qualified personnel equipped with appropriate personal protective equipment and following safe electrical work practices.
- Energized from PV array while exposed to light, AC grid, and possibly an auxiliary AC source. Before opening doors or covers consult system diagram to identify all sources, de-energize, lock-out, and tag-out all sources, and wait at least 5 minutes for internal capacitors to discharge to safe voltages. See “Lockout and Tag (De-energize/Isolation Procedure) for Inverter with Barriers Installed” on page ix.
- Before servicing, test using a meter rated at least 1000V AC and DC, to ensure all circuits are de-energized.
- Normally GROUNDED conductors may be UNGROUNDED and ENERGIZED when a GROUND FAULT is indicated.
- This unit employs field adjustable voltage and frequency setpoints and time delays that are factory set in compliance with UL1741 and may only be changed by trained technicians with approval by both the local utility and equipment owner.
- For proper circuit isolation, connect a minimum 500kVA rated isolating transformer between output of unit and utility power line connections.
- Transformer must be an isolation type having separate primary and secondary windings.
- Transformer must be selected and installed in accordance with product planning and installation manual.

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

WARNING: Shock hazard from multiple locations

- Only opening the AC circuit breaker and DC disconnect leaves the inverter's AC output terminals and DC input terminals energized with hazardous voltages. In addition, the circuit connected to TB6 may still be energized. All AC sources must have over current devices supplied by the installers. External disconnect devices must be provided by the installers for all AC and DC sources.
- Do not open the cabinet doors if extreme moisture is present (rain or heavy dew).

Failure to adhere to these warnings could result in severe injury or possible death. Exercise extreme caution at all times to prevent accidents.

Risks

WARNING: Lethal Voltage

Never make connections or disconnections to any part of the inverter when energized sources are present.

Always follow the “Lockout and Tag (De-energize/Isolation Procedure) for Inverter with Barriers Installed” on page ix.

WARNING: Explosion Hazard

- Internal components may explode in the event of a major malfunction.
- The Xantrex GT500 MVX and Xantrex GT500 MVX PG enclosure doors should remain closed with the latches tightened, unless all possible sources of energy are confirmed to be disconnected.

WARNING: Crush Hazard

The Xantrex GT500 MVX and Xantrex GT500 MVX PG each weigh approximately 1600 kg (3500 lbs). Avoid personal injury and equipment damage by following all instructions provided in this manual. Always exercise caution and follow instructions when lifting, moving, and mounting the Xantrex GT500 MVX or Xantrex GT500 MVX PG. Do not lay the Xantrex GT500 MVX or Xantrex GT500 MVX PG on its side.

WARNING: Amputation Hazard

The Xantrex GT500 MVX and Xantrex GT500 MVX PG contain an integrated ventilation system that includes moving parts. Do not place fingers or hands into areas where moving parts are or may be present.

WARNING: Burn Hazard

The Xantrex GT500 MVX and Xantrex GT500 MVX PG have internal components that can be very hot during normal operation. Use caution and do not touch internal components without confirming that they have cooled enough to safely handle them.

WARNING: Limitations on use

The Xantrex GT500 MVX and Xantrex GT500 MVX PG are not intended for use in connection with life support systems or other medical equipment or devices. The Xantrex GT500 MVX and Xantrex GT500 MVX PG may only be used in grid-interconnected PV systems. They are not suitable for any other application areas.

CAUTION

The Xantrex GT500 MVX and Xantrex GT500 MVX PG incorporate an air supply and exhaust air area, which must remain unobstructed. Failure to follow the installation instructions could result in the Xantrex GT500 MVX or Xantrex GT500 MVX PG overheating which could destroy the unit.

CAUTION

Sensitive electronics inside the Xantrex GT500 MVX and Xantrex GT500 MVX PG can be destroyed when touched and when electrostatically charged. Discharge using earth potential before touching, and wear appropriate protective gear.

General Safety Precautions

1. When installing the Xantrex GT500 MVX or Xantrex GT500 MVX PG use only components recommended or sold by the manufacturer. Doing otherwise may result in a risk of fire, electric shock, and injury to persons, and it will void the warranty.
2. Do not attempt to install the Xantrex GT500 MVX or Xantrex GT500 MVX PG if it has been dropped or received more than cosmetic damage during transport or shipping. If the Xantrex GT500 MVX or Xantrex GT500 MVX PG is damaged, or suspected to be damaged, see the Warranty section in your manual.
3. To reduce the risk of electrical shock, lock-out and tag the Xantrex GT500 MVX or Xantrex GT500 MVX PG as well as all external sources of energy before attempting any maintenance, service, or cleaning.
4. To avoid risk of fire and electric shock, make sure that any existing wiring is in good condition and that wire is not undersized. Do not install the Xantrex GT500 MVX or Xantrex GT500 MVX PG with undersized, damaged, or substandard wiring.

5. Do not disassemble, modify, or replace parts on the Xantrex GT500 MVX or Xantrex GT500 MVX PG. There are no user serviceable parts. This could result in a risk of electrical shock, explosion, or fire. This will void your warranty.
6. Always use safety equipment required by the installation site and listed in this manual. Thoroughly inspect the installed equipment prior to energizing. Verify that all tools, loose parts, and equipment have been removed from the Xantrex GT500 MVX or Xantrex GT500 MVX PG.
7. Avoid personal injury by never energizing the Xantrex GT500 MVX or Xantrex GT500 MVX PG without closing the doors and tightening all door latches.
8. The Xantrex GT500 MVX and Xantrex GT500 MVX PG are designed and certified for full power operation at ambient temperatures up to 45 °C. Operation between 45 °C and 50 °C will result in reduced output power, and the front panel display will show that the inverter is in the “PV Derating” state. During this state, the inverter will regulate output power between 400 kW and 500 kW.

Personal Safety

Follow these instructions to ensure your safety while working with the Xantrex GT500 MVX or Xantrex GT500 MVX PG.

Qualified Personnel

The Manual is intended for use by anyone who plans to operate, commission, or troubleshoot a system involving Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters. The commissioning and troubleshooting information in this manual is intended for qualified personnel. Qualified personnel have training, knowledge, and experience in:

- installing electrical equipment and PV power systems (up to 600 V).
- applying all applicable installation codes.
- analyzing and reducing the hazards involved in performing electrical work.
- selecting and using Personal Protective Equipment (PPE).

Safety Equipment

Authorized service personnel must be equipped with appropriate personal protective equipment including the following:

- Safety glasses
- Ear protection
- Steel-toed safety boots
- Safety hard hats
- Padlocks and tags

- Double-insulated tools
- Appropriate meter to verify that the circuits are de-energized (1000V AC and DC rated, minimum)

Check local safety regulations for other requirements.

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 been inadvertently left behind. Close all doors and tighten all door latches, especially at installation startup and initial startup after any repairs.

Lockout and Tag (De-energize/Isolation Procedure) for Inverter with Barriers Installed

WARNING: Shock Hazard

- The Xantrex GT500 MVX and Xantrex GT500 MVX PG can be energized from both the AC source and the DC source. Review the system/site schematic for the installation to verify that all available energy sources are identified.
- Safety requirements mandate that this equipment not be serviced while energized. A padlock and tag should be installed on every energy source prior to servicing.
- Once all sources of input are identified and isolated, allow five minutes for all capacitors within the main enclosure to completely discharge before proceeding.
- If the external AC disconnect is not opened and locked out, there will be voltage at the AC terminal block (TB1) located at the bottom terminals of the AC circuit breaker.
- If the external auxiliary power disconnect is not opened and locked out, there will be hazardous voltages at numerous locations through out the unit in both the AC and DC compartments.
- If the external DC disconnect is not opened and locked out, 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 600 VDC.

To lockout and tag a Xantrex GT500 MVX or Xantrex GT500 MVX PG with barriers installed:

1. Open, lockout, and tag the external AC and DC disconnect switches for the main utility and PV connections.
2. Open, lockout, and tag the external AC disconnect switch for the auxiliary power source, if wired.
3. Wait five minutes, and then turn the DC switch S1 on the inverter to the open (OFF) position. Lockout and tag the switch.

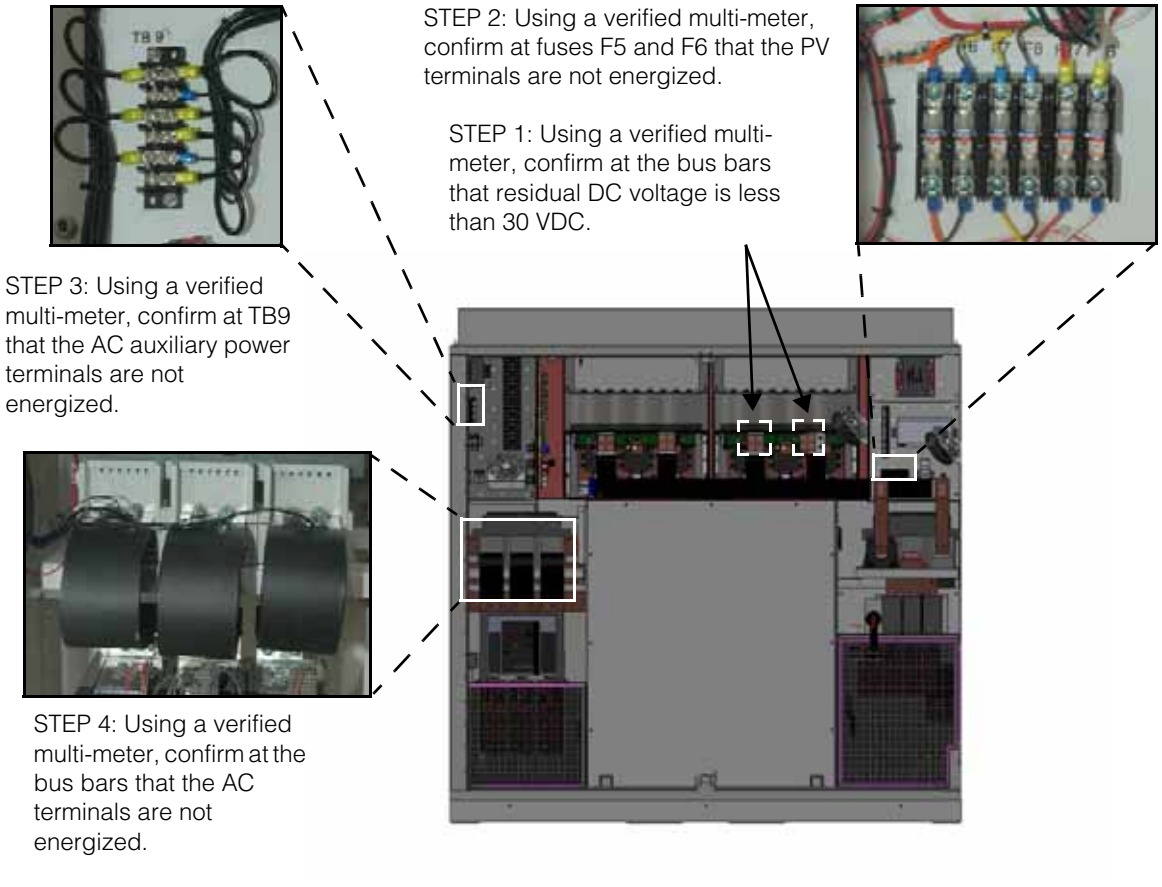


Figure i Terminal Locations to be Verified as De-energized (Inverter with Barriers)

Important: Use the triangular key provided to open the right side DC compartment door and the left side AC compartment door.

4. Open the right enclosure door only, and then turn the DC switch S1 to the closed (ON) position using a tool or a separate knob.
5. Using a verified multimeter, measure the DC voltage on the bus bars between the DC contactor K1 and the capacitor bank.

   Do not proceed until the voltage has decreased to less than 30 VDC.

6. After the voltage has decreased to less than 30 VDC, measure the PV voltages from the bottom side of F5 and F6 to chassis ground, and then from F5 to F6. Be careful to avoid shorting the test leads.
7. Turn the DC switch S1 on the inverter to the open (OFF) position.
8. Check the OPEN/CLOSED status of the AC circuit breaker (CB1) which appears in a window on the AC breaker. See Figure 1-1. To verify that all AC voltages have been removed, the status must be CLOSED.
9. Open the left enclosure door, and then use a verified multimeter to measure:
   a) between phases and from each phase to chassis ground on the bus bars between CB1 and K1.
   b) the AC voltage on pins 1, 3, and 5 of TB9 with respect to each other and to chassis ground.
10. Using a flat-head screwdriver, open the small circuit breaker access door on the left side of the inverter. The AC circuit breaker has a push button lock window on both the PUSH TO OPEN and PUSH TO CLOSE switches.

Figure 1-1 AC Circuit Breaker

11. Change the OPEN/CLOSED status of the AC circuit breaker to OPEN:
   a) Use a crosshead (Phillips) screwdriver to remove screw on the lockable window covering the PUSH TO OPEN switch.
   b) Depress the PUSH TO OPEN switch to open the circuit.
   c) Confirm status indicates OPEN.
   d) Close the window and secure with a pad lock.
   e) Tag accordingly.

Lockout and Tag (De-energize/Isolation Procedure) for Inverter Without Barriers Installed

WARNING: Shock Hazard

- The Xantrex GT500 MVX and Xantrex GT500 MVX PG can be energized from both the AC source and the DC source. Review the system/site schematic for the installation to verify that all available energy sources are identified.
- Safety requirements mandate that this equipment not be serviced while energized. A padlock and tag should be installed on every energy source prior to servicing.
- Once all sources of input are identified and isolated, allow five minutes for all capacitors within the main enclosure to completely discharge before proceeding.
- If the external AC disconnect is not opened and locked out, there will be voltage at the AC terminal block (TB1) located at the bottom terminals of the AC circuit breaker.
- If the external auxiliary power disconnect is not opened and locked out, there will be hazardous voltages at numerous locations through out the unit in both the AC and DC compartments.
- If the external DC disconnect is not opened and locked out, 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 600 VDC.

Important: Use the triangular key provided to open the right side DC compartment door and the left side AC compartment door.

To lockout and tag a Xantrex GT500 MVX or Xantrex GT500 MVX PG without barriers installed:

1. Open, lockout, and tag the external AC and DC disconnect switches for the main utility and PV connections.
2. Open, lockout, and tag the external AC disconnect switch for the auxiliary power source, if wired.
3. Wait five minutes, and then turn the DC switch S1 on the inverter to the open (OFF) position. Lockout and tag the switch.
4. 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. Make sure 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, and TB2 (GND BUS)] (see Figure 1-3 on page 1-5)
- PV Terminals: [TB3, TB4 and TB5 (PV GND)] (see Figure 1-6 on page 1-9)
- AC Auxiliary Power Terminals: [TB6-3, TB6-6,TB6-9, and TB6-10 (GND)] (see Figure 1-4 on page 1-6)

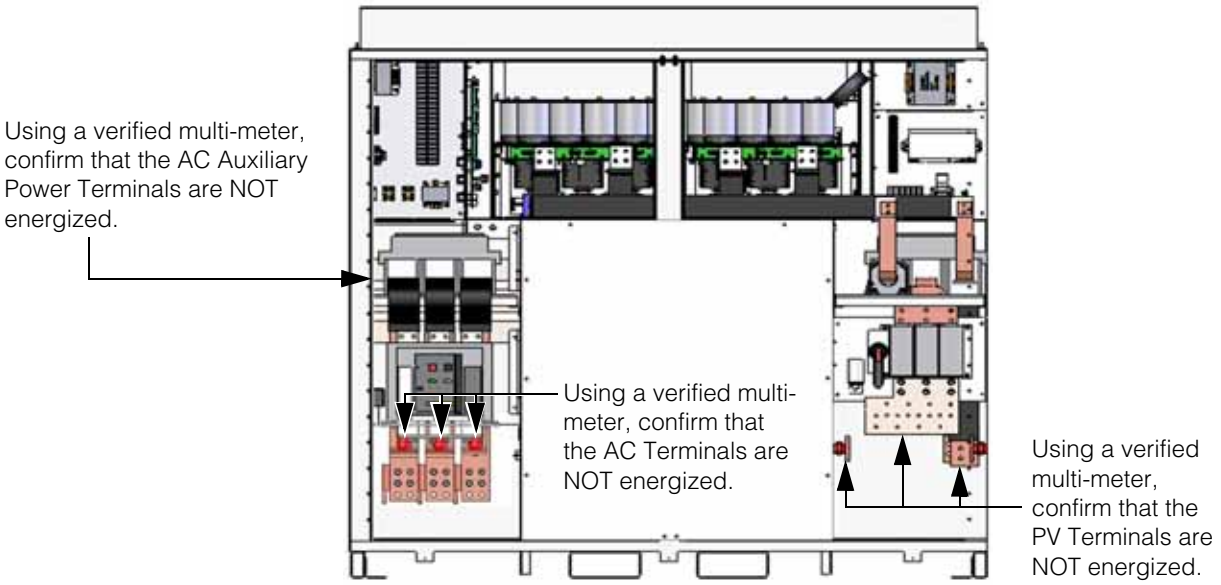


Figure ii Terminal Locations to be Verified as De-energized (Inverter Without Barriers)

Interconnection Standards Compliance

The Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters are CSA (Canadian Standards Association) Certified to required US and Canadian safety standards. They bear the CSA c/us Mark. See “Regulatory Specifications” on page A–4 for more detailed information.

Intended Use

The Xantrex GT500 MVX and Xantrex GT500 MVX PG may only be used in connection with PV modules. They are not suitable for any other application areas.

Contents

Figures

Tables

1 Introduction

Chapter 1, “Introduction” provides information about the features and functions of Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters.

Description of the Xantrex GT500 MVX and Xantrex GT500 MVX PG

The Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters are utility interactive, three-phase power conversion systems for grid-connected photovoltaic arrays with a power rating of 500 kW. Designed to be easy to install and operate, the Xantrex GT500 MVX and Xantrex GT500 MVX PG automate startup, shutdown, and fault detection scenarios. With user-settable power tracking that matches the inverter to the array and adjustable delay periods, users are able to customize startup and shutdown sequences.

Power Conversion System

The Xantrex GT500 MVX and Xantrex GT500 MVX PG power conversion systems consist of a pulse-width modulated (PWM) inverter bridge and 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 Xantrex GT500 MVX and Xantrex GT500 MVX PG incorporate sophisticated Insulated Gate Bipolar Transistors (IGBTs) as the main power switching devices. An advanced, Maximum Peak Power Tracker (MPPT) integrated within the Xantrex GT500 MVX and Xantrex GT500 MVX PG control firmware ensures the optimum power throughput for harvesting energy from the photovoltaic array.

Advanced Design Features

Self-protection

The Xantrex GT500 MVX and Xantrex GT500 MVX PG integrated controller contains self-protection features including over and under voltage and frequency safeguards in compliance with UL 1741, 2nd Edition.

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 Xantrex GT500 MVX and Xantrex GT500 MVX PG include 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 Xantrex GT500 MVX and Xantrex GT500 MVX PG will sense the discrepancy and automatically correct for a clockwise (A-B-C) phase rotation.

Local Display and Remote Graphic User Interface

The Xantrex GT500 MVX and Xantrex GT500 MVX PG include a local user interface comprised of an ENABLE/DISABLE switch, keypad, and four-line, 80-character display.

A user-friendly Xantrex GT View graphic user interface (GUI) provides a remote interface for operator interrogation of Xantrex GT500 MVX and Xantrex GT500 MVX PG system status, control, metering/data logging, and protective functions within the Xantrex GT500 MVX and Xantrex GT500 MVX PG. 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 Xantrex GT500 MVX and Xantrex GT500 MVX PG are assembled in a single NEMA-3R, corrosive resistant, powder-coated enclosure that includes two access doors to house the electronics. Internally, the Xantrex GT500 MVX and Xantrex GT500 MVX PG are compartmentalized to include sections for the AC interface (left side), the power electronics (upper portion), and the DC interface (right side).

Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters come in two models, configured for positive and negative grounding, respectively.

The Xantrex GT500 MVX and Xantrex GT500 MVX PG consist of one enclosure which includes the power conversion circuit, control circuits, as well as AC and DC interfaces.

The enclosure doors are equipped with locks to secure the compartments.

WARNING: Lethal Voltage

The Xantrex GT500 MVX and Xantrex GT500 MVX PG produce lethal voltages when “live.” The enclosure doors should remain closed and locked at all times. Never perform installation or maintenance activities on a “live” unit. Use extreme caution while testing a “live” unit. Never open the enclosure doors during normal operation.

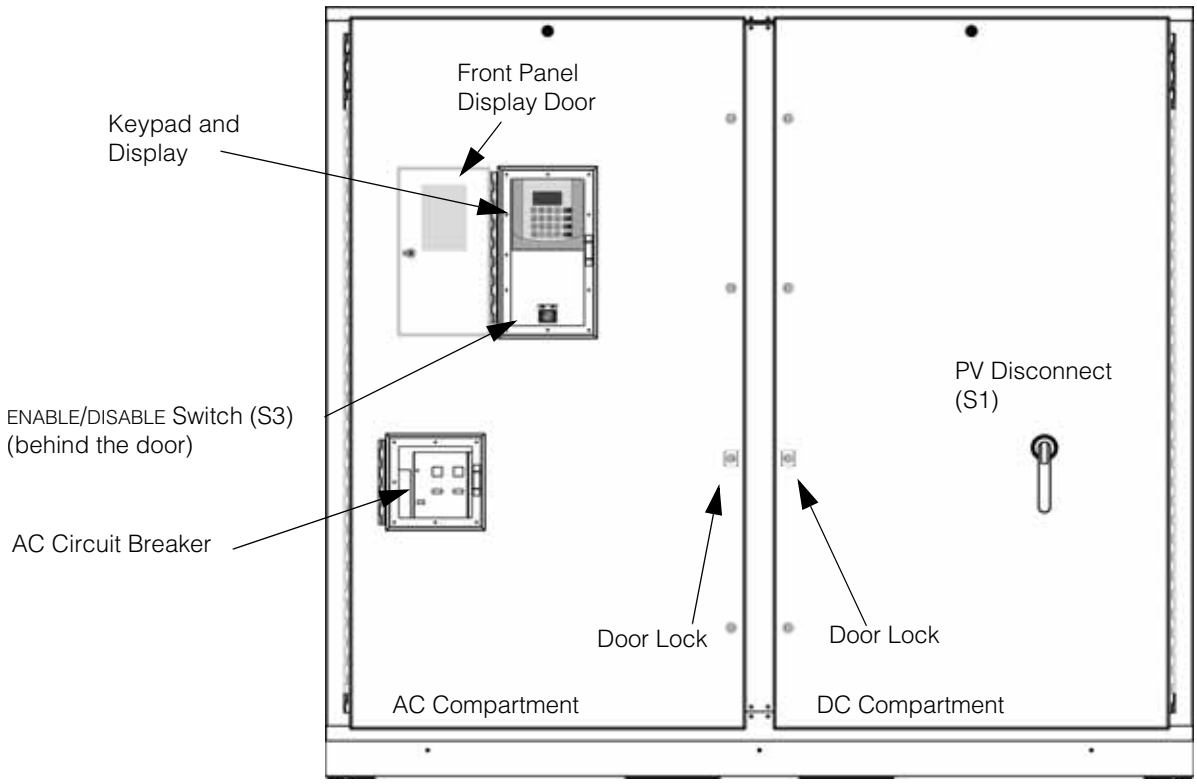


Figure 1-1 Xantrex GT500 MVX and Xantrex GT500 MVX PG

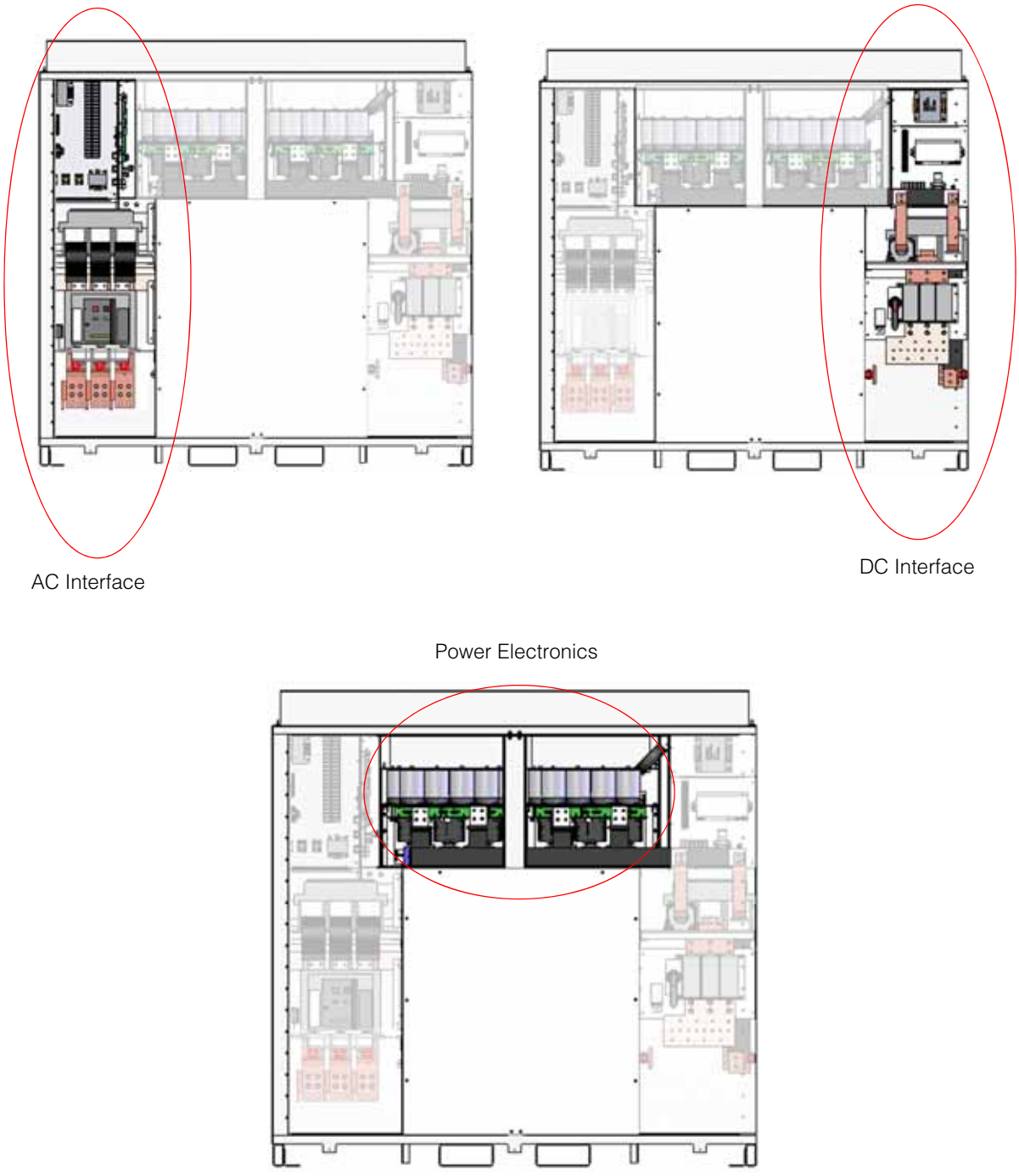


Figure 1-2 Main Enclosure Interfaces (Shown With Barriers Removed)

AC Interface

The AC interface serves as the connection for the utility. This compartment (section) houses the AC terminals (TB1-A, -B, and -C), AC circuit breaker, AC contactor, control power transformer, solid-state relays, control fuses, and AC sensing circuitry. See Figure 1-2 on page 1–4 for the location of the AC interface compartment.

AC Terminals

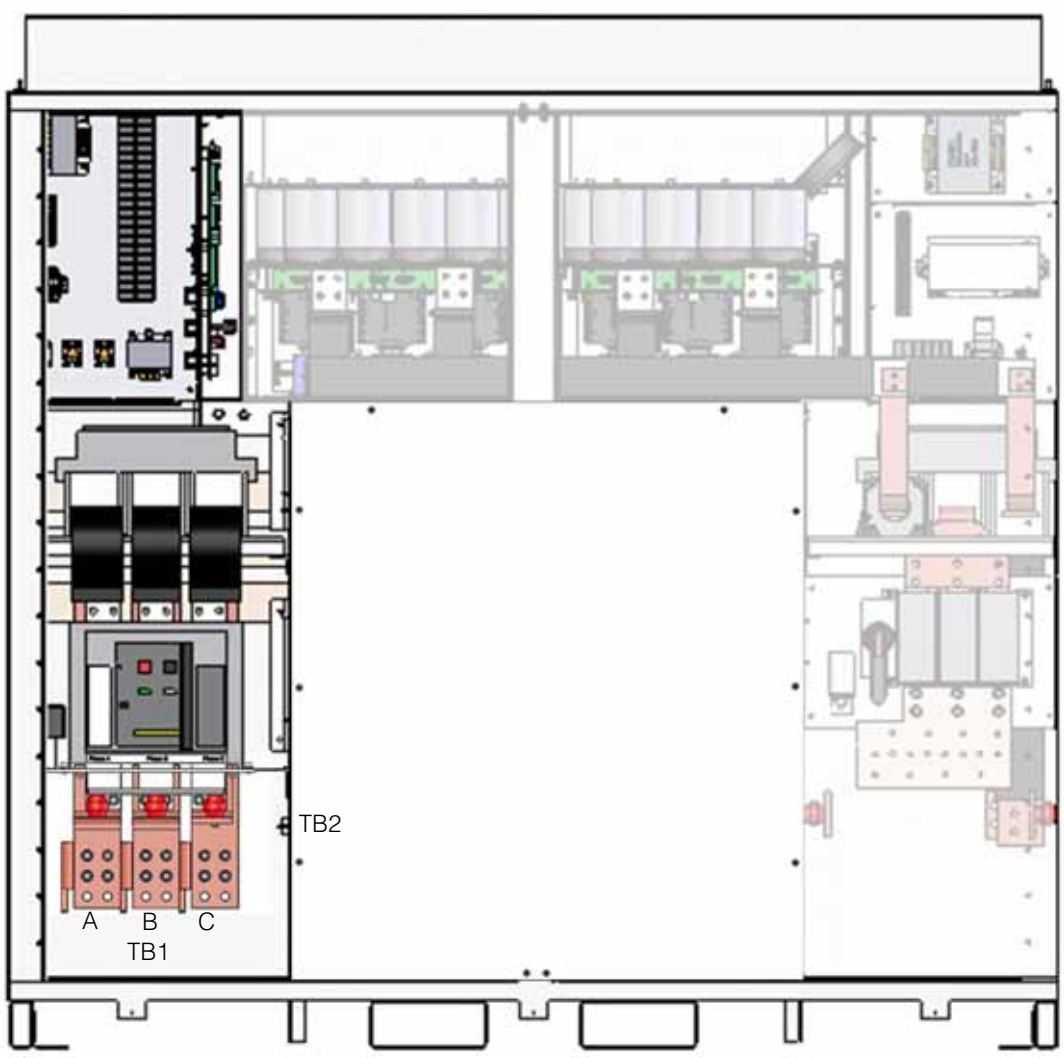


Figure 1-3 AC Utility Terminals

Each terminal provides two holes with space for three cables with an M10 clearance diameter per pole (see Table A-4 on page A–5 for torque requirements).

Auxiliary Control Interface

The Xantrex GT500 MVX and Xantrex GT500 MVX PG have provisions within the AC interface for installing auxiliary control signals that include a remote disconnect control and a remote ENABLE/DISABLE signal.

Auxiliary control via the remote ENABLE/DISABLE signal is advantageous for coordination of the Xantrex GT500 MVX or Xantrex GT500 MVX PG at specific installations where a pre-existing back-up emergency generator is present.

Two separate dry contact circuits at the TB7 terminal are used for remote control of the input signals. Circuit termination and signal type are identified in Table A-6 on page A–6.

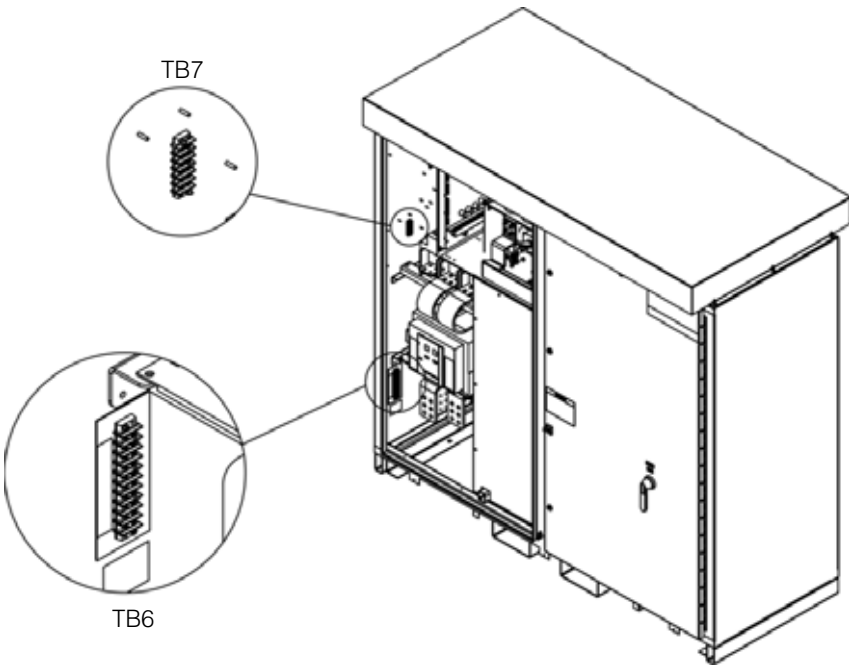


Figure 1-4 Remote Control Terminal Connections

Auxiliary Control Power

The Xantrex GT500 MVX and Xantrex GT500 MVX PG require a 30 A, 208 V, three-phase circuit to be connected to TB6. The circuit provides power for control, communication, and heater circuits.

This control power circuit can be sourced from inside of the inverter or via an external source. The factory default configuration sources the control power from within the inverter. If an external source is preferred, a suitable external disconnect device and over current device must be provided to remove/shutdown auxiliary control power. Optionally, auxiliary power can be sourced from the inverter AC power line (local auxiliary). To supply the auxiliary power from an external source, see the instructions in “Auxiliary Power Interface” in

Chapter 3 of the Xantrex GT500 MVX and Xantrex GT500 MVX PG Grid-Tied Photovoltaic Inverter Planning and Installation Manual (Document Part Number 975-0553-01-01).

Communications Circuit

The Xantrex GT500 MVX and Xantrex GT500 MVX PG can be remotely accessed through an RS232 serial port or through an RS485/Modbus connection. 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 control card within the Xantrex GT500 MVX and Xantrex GT500 MVX PG 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 Xantrex GT500 MVX and Xantrex GT500 MVX PG power electronics section contains the control card and the power electronics bridge. It also includes the Hall-effect current transducers and an internal air circulation fan.

Control Card

The control card is a digital signal processor (DSP) based control board that performs numerous control and diagnostic functions associated with Xantrex GT500 MVX and Xantrex GT500 MVX PG operation. Its most significant tasks are control of Xantrex GT500 MVX and Xantrex GT500 MVX PG electromechanical components and power electronics converters, communication with the universal front panel control unit, and system sensors. The control card also contains the necessary DC power supplies to support its operation.

Power Electronics Bridge

The power electronic converter bridge consists of switching transistors (IGBTs), transistor gate drive electronics, laminated DC bus structure, DC capacitors, and a copper extrusion heat sink with cooling fans. The fans are located behind the bridge assembly and force air onto the heat sink.

The PV generator is tied to the DC bus via the DC interface section. The embedded control card manages the transfer of power between the PV generator and the utility grid.

Heater Fans

The Heater Fans provide supplementary heat to Xantrex GT500 MVX and Xantrex GT500 MVX PG inverters installed in particularly cold areas. These heaters ensure that the Xantrex GT500 MVX or Xantrex GT500 MVX PG remains above the low temperature cut-off point and enables the Xantrex GT500 MVX or Xantrex GT500 MVX PG to begin operation when the external ambient temperature is below the rated operating temperature. In addition to aiding start-up in low temperatures, the heater fans run all night, if the thermostat setpoint is reached, in order to prevent condensation inside the unit. The heater is capable of producing from 500 W (at 85°F) to 700 W (at -4°F) of power, dependant on ambient temperature.

Heater Fan Locations

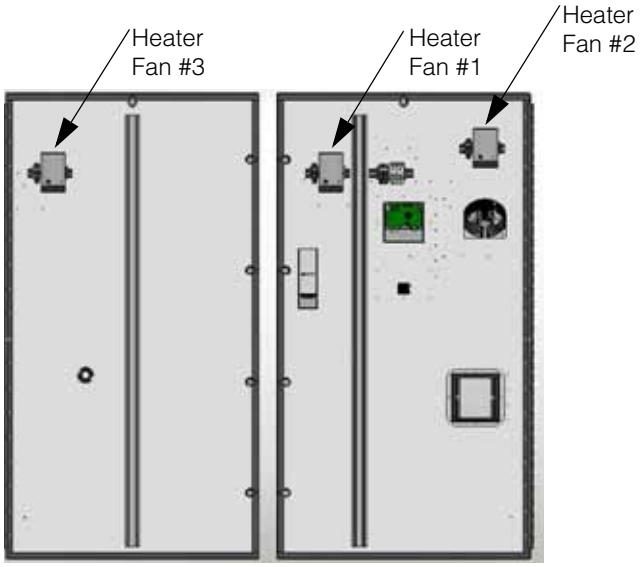


Figure 1-5 Heater Fan Locations

DC Interface

The DC interface serves as the connection interface between the PV array and the Xantrex GT500 MVX or Xantrex GT500 MVX PG (see Figure 1-2 on page 1–4 to locate the DC interface compartment). This section houses the DC disconnect switch and DC contactor. Additionally, the PV ground fault detection circuitry, DC surge arrestor, solid-state relays, and 48 VDC power supply are housed in this section.

DC Terminals

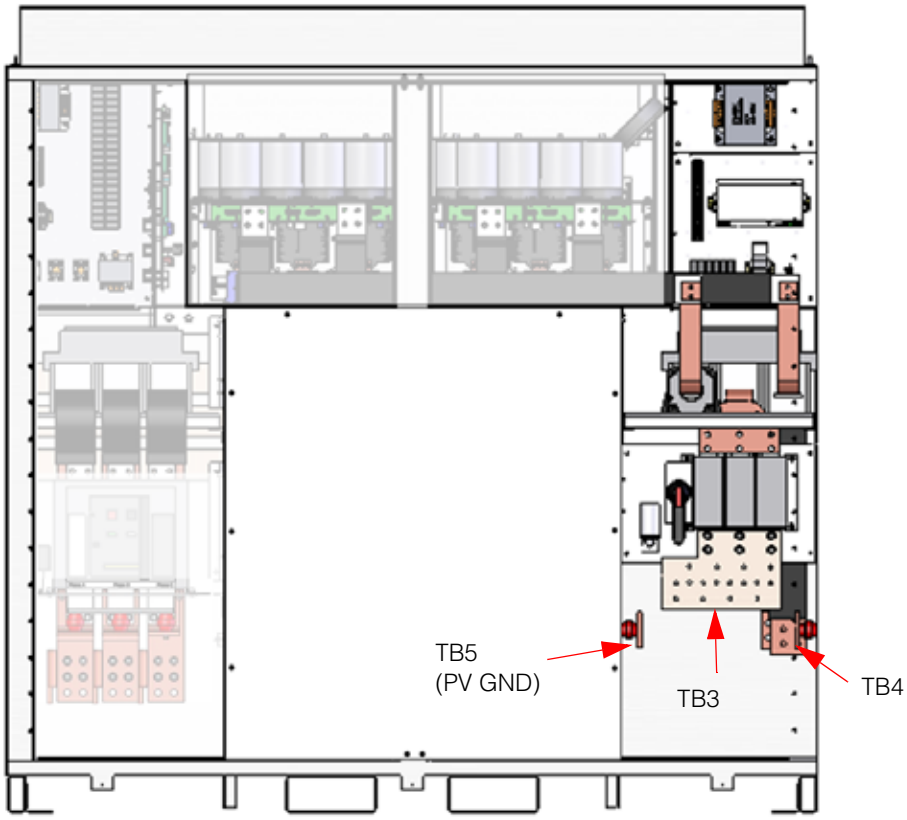


Figure 1-6 DC Terminals

The terminals provide 16 holes with space for 16 cables with an M10 clearance diameter per pole (see Table A-5 on page A–5 for torque requirements).

The table below describes the DC terminal polarity for each Xantrex GT500 MVX and Xantrex GT500 MVX PG model.

Table 1-1 DC Terminal Polarity

Model	TB3	TB4	TB5
Xantrex GT500 MVX	PV+	PV–	PV GND
Xantrex GT500 MVX PG	PV-	PV+	PV GND

Operator Interface Controls

Operator interface controls are located on the front doors of the enclosure. The controls on the AC interface door are housed in two lockable compartments. These controls include the following:

- ENABLE/DISABLE switch
- Four-line display and keypad 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.
- AC circuit breaker

The DC disconnect handle is on the front of the DC interface door.

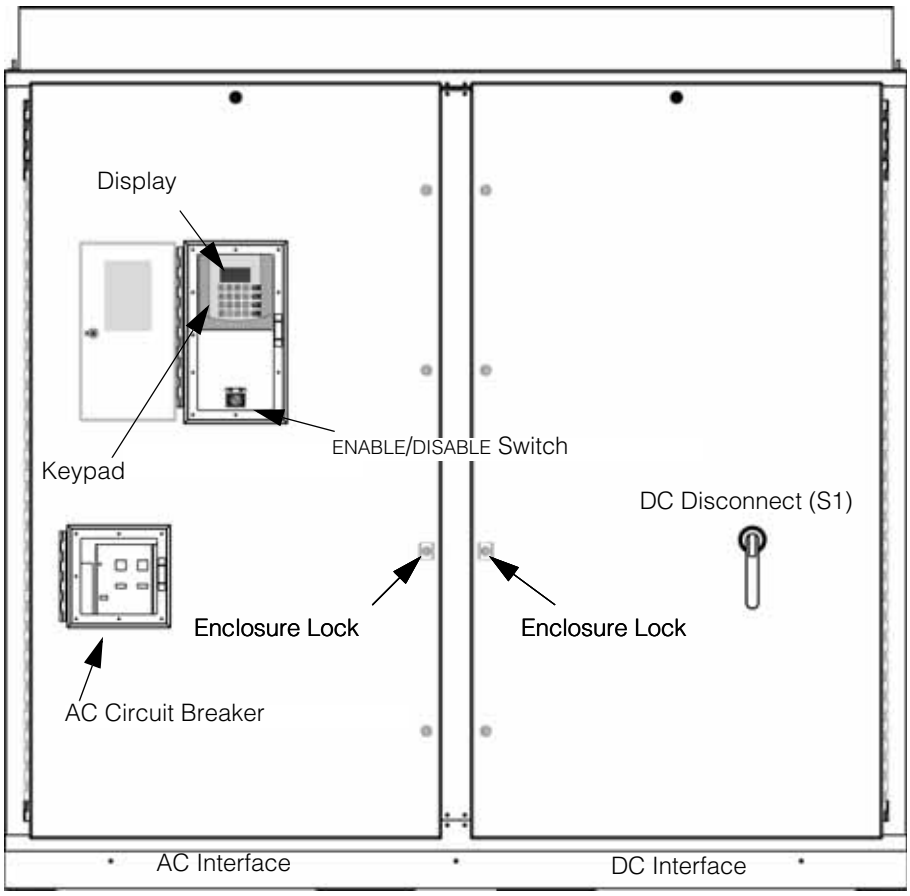


Figure 1-7 Operator Interface Components

ENABLE/DISABLE Switch

The Xantrex GT500 MVX and Xantrex GT500 MVX PG incorporate a maintained position ENABLE/DISABLE switch located on the left front door, under the keypad, as shown in Figure 1-7. Under normal operating conditions, the ENABLE/DISABLE switch is in the ENABLE position. Turning the switch to DISABLE initiates an immediate controlled shutdown of the Xantrex GT500 MVX or Xantrex GT500 MVX PG and opens 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 ENABLE position. The Xantrex GT500 MVX or Xantrex GT500 MVX PG is prevented from restarting until the ENABLE/DISABLE switch is turned back to the ENABLE position.

WARNING: Shock Hazard

Turning the ENABLE/DISABLE switch to DISABLE does NOT remove all hazardous voltages from inside the inverter. Before attempting to service the Xantrex GT500 MVX or Xantrex GT500 MVX PG, follow the de-energize Lockout and Tag procedure on page ix.

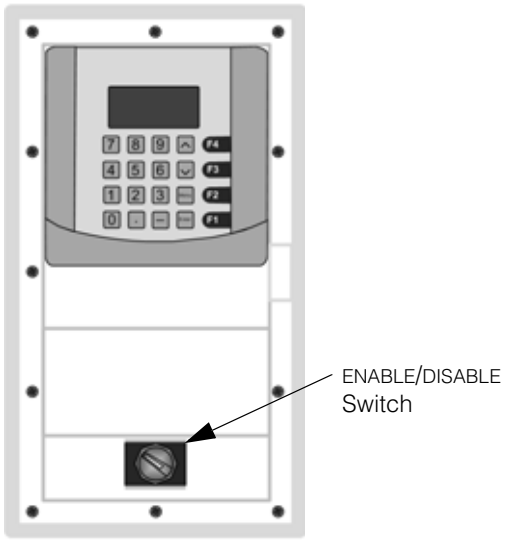


Figure 1-8 ENABLE/DISABLE Switch

Circuit Breaker (CB1) Operation

The internal AC circuit breaker can be opened by accessing the small door on the main AC compartment door as shown in Figure 1-7 on page 1–10. The PUSH TO OPEN button (see Figure 1-9) will open the internal AC circuit breaker and interrupt the main AC grid connection to the inverter. The PUSH TO OPEN button is not the preferred method of orderly shutdown while the inverter is operating. Perform a controlled shutdown by using the ENABLE/DISABLE switch before activating the PUSH TO OPEN button. To close the circuit breaker, the closing spring must be charged. See “System Startup” in the Xantrex GT500 MVX and

Xantrex GT500 MVX PG Grid-Tied Photovoltaic Inverter Planning and Installation Manual (Document Part Number 975-0553-01-01) for specific instructions. The PUSH TO CLOSE button will close the internal AC circuit breaker and connect the inverter to the main power grid. The internal AC circuit breaker must be in the closed position to operate the inverter.

Figure 1-9 AC Circuit Breaker

DC Disconnects

The Xantrex GT500 MVX and Xantrex GT500 MVX PG are equipped with a DC disconnect handle to interrupt the incoming and outgoing power (see Figure 1-7 on page 1–10). The DC disconnect handle and shaft provide a mechanical door interlock for DC interface sections. The doors cannot be opened when the switch is in the ON position. The handle provides a lockout for both the open and closed positions.

Although the main ENABLE/DISABLE 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. If the DC disconnect switch is opened while the Xantrex GT500 MVX or Xantrex GT500 MVX PG is processing power from the PV array, the early-break contact block will signal the control card to stop processing power.

Additionally, opening the DC disconnect switch causes the Xantrex GT500 MVX or Xantrex GT500 MVX PG to execute an immediate orderly shutdown, open both the main AC and DC contactors, and report a PV disconnect fault on the display.

Communication Features and Methods

The Xantrex GT500 MVX and Xantrex GT500 MVX PG provide three types of information to the user:

- system status and fault information
- data logging information
- oscillography

System status and fault information can be accessed using the keypad 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 Xantrex GT500 MVX and Xantrex GT500 MVX PG communicate system status information to the user using the following methods.

- display above the keypad
- external monitoring – (optional) via an RS485/Modbus connection for remote plant monitoring

System Status and Fault Reporting

Basic system status and all fault conditions arising from within the Xantrex GT500 MVX and Xantrex GT500 MVX PG are reported. The four-line display shows a hexadecimal value and a brief description of the fault. Additionally, the control card stores the time and details of all faults in non-volatile memory for later retrieval.

The fault value is also made available to the RS232 connection and the RS485/ Modbus protocol and will include a more extensive description of the fault.

The keypad used to manipulate and view system operation and status is located on the left door. The keypad is comprised of 20 membrane switch keys that allow you to navigate through the menus and alter user-changeable settings. See Chapter 2, “Operation” for details.

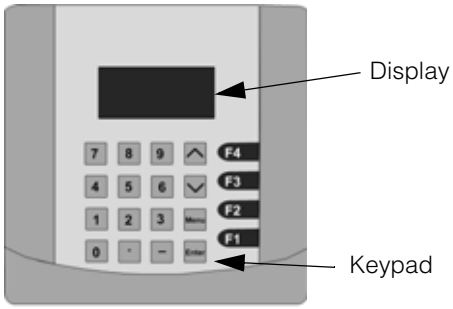


Figure 1-10 Display and Keypad

Status information includes:

- Current operating state or goal state
- Fault code (if applicable)
- Inverter state
- Line voltage and current
- Inverter bridge temperature
- Inverter power
- PV state
- PV voltage and current
- PV power
- Grid frequency
- Peak power tracker enabled

Data Logging

The Xantrex GT500 MVX and Xantrex GT500 MVX PG inverters store data values and software metrics for debugging. The firmware maintains a data log located in the control card's non-volatile memory with a capacity of 25840 32-bit words. The Xantrex GT500 MVX and Xantrex GT500 MVX PG record the 17 parameters listed below and logs them into a circular buffer, such that the earliest records are overwritten once the capacity of the buffer is exceeded. The log capacity is 25840 / 20 = 1292 records (each record has two words for timestamp and 18 words for parameters). Data logging requires the use of the RS485/Modbus connection.

The following parameter values are stored in the data logging records:

• Inverter Vab	• PV Current
• Inverter Vbc	• PV Power
• Inverter Vca	• System State
• I Phase A	• Fault Code
• I Phase B	• L Bridge Temp.
• I Phase C	• R Bridge Temp.
• Grid Freq	• Analog input
• Real Power	• Fan speed control
• PV Voltage	

Oscillography

The Xantrex GT500 MVX and Xantrex GT500 MVX PG include a graphic data analysis tool known as oscillography. The inverter firmware continuously records, in the control card's 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. As soon as the fault is cleared the log will clear the data and start recording again.

The following parameter instant values are 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, left bridge
- Ib – Grid current phase B, left bridge
- Ic – Grid current phase C, left bridge
- Ia (2nd) – Grid current phase A, right bridge
- Ib (2nd) – Grid current phase B, right bridge
- Ic (2nd) – Grid current phase C, right bridge
- 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 Xantrex GT500 MVX or Xantrex GT500 MVX PG to enhance its capabilities. Contact the manufacturer's distributor for further information on installation options.

Communication Interfaces

The manufacturer offers an RS485/Modbus communications interface as optional equipment. The remote user has the ability to control and monitor the status of the inverter through this connection.

Xantrex PV Combiner Box

The Xantrex GT500 MVX or Xantrex GT500 MVX PG is available with an optional fused sub-array combiner (Xantrex PV Combiner Box). The fused 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.

2 Operation

Chapter 2, “Operation” contains information on the basic operation of Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters.

Description of System Operation

Overview

The Xantrex GT500 MVX and Xantrex GT500 MVX PG are fully automated, grid-interactive photovoltaic inverters. System startup, system shutdown, PV power tracking, and fault detection scenarios are all governed and monitored by the control card within the Xantrex GT500 MVX or Xantrex GT500 MVX PG. Manual interaction or control of the inverter is necessary only in the event of a system fault. Additionally, the following conditions govern operation of the Xantrex GT500 MVX and Xantrex GT500 MVX PG:

- Stable utility AC voltage and frequency as specified in Table A-3 must be present for all states of operation.
- PV voltage as specified in Table A-2 must be present.
- With the exception of the inverter bridge test state, the ENABLE/DISABLE switch (S3), located on the front door of the Xantrex GT500 MVX and Xantrex GT500 MVX PG inverter enclosure, must be switched to the ENABLE position for all operating states.
- The DC disconnect switch must be in the ON or closed position.
- The AC circuit breaker must be in the CLOSED position.
- Fault conditions must not be present.

Faults

Fault states are automatic from any state of operation. In the event of a fault condition, the Xantrex GT500 MVX or Xantrex GT500 MVX PG immediately stops processing power, executes an immediate and orderly shutdown, opens both the main AC and DC contactors, and remains in a faulted state until the fault is remedied and cleared (manually or automatically).

Most faults are latching, and only those faults associated with grid disturbances and air duct intake temperature are auto-clearing and thus enable the Xantrex GT500 MVX or Xantrex GT500 MVX PG to restart after a delay period. All fault conditions arising from within the Xantrex GT500 MVX and Xantrex GT500 MVX PG are reported, and the four-line display shows a hexadecimal value (fault code) and a brief description of the fault.

Once the cause of the fault has been identified and corrected, and it is determined to be safe to proceed, Xantrex GT500 MVX and Xantrex GT500 MVX PG faults can be cleared using the keypad or via the remote GUI. See “Clearing Faults Manually” on page 3–3 for instructions on this procedure.

Operating States

A state machine implemented within the controller's software governs the operation of the Xantrex GT500 MVX and Xantrex GT500 MVX PG with clearly defined transitions between operating states. There are five steady-state operating states and numerous intermediate transition states:

- Shutdown
- Transition
- Power Tracking
- Automatic Sleep Test
- Manual Current
- Inverter Bridge Test (displayed as Matrix Test)
- Fault

The user should be aware of the following conditions governing Xantrex GT500 MVX and Xantrex GT500 MVX PG state transitions:

- Qualified utility voltage must be present for all states of operation.
- Fault states are automatic from any state of operation. A fault will cause the Xantrex GT500 MVX or Xantrex GT500 MVX PG to immediately stop processing all power. The fault condition will be reported to the display.
- Most Xantrex GT500 MVX and Xantrex GT500 MVX PG faults are latching and must be cleared at the operator interface keypad before transitioning to another operating state.
- The ENABLE/DISABLE switch, located on the front door of the Xantrex GT500 MVX or Xantrex GT500 MVX PG, must be in the ENABLE position for all operating states except inverter bridge test, in which case it must be in the DISABLE position.

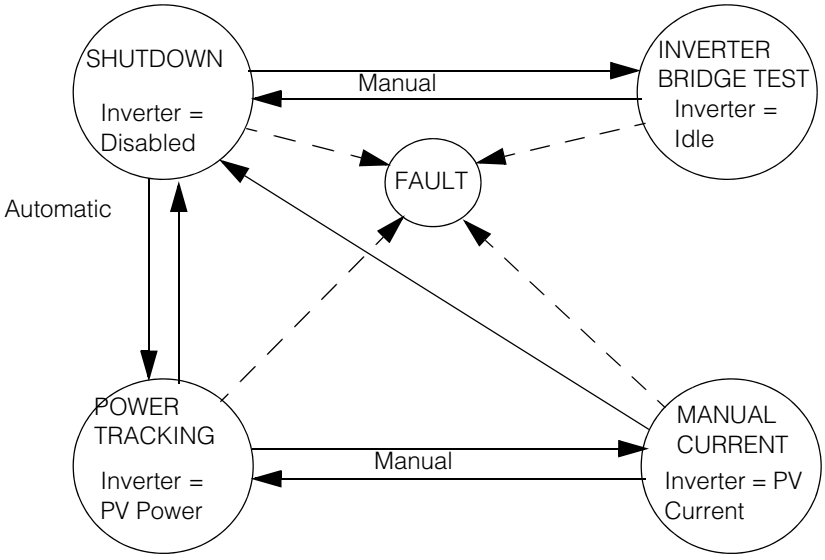


Figure 2-1 State Transition Diagram

Shutdown

The line interface controller is idle. The controller monitors the status of the PV array and utility grid, waiting in standby until the PV array is available to produce power to the grid.

Transition

The intermediate transition states provide an orderly progression from one operating state to the next. Users have the ability to manually transition the Xantrex GT500 MVX or Xantrex GT500 MVX PG between operating states via the operator interface keypad or remotely using the GUI software. Manual transitions are initiated by entering a *goal* state, where the goal state is the desired operating state. If all applicable system parameters are within acceptable limits, and the request is valid within the state machine, the Xantrex GT500 MVX or Xantrex GT500 MVX PG initiates the proper sequence of operations necessary to progress to the requested goal state. Refer to Figure 2-2 on page 2–6 for an illustration of valid state transitions.

Power Tracking

This is the standard operating state of the Xantrex GT500 MVX and Xantrex GT500 MVX PG. The Xantrex GT500 MVX and Xantrex GT500 MVX PG maximum power tracker will demand maximum power from the PV array, given sufficient PV irradiance.

Automatic Sleep Test

Toward the end of every solar day, the Xantrex GT500 MVX or Xantrex GT500 MVX PG automatically determines when to stop producing power dependent upon the output power of the inverter. As the net output power of the Xantrex GT500 MVX or Xantrex GT500 MVX PG nears zero, a timer is started to allow the inverter to ride through any brief irradiance reductions.

Manual Current

This operating state is provided to evaluate the existing PV array V-I characteristics. The PV controller regulates a constant amount of PV current as commanded by the user from the operator interface keypad, up to the PV current limit of the Xantrex GT500 MVX or Xantrex GT500 MVX PG. If the user commands more PV current than is available, the DC bus voltage will drop below the minimum bus voltage level and the Xantrex GT500 MVX or Xantrex GT500 MVX PG will enter Shutdown mode.

Inverter Bridge Test

This operating state is provided to verify proper operation of the inverter bridge and associated control electronics. In this state, the controller will send digitized gating signals (On/Off) to the IGBTs at a 2 Hz rate. There is no power transfer between the PV and utility in this mode. The ENABLE/DISABLE switch must be in the DISABLE position for the Xantrex GT500 MVX or Xantrex GT500 MVX PG to enter this state.

Fault

The Xantrex GT500 MVX or Xantrex GT500 MVX PG has encountered a fault condition. When this happens, regardless of the state of operation, the inverter will stop processing all power and execute an orderly system shutdown.
A description of the fault and the fault code appear on the display. The fault state can be cleared using the keypad once the cause of the fault has been corrected. See Chapter 3, “Troubleshooting” for a complete description of all fault codes.

See Figure 2-2 on page 2–6 for the Operating States Flow Chart for Power Tracking.

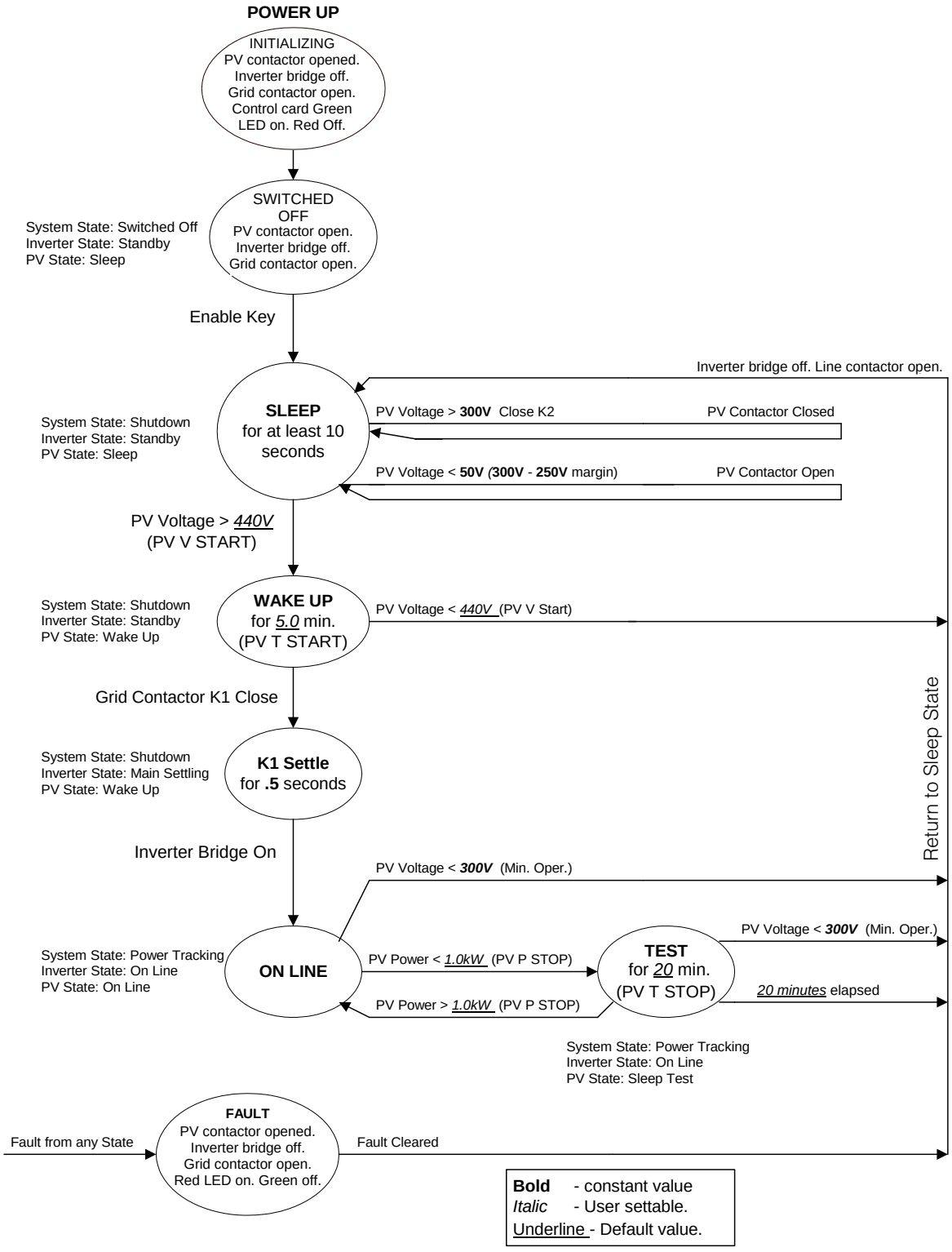


Figure 2-2 Operating States Flow Chart for Power Tracking

Operator Interface

The operator interface communicates critical operational information to and from the unit. This communication occurs between the operator and the keypad and display or between the operator and a personal computer running the Xantrex GT View GUI software. The RS485/Modbus connection is also available for remote monitoring and control systems.

Keypad Operation and Display

The keypad used to manipulate and view system operation and status is located on the left front door of the inverter enclosure. It is comprised of 20 touch-sensitive, membrane switch keys that provide a means to navigate through the menus and alter user-settable parameters.

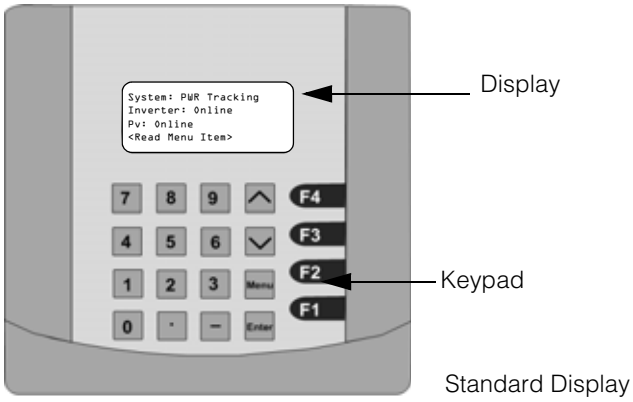


Figure 2-3 Keypad and Display

- Four function keys are available:
  - F1 – In the READ menu, this key jumps to display `INV A Volts`.
    If the Xantrex GT500 MVX or Xantrex GT500 MVX PG is faulted while in the READ menu, this key is used to send the `Clear Fault` message to the control card. In the WRITE menu, this key is used to set `Goal:`.
  - F2 – In the READ menu, this key jumps to display `INV kW`. In the WRITE menu, this key jumps to display `PPT V Ref:`.
  - F3 – In the READ menu, this key jumps to display `PV kW:`. In the WRITE menu, this key jumps to display `PPT Enable:`.
  - F4 – In the READ menu, this key jumps to display `kWH:`.
    In the WRITE menu, this key is used to both confirm and display parameters.
    – When confirming a Goal State change, this key sends the `Command Goal State` message to the control card.
    – When re-setting the KWH, this key sends the `Reset kWH:` message to the control card.
    – When setting all WRITE menu parameters to factory default, this key sends the `Set to Factory Default` message to the controller.
    In the WRITE menu, this key jumps to display `Factory Default`.

- Two navigation keys are available. \/ and /\ move forward and backward respectively within the menu structure. Upon reaching the end of the menu, it will roll-over to the beginning of the same menu.
- Ten numeric keys (0 through 9), two symbol keys (“.” and “-”), and an **ENTER** key are available for entering user-settable parameters.
- The **MENU** key allows you to enter the password-protected WRITE parameters.

Display – Initialization Screen

Any time AC power is applied to the unit, the display cycles through the following screens while the system initializes. Once it is done with this process, the standard display will appear.

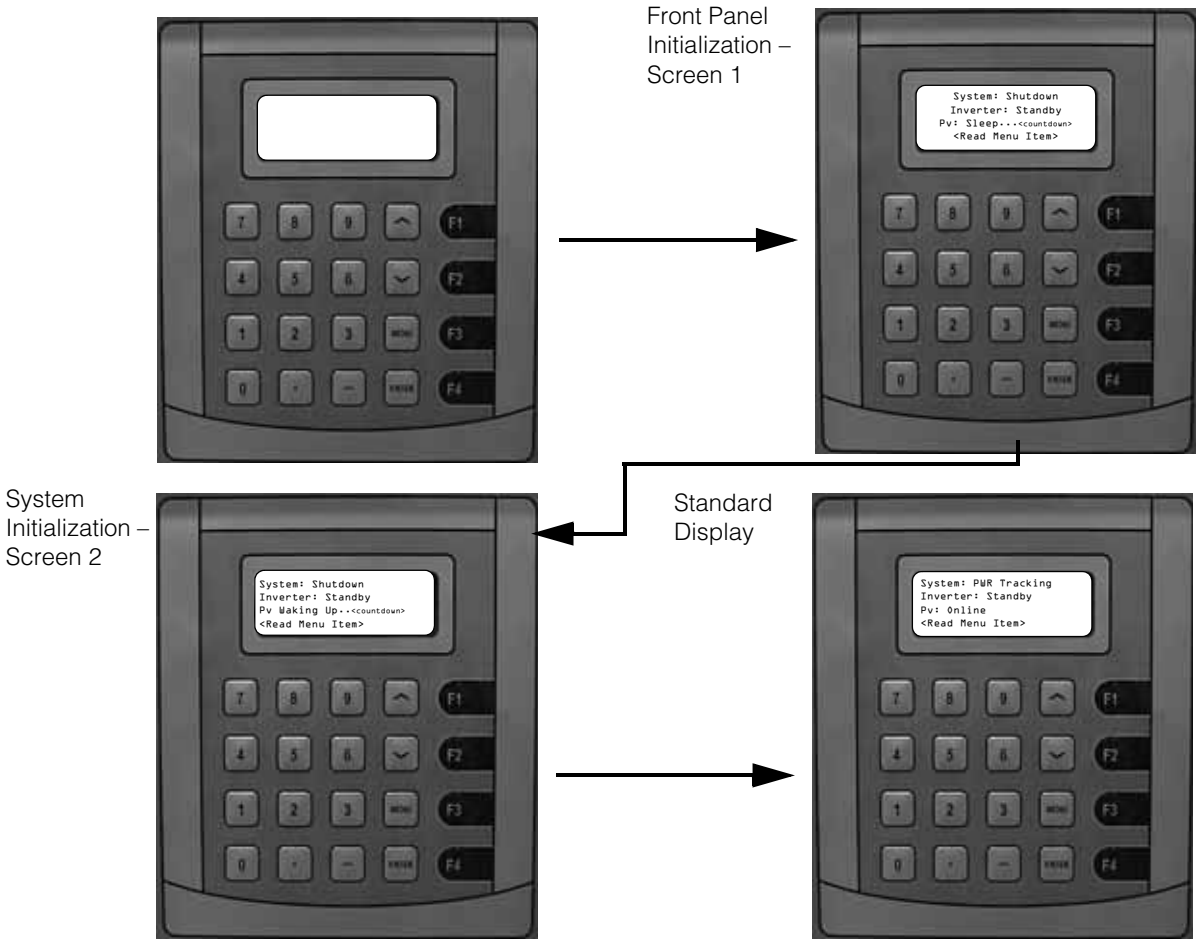


Figure 2-4 Initialization Screens

Standard Display

The standard display provides the following information:

- First Line – System Status (ID 1)
- Second Line – Inverter Status (ID 4)
- Third Line – PV Status (ID 13)
- Fourth Line – Goal State (ID 2)

Menu Structure

The operator interface consists of three levels:

- READ Menu – operation information provided ***to*** the user ***from*** the Xantrex GT500 MVX or Xantrex GT500 MVX PG. The READ menu consists of all operational values, the date, and the time. These can be viewed any time the Xantrex GT500 MVX or Xantrex GT500 MVX PG has control power.
- WRITE Menu – operational parameters provided ***from*** the user ***to*** the Xantrex GT500 MVX or Xantrex GT500 MVX PG. The WRITE menu consists of a goal state sub-menu and all system configurable parameters. The WRITE menu can be viewed any time the Xantrex GT500 MVX or Xantrex GT500 MVX PG has control power. However, modifying the parameters requires a password and must only be done by trained service technicians. Specifically, parameters relating to utility protection setpoints should not be modified.
- Data Logging – the collection of specific parameter values over a period of time. The data logging feature is available only if using the Xantrex GT View GUI. See the list of stored parameters on page 1–14.

Information reported back to the user (READ menu) is shown on the display above the keypad and (if used) at the computer running the Xantrex GT View GUI monitoring program. Making changes to the parameters within the WRITE menu is done with the keypad or the GUI software program and requires a password.

Important: Specific grid-interface parameters within the WRITE menu have been set in the factory to the limits mandated by UL 1741. Any changes to these setpoints should be agreed upon by the local utility and the equipment owner.

Upon system powerup, the display shows the system operating state on the first line. The second line shows the inverter's state of operation, the third line shows the PV array's state of operation, and the fourth line shows the goal target.

Important: While in the WRITE menu, the operator interface display will reset itself to the standard display if there is no input for more than two minutes.

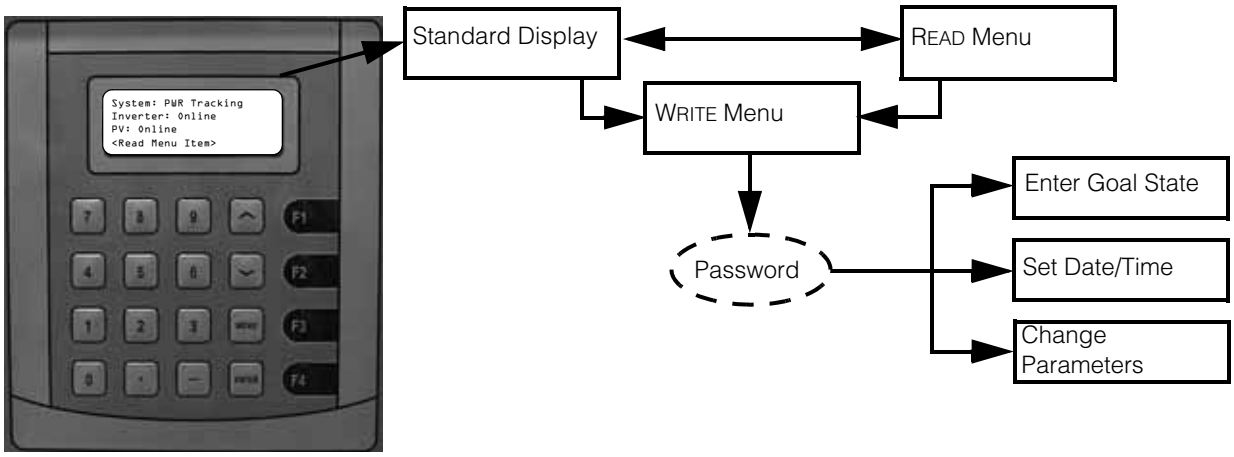


Figure 2-5 Operator Interface Menu Diagram

READ Menu

The READ menu includes the following information:

- Current Operating State or Goal State
- Fault Code (if applicable)
- Inverter State
- Line Voltage and Current
- Inverter Matrix (Bridge)
- Inverter Power
- PV State
- PV Voltage and Current
- PV Power
- Grid Frequency
- Accumulated Power

Table 2-1 shows how the third and fourth line of the display changes as the operator continues scrolling through the menu. Table 2-2 on page 2–13 provides a detailed description of READ menu operational values that are shown on the display.

To Display Any Operational Value in the READ Menu:

From the standard display, use the /\ or \/ key on the keypad to scroll through the READ menu. The fourth line of the display changes to show the appropriate information. See Table 2-1.

- The \/ key scrolls downward through the menu.
- The /\ key scrolls upward through the menu.

Table 2-1 Scrolling through the READ Menu Parameters

READ Menu Value	Fourth Line of the Display
FP Software Version	FP V151-0418-xx-xx
CCU Software Version	CCU 151-0143-xx-xx
Model Name	G T 5 0 0 k W
Date and Time	JUN-25-2007 15:35:05
Goal State	PWR Tracking
Inverter A-B Volt	INV A Volts:
Inverter B-C Volt	INV B Volts:
Inverter C-A Volt	INV C Volts:
Inverter A Current	INV A Amps:
Inverter B Current	INV B Amps:
Inverter C Current	INV C Amps:
Inverter AC Power	INV kW:
Left Inverter Matrix Temperature (Bridge)	L INV Temp:
Right Inverter Matrix Temperature (Bridge)	R INV Temp:
PV Voltage	PV Volts:
PV Current	PV Amps:
PV Power	PV kW:
AC Grid Frequency	Grid Freq:
Accumulated Power	kWH:

When scrolling through the READ menu parameter list, if the last item in the menu is reached the list returns to the first item.

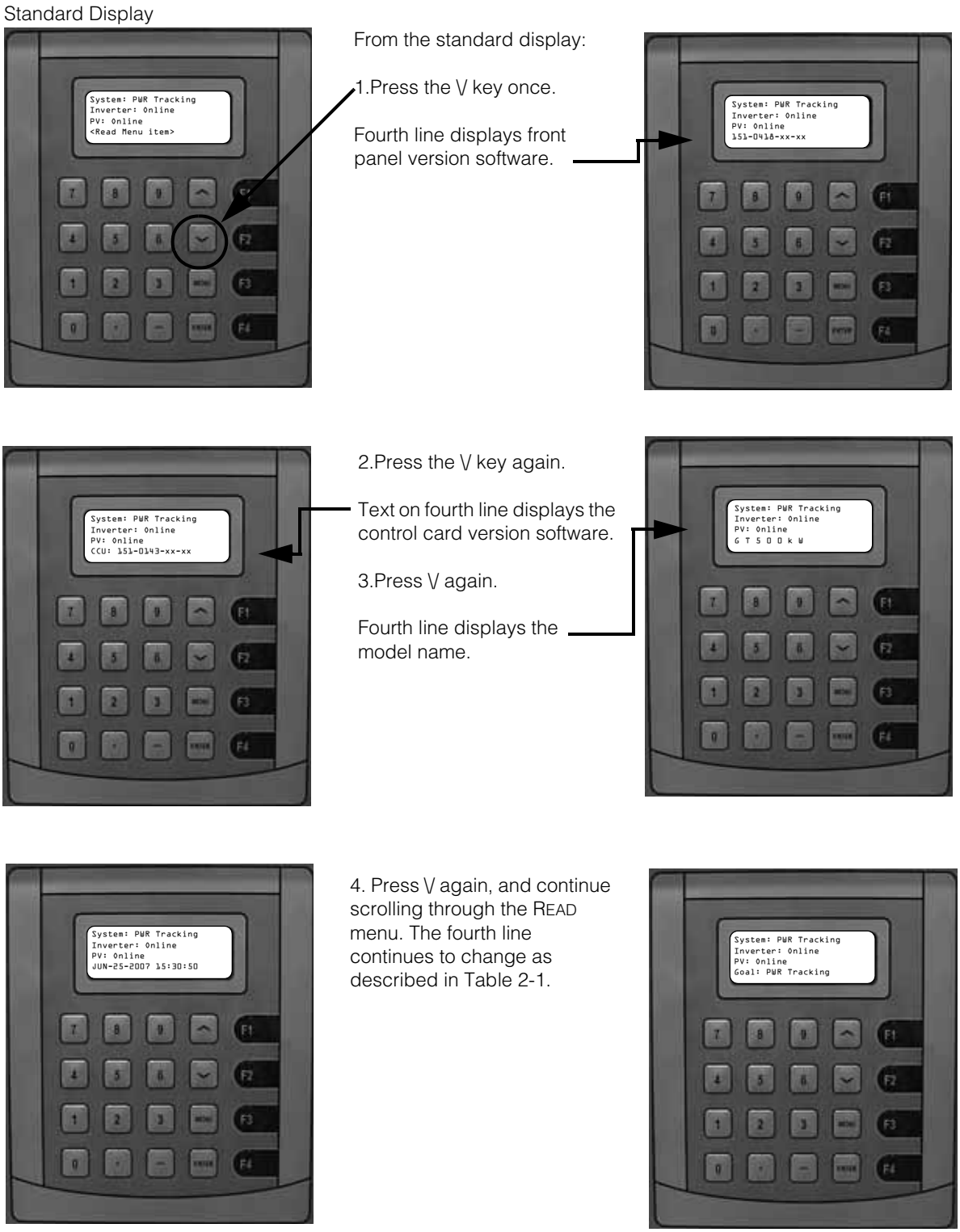


Figure 2-6 Scrolling Through the Read Menu

Table 2-2 Read Menu Descriptions

Operational Parameter	Description	ID	Units
Current Operating State Displays as: System: * where * can be any one of the states listed in the description for this parameter.	Current system states include the following. Initializing (0) Switched Off(1) Shutdown (2) Starting (3) PWR Tracking (4) Manual Current (5) Matrix Test (6) Faulted (7)	1	N/A
System Goal State Displays as: Goal: * where * can be any one of the states listed in the description for this parameter.	Goal States include the following. Shut Down (2) PWR Tracking (4) Manual Current (5) Matrix Test (6)	2	N/A
Fault code	See “Fault Code Descriptions” on page 3–4 for a detailed list and description of Fault Codes.	3	N/A
Inverter State Displays as: Inverter: * where * can be any one of the states listed in the description for this parameter.	Inverter States includes the following. Shutdown (0) Stand-by (1) Starting (2) Main-Settling (3) On-Line (4)	4	N/A
Line A–B voltage Displays as: INV A volts: xxx	AB Line to line voltage	5	V_{rms}

Table 2-2 Read Menu Descriptions

Operational Parameter	Description	ID	Units
Line B–C voltage Displays as: `INV B volts: xxx`	BC Line to line voltage	6	V_{rms}
Line C–A voltage Displays as: `INV C volts: xxx`	CA Line to line voltage	7	V_{rms}
Phase A current Displays as: `INV A amps: xxx`	Phase A current	8	A_{rms}
Phase B current Displays as: `INV B amps: xxx`	Phase B current	9	A_{rms}
Phase C current Displays as: `INV C amps: xxx`	Phase C current	10	A_{rms}
Inverter Real Power Displays as: `INV KW:`	Inverter Real Power	11	kW
Inverter Left Bridge Temperature Displays as: `L INV Temp.:`	Temperature of the Inverter Left IGBT Bridge heat sink	12	°C

PV State
 	
Displays as: `PV: *`
 	
where * can be any one of the states listed in the description for this parameter.
	PV States include the following.
	
	`Shut Down (0)`
	`Sleep (1)`
	`Wakeup (2)`
	`On-line (3)`
	`Sleep-test (4)`
		13	N/A

Table 2-2 Read Menu Descriptions

Operational Parameter	Description	ID	Units
PV Voltage Displays as: `PV Volt: xxx`	PV Voltage	14	VDC
PV Current Displays as: `PV amps: xxx`	PV Current	15	ADC
PV Power Displays as: `PV kW: xxx`	PV Power	16	kW
Grid Frequency Displays as: `Grid Freq:`	Grid Frequency	17	Hz
Inverter Right Bridge Temperature Displays as: `R INV Temp.:`	Temperature of the Inverter Right IGBT Bridge heat sink	21	°C
Accumulated Power Displays as: `KWH:`	Accumulated AC Power produced by the Xantrex GT500 MVX or Xantrex GT500 MVX PG since commissioning, or since the last KWH reset.	625	KWH

Read-by-ID

The Read-by-ID feature supports the ability of the user to view any READ or WRITE parameter available within the menu structure. See Table 2-2 for a list of the READ menu parameters.

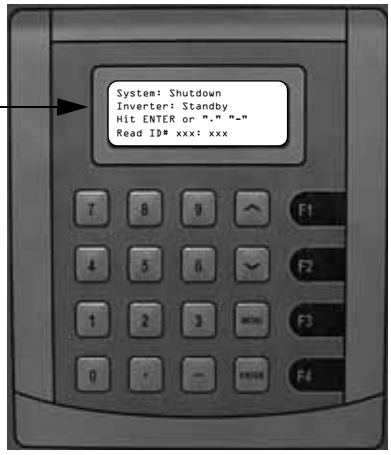
To use the Read-by-ID Feature:

1. From the standard display, press the \/ key to scroll downward through the menu to the Read-by-ID menu item. Stop when the third and fourth line of the display change as shown in Figure 2-7.
2. Press **ENTER** to enter the Read-by-ID feature.
3. Use the keypad to enter the ID number of the Data Log Configuration or Accumulated Value ID number, and then press **ENTER**. See Table 2-2 for a list of READ menu items and their ID numbers.
   a) Press the "." key to move upward in the menu structure.
   b) Press the "–" key to move backward in the menu structure. These keys only function in the Read-by-ID feature.

Press **ENTER** when this screen appears to access the Read-by-ID feature.

Use the keypad to enter the desired ID number, and then press **ENTER**. The display changes as shown and shows the requested value.

where:
xxx = any Menu ID
xxx = operational value of Menu ID



Use the "." and "–" keys to scroll backward and forward within the Read-by-ID menu.

Figure 2-7 Read-by-ID Feature

WRITE Menu

Important: Specific grid-interface parameters within the WRITE menu are set in the factory to the limits mandated by UL 1741. Any changes to these setpoints should be agreed upon by the local utility and the equipment owner.

The WRITE menu includes the following parameters:

- Min/Max AC Volts%
- Min/Max AC Volt Delay
- Min/Max AC Freq.
- Min/Max AC Freq. Delay
- PPT Voltage Reference
- PV Voltage Start
- PV Time (Start and Stop)
- PV Power Stop

- PPT Current Max%
- Manual Current%
- PPT Enable
- PPT Update Rate and Voltage Step
- Min Reconnect Voltage

Important: WRITE parameters can be viewed; however, changing them requires a password and must only be done by authorized personnel.

Table 2-3 provides a detailed description of WRITE parameters that are shown on the display.

Changing WRITE Menu Parameter Values

Follow the procedure below to change WRITE menu parameters.

To change WRITE menu parameters:

1. From the standard display or anywhere in the READ menu, access the WRITE menu parameters by pressing **MENU**.
2. The first item in the WRITE menu is `Set Goal State`. Use the /\ or \/ key on the operator interface keypad to scroll through the WRITE menu parameters.
   a) To change the displayed parameter, press **ENTER**. You will be asked for a password.
   b) Enter the password 594, and then press **ENTER**.
   - If the wrong password is entered, the display will again prompt for the password.
   - If a mistake is made while keying in the password, the /\ or \/ keys can be used as a backspace key.

   c) Enter the desired value and press **ENTER**. If the value entered is outside the acceptable range for the parameter, the original value will remain.
   d) To leave the WRITE menu and return to the READ menu, press **MENU** once and the standard display will reappear on the display.

Important: While in the WRITE menu, the operator interface display will reset itself to the standard display if there is no input for more than two minutes.

Table 2-3 Write Menu Parameters

Parameter	Description	ID	Units	Default Value	Maximum Value	Minimum Value
Set Goal State Displays as: `Hit ENTER to set Goal:`	Commands a Goal State. CMD To Shutdown CMD To PWR Tracking CMD To Manual I CMD To Matrix Test	N/A	N/A	N/A	N/A	N/A
Set Date Displays as: `042807`	The date is entered month-day-year (mmddyy): April 28, 2007 is entered `042807`.	N/A	N/A	N/A	N/A	N/A
Set Time: Displays as: `163000`	The time is entered in military hours-minutes-seconds (i.e., 24-hour clock): 4:30 pm is entered `163000`.	N/A	N/A	N/A	N/A	N/A
Maximum Grid Voltage Displays as: `Max AC Volts %:`	This parameter sets the trigger point value for the ***AC voltage high*** (0013) fault. If the grid voltage is over this parameter's value, the fault is triggered. The upper limit of this parameter is restricted by UL 1741 requirements.	32	Percentage of Nominal voltage	110	120	106
Minimum Grid Voltage Displays as: `Min AC Volts%:`	This parameter sets the trigger point value for the ***AC voltage low*** (0012) fault. If the grid voltage is below this parameter's value, the fault is triggered. The lower limit of this parameter is restricted by UL 1741 requirements.	33	Percentage of Nominal voltage	88	88	88

Table 2-3 Write Menu Parameters

Parameter	Description	ID	Units	Default Value	Maximum Value	Minimum Value
Maximum Grid Frequency Displays as: `Max AC Freq:`	This parameter sets the trigger point value for the *AC frequency high* (0011) fault. If the grid frequency is over this parameter's value, the fault is triggered. The upper limit of this parameter is restricted by UL 1741 requirements.	34	Hertz	60.5	N/A	N/A
Minimum Grid Frequency Displays as: `Min AC Freq:`	This parameter sets the trigger point value for the *AC frequency low* (0010) fault. If the grid frequency is below this parameter's value, the fault is triggered. The lower limit of this parameter is restricted by UL 1741 requirements.	35	Hertz	59.3	59.8	59.3
Peak Power Tracker Reference Voltage Displays as: `PPT V Ref:`	This is the initial PV voltage the inverter is going to try to keep as it goes into on-line mode. If the power tracker is off, the inverter will draw current from the PV array to maintain this reference voltage. If the power tracker is on, this is the reference voltage from which the inverter starts exploring voltages that produce more power.	37	Volts	400	590	300
PV Wakeup Voltage Displays as: `PV V Start:`	This is the trigger point that transitions the inverter from PV Sleep state to PV Wake Up state. When the PV voltage reaches the value of this parameter the inverter transitions into PV Wake Up mode.	38	Volts	440	590	300

Table 2-3 Write Menu Parameters

Parameter	Description	ID	Units	Default Value	Maximum Value	Minimum Value
Time Delay for PV Wake up Displays as: `PV T Start:`	This is the time delay to transition from PV Wake Up state to PV On-line state. Once the inverter is in PV Wake Up mode, it waits for the amount of time determined by this parameter before transitioning into PV on-line mode. During this time the inverter checks that the PV voltage is no less than the PV wake voltage, otherwise it goes into PV Sleep mode.	39	Seconds	300	1200	0
Time delay for PV Sleep Test Displays as: `PV T Stop:`	This is the amount of time the inverter will be in Sleep Test mode if the output power continues to be below ***PV P Stop***. The inverter will exit Sleep Test mode towards on-line mode if the power is over ***PV P Stop*** or towards Shutdown mode if the ***PV T Stop*** timer expires.	40	Seconds	300	1200	0
PV Output Power to Enter Sleep Test Mode Displays as: `PV P Stop:`	This is the output power trigger point for the inverter to transition into Sleep Test mode. When the output power is below the value of this parameter the inverter enters Sleep Test mode.	41	KW	1	10.0	0.1
Power Tracker Maximum Output Power Displays as: `I PPT Max:`	This parameter sets the percentage of maximum rated power the inverter will produce when in Power Tracker mode. For example, a 250 kW system with this parameter set to 50 will not attempt to produce more than 125 kW.	42	Percentage of maximum output power.	100	100	0

Table 2-3 Write Menu Parameters

Parameter	Description	ID	Units	Default Value	Maximum Value	Minimum Value
Manual Current Output Displays as: `I Manual:`	This parameter sets the percentage of maximum out current the inverter will attempt to produce while in Manual Current mode.	43	Percentage of maximum output current.	25	105	0
Enable Peak Power Tracker Displays as: `PPT Enable:`	This parameter switches the Power Tracker function on and off. When the Power Tracker is on, the inverter regulates the bus voltage to optimize output power. When the Power Tracker is off, the inverter regulates the bus voltage to maintain it at ***PPT V Ref*** volts.	44	0 = Off 1 = On	1	1	0
Power Tracker Rate Displays as: `PPT Rate:`	This parameter sets the rate at which the Power Tracker function makes changes to the voltage reference point as it tries to find the optimal position. For example, if the value of this parameter is 0.5, then every half second the Power Tracker will increase or decrease the voltage reference point to check if more power can be produced at the new level.	45	Seconds	0.5	50.0	0.1
Power Tracker Step Displays as: `PPT V Step:`	This parameter sets the size of the change the Power Tracker will make to the voltage reference point as it tries to find the optimal position. For example, if the value of this parameter is set to 1, the Power Tracker will increase or decrease the voltage reference point by one volt at a speed of ***PPT Rate*** to check if more power can be produced at the new level.	46	Volts	1	10.0	0.1

Table 2-3 Write Menu Parameters

Parameter	Description	ID	Units	Default Value	Maximum Value	Minimum Value
Minimum Reconnect Voltage	This parameter sets the reconnect voltage threshold. If the grid voltage is over this parameter's value, the fault is triggered. The lower limit of this parameter is restricted by UL 1741 requirements.	48	Percentage of Nominal voltage	106	120	106
Maximum AC Voltage Delay Displays as: `Max Volt Delay:`	This parameter sets the time delay value, in AC cycles, for the *AC voltage high* (0013) fault. If the grid voltage remains above the maximum AC voltage setting (Max AC Volts%) for the duration of this delay period, the fault is triggered. The limits of this parameter are restricted by UL 1741 requirements.	56	AC cycles	12	N/A	N/A
Minimum AC Voltage Delay Displays as: `Min Volt Delay:`	This parameter sets the time delay value, in AC cycles, for the *AC voltage low* (0012) fault. If the grid voltage remains below the minimum AC voltage setting (Min AC Volts%) for the duration of this delay period, the fault is triggered. The limits of this parameter are restricted by UL 1741 requirements.	57	AC cycles	24	N/A	N/A
Maximum AC Frequency Delay Displays as: `Max Hz Delay:`	This parameter sets the time delay value, in AC cycles, for the *AC Frequency High* (0011) fault. If the grid frequency remains above the maximum AC frequency setting (Max AC Freq) for the duration of this delay period, the fault is triggered. The limits of this parameter are restricted by UL 1741 requirements.	58	AC cycles	2	N/A	N/A

Table 2-3 Write Menu Parameters

Parameter	Description	ID	Units	Default Value	Maximum Value	Minimum Value
Minimum AC Frequency Delay Displays as: `Min Hz Delay:`	This parameter sets the time delay value, in AC cycles, for the *AC Frequency Low* (0010) fault. If the grid frequency remains below the minimum AC frequency setting (Min AC Freq) for the duration of this delay period, the fault is triggered. The limits of this parameter are restricted by UL 1741 requirements.	59	AC cycles	10	300	10
AC Auto-Clear Delay Displays as: `AutoClear Delay:`	This parameter sets the time delay value, in seconds, for the Auto-Clear feature corresponding with the AC voltage and frequency (0013, 0012, 0011, and 0010) faults. The AC voltage and frequency must remain within their respective limits before an Auto-Clear can occur. The limits of this parameter are restricted by UL 1741 requirements.	60	Seconds	300	300	10
Modbus Protocol ON Displays as: `Modbus ON:`	This parameter sets the protocol used by the serial port (J8) on the control card. It can be set to either Modbus ON (1) or Modbus OFF (0) [manufacturer protocol].	61	0=Off 1=On	1	1	0
Modbus Address Displays as: `Modbus Address:`	This parameter sets the address used by the Modbus protocol.	62		N/A	N/A	N/A

Commanding Goal State Changes

To change the goal state:

1. From the standard display, press **MENU**. The third line of the display changes to `Hit ENTER to set` and the fourth line changes to `Goal:`.
2. Press **ENTER**. You will be prompted for a password. The third line of the display changes to `Hit ENTER to set` and the fourth line changes to `Password:`.
3. Enter the password 594, and then press **ENTER**.
4. Scroll through the goal state menu with the /\ or \/ keys until the desired goal state is displayed on the fourth line of the display.
5. Press **ENTER**. The display shows the following prompt on the third line: `Press F4 to Confirm`.
6. Press **F4**, and the Xantrex GT500 MVX or Xantrex GT500 MVX PG will transition to the requested goal state. If the requested goal state violates the conditions of the state machine, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will remain in the previous state of operation.

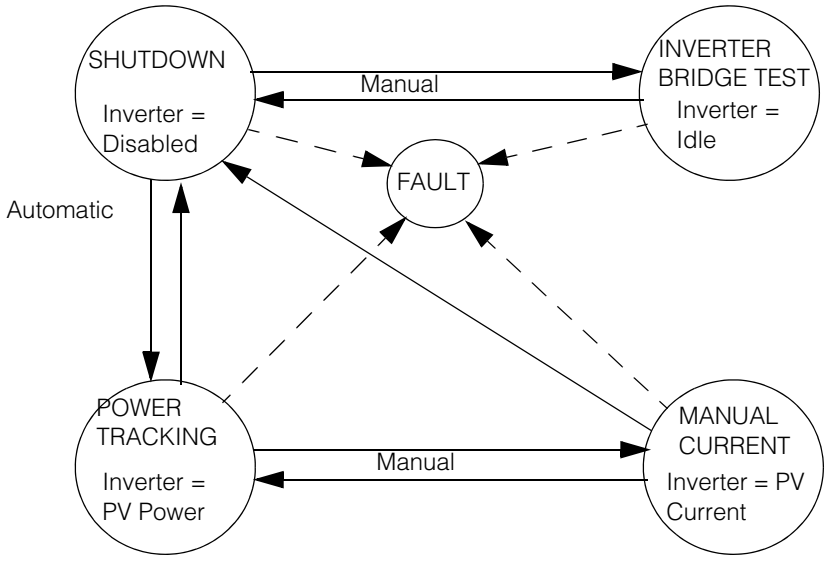


Figure 2-8 State Transition Diagram

Setting the Date and Time

Follow the procedure below to change the date and time.

To change the Date and Time:

1. From the standard display, press **MENU**. The third line of the display changes to `Hit ENTER to set` and the fourth line changes to `Goal:`.
2. Use the \/ key to scroll down until date or time parameters are reached.
   a) If you are changing the date, the third and fourth lines of the display are:
   ```
   Type and hit ENTER
   Set Date: "MMDDYY
   ```
   b) If you are changing the time, the third and fourth lines of the display are:
   ```
   Type and hit ENTER
   Set Time: "HHMMSS
   ```
3. Press **ENTER**. You will be prompted for a password. The third and fourth lines of the display change to:
   ```
   Hit ENTER to set
   Password:.
   ```
4. Enter the password 594, and then press **ENTER**.
5. Enter the proper date or time in a six digit format, and then press **ENTER**.
   - The date is entered month-day-year (mmddyy). For April 28, 2005, enter `042805`.
   - The time is entered in military hours-minutes-seconds (24-hour clock). For 4:30 pm, enter `163000`.

   If you make a mistake while entering the date or time, the /\ and \/ keys can be used as a backspace key. Any two-digit year (yy) may be entered for the date, but regardless of the keyed entry, the maximum month/day (mmdd) that will be accepted is “1231” or Dec. 31st. The maximum allowable time entry that will be accepted is “235959”.
6. Once the entry is accepted, the third and fourth lines of the display revert back to the following:
   a) If you are changing the date, the third and fourth lines of the display are:
   ```
   Hit ENTER to set
   Set Date:
   ```
   b) If you are changing the time, the third and fourth lines of the display are:
   ```
   Hit ENTER to set
   Set Time:
   ```
7. Press **MENU** to return to the standard display.

Manual State Transitions

State conditions can also be transitioned manually. Refer to “Commanding Goal State Changes” on page 2–24 for instructions on transitioning goal states for the Xantrex GT500 MVX or Xantrex GT500 MVX PG manually.

Shutdown → Inverter Bridge Test → Shutdown

1. Turn the ENABLE/DISABLE switch to the DISABLE position.
2. Command the Xantrex GT500 MVX or Xantrex GT500 MVX PG to the inverter bridge (matrix) test.
3. After completing the inverter bridge test, command the Xantrex GT500 MVX or Xantrex GT500 MVX PG to Shutdown.

If the ENABLE/DISABLE switch is turned to ENABLE while the Xantrex GT500 MVX or Xantrex GT500 MVX PG is in the inverter bridge test state, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will transition to Shutdown.

Power Tracking→ Manual Current→ Power Tracking or Shutdown

1. Verify the PV manual current parameter (`I Manual %`) is set to the desired percent of rated.
2. Command the Xantrex GT500 MVX or Xantrex GT500 MVX PG to manual current mode from the operator interface keypad. While in the manual current mode, the user may change the PV manual current parameter. However, the user may demand greater current than the capacity of the PV array. If this causes the PV voltage to drop below the minimum operating voltage (300 VDC), the Xantrex GT500 MVX or Xantrex GT500 MVX PG will transition to Shutdown.
3. To exit the manual current mode, the user must manually command the Xantrex GT500 MVX or Xantrex GT500 MVX PG to Power Tracking.

Automatic State Transitions

State conditions can also be transitioned automatically. Refer to “Commanding Goal State Changes” on page 2–24 for instructions on commanding Xantrex GT500 MVX or Xantrex GT500 MVX PG goal states.

Shutdown → Power Tracking → Shutdown

1. The ENABLE/DISABLE switch must be turned to the ENABLE position.
2. Once the PV voltage exceeds the PV voltage start set point (`PV V Start`) the Xantrex GT500 MVX or Xantrex GT500 MVX PG will start a wake-up timer (`PV T Start`).
   - If the PV voltage remains above the PV start voltage set point for the duration of the wake-up timer, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will transition to Power Tracking.
   - If the PV power drops below the PV power stop set point, (`PV P Stop`) the Xantrex GT500 MVX or Xantrex GT500 MVX PG will start a PV sleep timer (`PV T Stop`).
   - If the PV voltage and power remain below their respective setpoints for the duration of the sleep timer, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will transition to Shutdown.

Any State → Fault

If the Xantrex GT500 MVX or Xantrex GT500 MVX PG encounters a fault, regardless of operating state, it will transition to the Fault state. The Xantrex GT500 MVX or Xantrex GT500 MVX PG will remain in this state until the fault condition has been remedied and cleared. The Fault Code number appears on the first line of the display. A description of the fault is shown on the second line. The third line reads `F1 to Clear Fault?`. The fourth line shows the goal state.

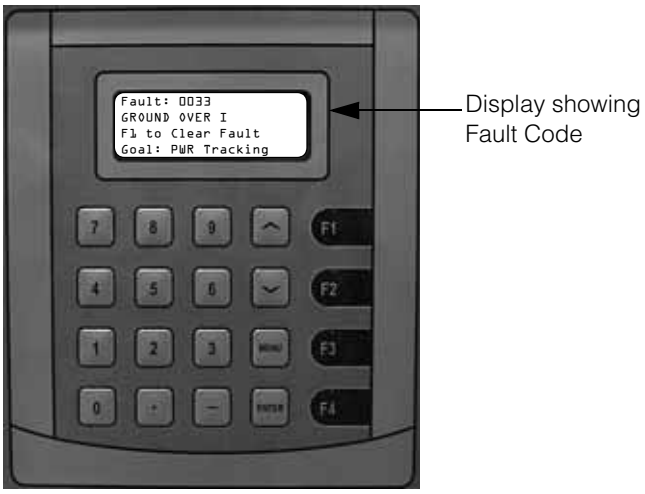


Figure 2-9 Display Showing Fault Code

To clear the fault:

1. See Table 3-1, “Fault Codes” on page 3–4 for a complete listing of Fault Codes and possible remedies. Correct the fault condition if possible, and attempt to clear the fault by pressing **F1**.
2. Faults can only be cleared from the READ menu. If a fault occurs while accessing the WRITE menu, press **MENU** once to return to the READ menu, and `F1 to Clear Fault` will appear on the third line of the display.

Auto-restart Feature

In the event of a utility voltage or frequency excursion outside of those specified in Table A-3 on page A–4, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will automatically transition to a Fault condition. Once the utility voltage and frequency recover and remain within the excursion limits for a period set by the Auto-Clear Delay (ID 60), the Xantrex GT500 MVX or Xantrex GT500 MVX PG will automatically clear the fault, and then resume normal operation.

Energize Procedure (Startup)

WARNING

Make sure the Xantrex GT500 MVX or Xantrex GT500 MVX PG has been installed by a qualified installer and verified following the instructions in the Xantrex GT500 MVX and Xantrex GT500 MVX PG Grid-Tied Photovoltaic Inverter Planning and Installation Manual (Document Part Number 975-0553-01-01). Make sure enclosure doors are shut and secured.

To start up the Xantrex GT500 MVX and Xantrex GT500 MVX PG:

1. Remove any lockout devices from the utility connection circuit breaker and PV disconnect switch.
2. Close the utility connection circuit breaker.
3. Close the PV array disconnect.
4. Close the AC circuit breaker by pressing the PUSH TO CLOSE (CB1) button located on the inverter's AC circuit breaker. To close the breaker, it must indicate OPEN and CHARGED OK. If the breaker indicates DISCHARGED, you must charge the closing spring with sufficient energy for closing:
   a) Use the charging handle located on the front of the breaker to charge the closing spring. Pump the handle until you hear a click and the indicator shows CHARGED OK.
   b) Press the PUSH TO CLOSE button on the circuit breaker. The breaker should now indicate CLOSED.
5. Close the DC disconnect switch (S1).
6. Turn the ENABLE/DISABLE switch (S3) to the ENABLE position.

After a 15 second initialization period, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will automatically transition to ***Waking Up***, given the PV voltage is greater than the PV V Start set point.

Lockout and Tag (De-energize/Isolation Procedure)

See “Lockout and Tag (De-energize/Isolation Procedure) for Inverter with Barriers Installed” on page ix.

Computer Communications with the Xantrex GT500 MVX and Xantrex GT500 MVX PG

The Xantrex GT500 MVX and Xantrex GT500 MVX PG provide an option for communicating system status, oscillography, or data logging through a personal computer via an RS232 connection and a modem using the Xantrex GT View GUI software. System status, oscillography, and data logging are also available via the RS485/Modbus connection.

The Xantrex GT View GUI software is a Windows™-based program that:

- displays system status.
- accesses inverter controls.
- accesses metering and data logging capabilities.
- controls protective functions.

If multiple inverters are networked together, the software is capable of tracking multiple inverters on the same network.

Make sure the appropriate hardware is in place before proceeding with installing the GUI. See the “PC Connection Methods” section of the Xantrex GT500 MVX and Xantrex GT500 MVX PG Grid-Tied Photovoltaic Inverter Planning and Installation Manual (Document Part Number 975-0553-01-01) for instructions on establishing the desired connection if this has not already been done.

3 Troubleshooting

Chapter 3, “Troubleshooting” contains information and procedures for troubleshooting Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters. It provides descriptions of common situations and errors that may occur and provides possible solutions for resolving fault conditions. It also provides instructions for clearing faults manually, if required.

Faults and Fault Codes

Fault states are automatic from any state of operation. In the event of a fault condition, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will immediately stop processing power and execute an orderly shutdown, open both the main AC and DC contactors, and remain in a faulted state until the fault is remedied and cleared (manually or automatically).

- Faults associated with a grid disturbance or air duct intake temperature excursions clear automatically. The Xantrex GT500 MVX or Xantrex GT500 MVX PG will automatically restart after a period set by Auto-Clear delay or five minutes respectively.
- All other faults must be cleared manually.

All fault conditions arising from within the Xantrex GT500 MVX or Xantrex GT500 MVX PG are reported to the four-line display which will show a hexadecimal value (fault code) and a brief description of the fault. Most faults are latching and only those faults associated with grid disturbances are auto-clearing and thus enable the Xantrex GT500 MVX or Xantrex GT500 MVX PG to restart after a delay period.

Once the cause of the fault has been identified and corrected, and it is determined to be safe to proceed, Xantrex GT500 MVX and Xantrex GT500 MVX PG faults can be manually cleared using the keypad or using the remote GUI. See “Clearing Faults Manually” on page 3–3 for instructions on this procedure.

General Troubleshooting

Respond to any Xantrex GT500 MVX and Xantrex GT500 MVX PG alarm or fault as follows:

1. Note and document the alarm or fault code and brief text description.
2. Determine the source of the alarm or fault by referring to Table 3-1, “Fault Codes” on page 3–4.
3. Rectify the alarm or fault condition, determine it is safe to proceed, and attempt to clear the fault from the display using the keypad. See “Clearing Faults Manually” on page 3–3 for instructions on this procedure.

Important: Before clearing a fault, it is recommended that the oscillography data be retrieved from the control card. The log will start recording again, and overwrite the previous data, once the fault is cleared.

4. If the condition is sustained and cannot be corrected, again note and document the fault code and description, and contact either your Distributor / Reseller, or Customer Service.

WARNING: Lethal Voltage

- Review the system configuration to determine all of the possible sources of energy.
  In order to remove all sources of voltage from the Xantrex GT500 MVX or Xantrex GT500 MVX PG, the incoming power must be de-energized at the source. This may be done at the main utility circuit breaker, the PV array disconnect, and by opening the AC circuit breaker and the DC disconnect switch on the Xantrex GT500 MVX or Xantrex GT500 MVX PG.
- In addition, allow five minutes for the DC bus capacitors to discharge after removing power. Follow the “Lockout and Tag (De-energize/Isolation Procedure) for Inverter with Barriers Installed” procedure on page ix to de-energize the Xantrex GT500 MVX or Xantrex GT500 MVX PG.

Clearing Faults Manually

Faults associated with a grid disturbance clear automatically. These faults include:

- 0010 (AC Frequency Low)
- 0090 (Fast AC Frequency Low)
- 0011 (AC Frequency High)
- 0012 AC Voltage Low)
- 0092 (Fast AC Voltage Low)
- 0013 (AC Voltage High)
- 0093 (Fast AC Voltage High)
- 0015 (Grid Disconnect)

Once the utility recovers and remains within the excursion limits for a period set by the Auto-Clear Delay (ID 60), the Xantrex GT500 MVX or Xantrex GT500 MVX PG will automatically clear the fault and resume normal operation.

All other faults associated with the Xantrex GT500 MVX and Xantrex GT500 MVX PG must be identified, corrected, and then cleared manually using the keypad or GUI. The following procedure describes how to manually clear a fault message from the display.

To clear the fault:

1. Determine the source of the fault using Table 3-1, “Fault Codes” on page 3–4. Correct the fault condition.
2. Make sure the fault code and `Clear Fault?` message is shown on the display. If the `Clear Fault?` message is not shown on the second line of the display, scroll through the READ menu with the /\ or \/ key until the message appears.
3. To clear the fault, press **ENTER**. The Xantrex GT500 MVX or Xantrex GT500 MVX PG will immediately transition to Power Tracking mode.

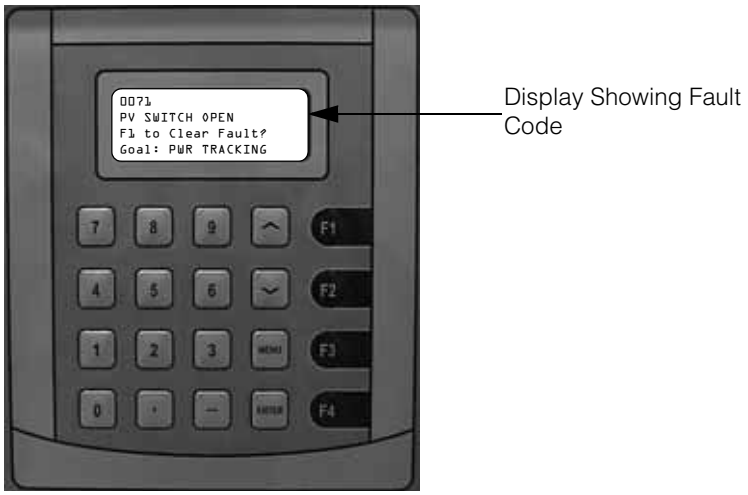


Figure 3-1 Display Showing Fault Code

Important: If the fault does not clear, the fault condition has not been corrected.

Fault Code Descriptions

Table 3-1 provides a complete description of all the fault conditions that can occur on the Xantrex GT500 MVX or Xantrex GT500 MVX PG. Default values are shown, but some limits are user-settable.

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0000	No Faults	N/A	N/A	N/A
0010	AC Frequency Low	S	This fault indicates that the utility grid frequency is below or fell below the minimum allowed value of 59.3 Hz (default) for greater than 10 AC cycles. This fault is auto-clearing. Once the utility grid frequency has recovered to within the acceptable operating range, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will qualify the value and automatically clear this fault and resume normal operation after a delay period.	Utility grid frequency fell below the allowable limit

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0011	AC Frequency High	S	This fault indicates that the utility grid frequency is above or rose above the maximum allowed value of 60.5 Hz (default) for greater than 10 AC cycles. This fault is auto-clearing. Once the utility grid frequency has recovered to within the acceptable operating range, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will qualify the value and automatically clear this fault and resume normal operation after a delay period.	Utility grid frequency rose above the allowable limit
0012	AC Voltage Low	S	This fault indicates that the utility grid voltage is below or fell below the minimum allowed value of 88% of nominal Vac for greater than 24 cycles. This fault is auto-clearing. Once the utility grid voltage has recovered to within the acceptable operating range, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will qualify the value and automatically clear this fault and resume normal operation after a delay period.	• Utility grid voltage fell below the allowable limit • P1001 on control card is loose or disconnected
0013	AC Voltage High	S	This fault indicates that the utility grid voltage is above or rose above the maximum allowed value of 110% (default) of nominal Vac for greater than 12 cycles. This fault is auto-clearing. Once the utility grid voltage has recovered to within the acceptable operating range, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will qualify the value and automatically clear this fault and resume normal operation after a delay period	• Utility grid voltage rose above the allowable limit • Neutral connection at TB1-N may be loose or disconnected

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0015	Grid Disconnection	S	This fault indicates that the highest of the three filtered line-to-line grid voltages is greater than 123% of the nominal voltage. This normally is the result of a sudden disconnection from the utility grid while the Xantrex GT500 MVX or Xantrex GT500 MVX PG was processing power.	K1 was opened while the Xantrex GT500 MVX and Xantrex GT500 MVX PG was processing power
0016	DC Contactor	S	This fault indicates that the input voltage measurement is different from the output voltage measurement by 50 V.	This condition generally happen in a low light condition. This fault does not clear automatically. Press F1 on the keypad to clear the fault.
0018	AC/DC Contactor Open	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected the AC contactor, DC contractor, or both contactors are open when they should be closed.	• K1 was opened while the Xantrex GT500 MVX and Xantrex GT500 MVX PG was processing power • SSR1 failed • TS1, TS2, TS3 or TS4 opened
0020	Capacitor Fuse Open	S	This fault indicates that the AC filter capacitor fuses F1-F3 have blown	• C1 capacitor has failed • Loose or disconnected wires to S5
0021	PV Over-Voltage	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected a DC input voltage of greater than the maximum allowed value of 600 VDC.	• PV system wiring short • Lightning strike on PV system wiring

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0023	Bus Voltage High	H	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the DC bus voltage has exceeded the maximum allowed value of 637 VDC.	• PV system wiring short • Lightning strike on PV system wiring
XX31	Left Inverter Bridge Over Current	H	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the AC current on one or more phases of the left bridge has exceeded the maximum allowed value of 1388 A_{peak}. The first two digits of the fault code indicate the particular phase where the over current occurred as follows: • 0131 – Left inverter bridge over current in phase A • 0231 – Left inverter bridge over current in phase B • 0431 – Left inverter bridge over current in phase C If more than one phase faults simultaneously, the two first digits are added in hexadecimal form to indicate an over current condition in more than one phase, thus the error code will contain the summation of the faulted phases.	• P3 or P1002 on control card is loose or disconnected • AC system wiring short

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
XX32	Right Inverter Bridge Over Current	H	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the AC current on one or more phases of the right bridge has exceeded the maximum allowed value of 1388 A_{peak}. The first two digits of the fault code indicate the particular phase where the over current occurred as follows: • 0832 – Right inverter bridge over current in phase A • 1032 – Right inverter bridge over current in phase B • 2032 – Right inverter bridge over current in phase C If more than one phase faults simultaneously, the two first digits are added in hexadecimal form to indicate an over current condition in more than one phase, thus the error code will contain the summation of the faulted phases.	• P3 or P1002 on control card is loose or disconnected • AC system wiring short
0033	Ground Over Current	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the ground fault current has exceeded the maximum allowed value (5 ADC).	• P3 or P2 on control card is loose or disconnected • Ground -to-AC or DC-to-System wiring short • F4 is blown • F4 fuse holder is open

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0040	Programming Software	S	This code indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the system is in Programming mode. This fault does not indicate any malfunction with the Xantrex GT500 MVX or Xantrex GT500 MVX PG. It is merely an indication that the system software is in the process of being downloaded into the EEPROMs of the control card.	N/A
0041	State Invalid	S	The state machine implemented within the control card system software governs the operation of the Xantrex GT500 MVX and Xantrex GT500 MVX PG. This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected an unknown system variable and has encountered an invalid state.	• Internal RAM error • CPU error
0042	Serial EEPROM Write Error	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected a serial EEPROM write error. The control card performs a verification check of data written to ROM compared to what is read back.	• Internal ROM error • CPU error
0043	Serial EEPROM Timeout	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that, when writing data to the serial EEPROM, a confirmation timer of 300 mS has expired.	• Internal ROM error • CPU error

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0044	Bad NOVRAM Memory	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that one of the two non-volatile memory banks on the control card board has failed. The control card performs a series of tests to confirm the validity of the NOVRAM, and one of the two banks has produced errors.	• Internal NOVRAM error • CPU error
0045	Interrupt 2 Timeout	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that an interrupt 2 timeout has occurred. The control card board performs a conversion validation of analog-to-digital data within the A to D converters. If validation of the conversion is not performed within 500 mS, an interrupt 2 timeout fault will occur.	• Internal A to D converter error • CPU error
0047	Software Test	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that a software test fault has occurred. This is a simulated fault used for debugging purposes.	N/A
0048	Bad Memory	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the SRAM DIMM on the control card board has failed. The control card performs a series of tests to confirm the validity of the SRAM, and the memory module has produced errors.	• Internal SRAM error • CPU error

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
XX50	Left IGBT Gate Drive	H	The control card sends digitized timing signals for gating the IGBTs via the driver board and bidirectional fiber optic communication. This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that an IGBT gate drive fault has occurred on the left inverter bridge. The first two digits of the fault code indicate the particular IGBT that reported the fault, as follows: • 0150 (A+) • 0250 (A-) • 0450 (B+) • 0850 (B-) • 1050 (C+) • 2050 (C-) If more than one IGBT faults simultaneously, the two first digits are added in hexadecimal form to indicate that the gate drive fault has occurred in more than one phase, thus the error code will contain the summation of the faulted phases.	• Fiber-optic harness is loose or disconnected • Control card ±15 VDC Power Supply is defective • P1 on driver board is loose or disconnected

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
XX51	Right IGBT Gate Drive	H	The control card sends digitized timing signals for gating the IGBTs via the driver board and bidirectional fiber optic communication. This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that an IGBT gate drive fault has occurred on the right inverter bridge. The first two digits of the fault code indicate the particular IGBT that reported the fault, as follows: • 0153 (A+) • 0253 (A-) • 0453 (B+) • 0853 (B-) • 1053 (C+) • 2053 (C-) If more than one IGBT faults simultaneously, the two first digits are added in hexadecimal form to indicate that the gate drive fault has occurred in more than one phase, thus the error code will contain the summation of the faulted phases.	• Fiber-optic harness is loose or disconnected • Control card ±15 VDC Power Supply is defective • P1 on driver board is loose or disconnected
0060	Left Inverter Bridge Temperature	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the temperature of the left inverter bridge heat sink has exceeded the maximum allowed value of 97 °C.	• External cooling fan inoperable • Air flow on heat sink impeded due to accumulation of debris • Operation above rated ambient temperature for an extended period of time

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0061	Right Inverter Bridge Temperature	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the temperature of the right inverter bridge heat sink has exceeded the maximum allowed value of 97 °C.	• External cooling fan inoperable • Air flow on heat sink impeded due to accumulation of debris • Operation above rated ambient temperature for an extended period of time
0071	PV Switch Open	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the DC disconnect switch (S1) is open and the auxiliary switch is in the active position. This fault is primarily for the safety of personnel. Opening the DC disconnect switch while the Xantrex GT500 MVX or Xantrex GT500 MVX PG is processing power will cause an immediate orderly shutdown of the system.	• DC disconnect switch is open and auxiliary switch is active • Auxiliary switch is inoperable • P2 or P3 on control card is loose or disconnected • Control card +/-15 VDC Power Supply is defective
0075	Shutdown Remotely	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the system was commanded via the GUI to transition to the Shutdown state. This fault is not indicative of a failure or malfunction, but primarily used to disable the system remotely.	Remote Shutdown command via the GUI

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0080	Left Inverter Bridge Not ON	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the left inverter bridge was not enabled after having sent a command for it to turn on. The control card sends an acknowledge bit to confirm the command is received. This fault is primarily a watch-dog between software and hardware to ensure control of the left inverter bridge.	• Software acknowledge bit not accepted • FPGA inoperable
0081	Right Inverter Bridge Not ON	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the right inverter bridge was not enabled after having sent a command for it to turn on. The control card sends an acknowledge bit to confirm the command is received. This fault is primarily a watch-dog between software and hardware to ensure control of the right inverter bridge.	• Software acknowledge bit not accepted • FPGA inoperable
0084	Left Inverter Bridge Not OFF	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the left inverter bridge was not disabled after having sent a command for it to turn off. The control card sends an acknowledge bit to confirm the command is received. This fault is primarily a watch-dog between software and hardware to ensure control of the left inverter bridge.	• Software acknowledge bit not accepted • FPGA inoperable

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0085	Right Inverter Bridge Not OFF	S	This fault indicates that the Xantrex GT500 MVX or Xantrex GT500 MVX PG has detected that the right inverter bridge was not disabled after having sent a command for it to turn off. The control card sends an acknowledge bit to confirm the command is received. This fault is primarily a watch-dog between software and hardware to ensure control of the right inverter bridge.	• Software acknowledge bit not accepted • FPGA inoperable
0090	Fast AC Freq Low	S	This fault indicates that the utility grid frequency is below or fell below the minimum allowed value of 59.2 Hz (Fixed) for greater than 2 AC cycles (Fixed). This fault is auto-clearing. Once the utility grid frequency has recovered to within the acceptable operating range, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will qualify the value, automatically clear this fault, and resume normal operation after delay period.	Utility grid frequency fell below the allowable limit.

Table 3-1 Fault Codes

Error Code	Fault Source(s)	Fault Type H=Hardware S=Software	Fault Description	Possible Causes
0092	Fast AC Voltage Low	S	This fault indicates that the utility grid voltage is below or fell below the minimum allowed value of 88% (Fixed) of nominal Vac for greater than 10 cycles (Fixed). This fault is auto-clearing. Once the utility grid voltage has recovered to within the acceptable operating range, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will qualify the value, automatically clear this fault, and resume normal operation after a delay period.	• Utility grid voltage fell below the allowable limit. • P1001 on control card is loose or disconnected.
0093	Fast AC Voltage High	S	This fault indicates that the utility grid voltage is above or rose above the maximum allowed value of 120% (Fixed) of nominal Vac for greater than 2 AC cycles (Fixed). This fault is auto-clearing. Once the utility grid voltage has recovered to within the acceptable operating range, the Xantrex GT500 MVX or Xantrex GT500 MVX PG will qualify the value, automatically clear this fault, and resume normal operation after a delay period.	Utility grid voltage rose above the allowable limit.
0119	Circuit Breaker Open	S	This fault indicates that the circuit breaker CB1 is OPEN	N/A
0219	Circuit Breaker Trip	S	This Fault indicates that the circuit breaker CB1 has tripped	• Utility grid over current. • A component failure in the inverter.

4 Preventive Maintenance

Chapter 4, “Preventive Maintenance” contains information and procedures for performing preventive maintenance on Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters.

Maintenance Safety

Prior to following any maintenance procedures, follow the “Lockout and Tag (De-energize/Isolation Procedure) for Inverter with Barriers Installed” on page ix.

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 been left behind inadvertently.

WARNING: Lethal Voltage

- Review the system configuration to determine all of the possible sources of energy.
  In order to remove all sources of voltage from the Xantrex GT500 MVX or Xantrex GT500 MVX PG, the incoming power must be de-energized at the source. This may be done at the main utility circuit breaker, the PV array disconnect, and by opening the AC circuit breaker and the DC disconnect switch on the Xantrex GT500 MVX or Xantrex GT500 MVX PG.
- In addition, allow five minutes for the DC bus capacitors to discharge after removing power. Follow the “Maintenance Intervals” on page 4–2 to de-energize the Xantrex GT500 MVX or Xantrex GT500 MVX PG.

Maintenance Intervals

The maintenance intervals must be adhered to in order to warrant safe and precise operation. The requirement for these maintenance intervals is an assembly at an average annual temperature of +20 °C, whereby the maximum cooling air must be within the +50 °C to -20 °C range.

In principle, customers choose between two types of maintenance intervals:

- maintenance interval determined by the environmental degree of pollution
- maintenance interval determined by facility’s operating time.

The manufacturer recommends at a minimum that the maintenance interval be annually.

Periodic Maintenance

The manufacturer recommends that the following preventive maintenance procedures be carried out on the Xantrex GT500 MVX and Xantrex GT500 MVX PG.

Monthly Interval or As Required

Perform the following preventive maintenance tasks on a monthly basis or as required.

Intake Air Duct Inspect the intake air ducts and external cooling fans for accumulation of dirt and debris. Accumulation of dirt and debris within the duct, bridge and inductor cooling fans will decrease their ability to move air and thus transfer heat away from the IGBT bridge heat sink and inductor, which may cause the Xantrex GT500 MVX or Xantrex GT500 MVX PG to enter a fault state based upon an over-temperature alarm. Remove and clean if debris is present.

Fan Operation Verify proper operation of the external cooling fans located at the rear of the enclosure. Remove and clean if debris is present.

Six Month Interval

Perform the following preventive maintenance tasks on a six-month basis or as required.

Enclosure Seals Inspect the enclosure door seal. If damaged, replace with equivalent closed cell foam gasket. Call the manufacturer's distributor for factory replacements or specifications.

Electrical Connections Inspect the condition of all wiring within and interfacing to the Xantrex GT500 MVX or Xantrex GT500 MVX PG. Inspect all compression-type cable terminations and box-type connections within the AC and DC interface, and the main inverter enclosure for damage caused from high temperature. Also check these terminations and connections for signs of corrosion. If any cabling or wiring within and interfacing to the Xantrex GT500 MVX or Xantrex GT500 MVX PG are found to be or are suspected to be unacceptable, contact the manufacturer's distributor for factory replacements or recommendations. Replacement of any damaged wires will be necessary.

Verify all mechanical connections are sufficiently tightened. Verify all conduction surfaces are clean and free of corrosion. Mechanical electrical connections may loosen over time primarily due to thermal cycling during normal operation. As electrical connections loosen, impedance will increase at the connection, eventually leading to possible fire and component damage. It is critical to check all electrical connections every six months. See termination torque specifications for AC connections in Table A-4 on page A–5. See termination torque specifications for DC connections in Table A-5 on page A–5.

Inductor Enclosure Remove the access panel on the inductors and inspect for any accumulated dirt and debris within the enclosure. Vacuum enclosure whenever dust or dirt is present.

A Specifications

Appendix A provides the environmental and electrical specifications for Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverters.

System Specifications

The Xantrex GT500 MVX and Xantrex GT500 MVX PG have been designed for photovoltaic power systems, which operate within the following specifications.

CAUTION: Equipment Damage

Operation of the Xantrex GT500 MVX or Xantrex GT500 MVX PG in a manner other than specified in this manual may cause damage to the Xantrex GT500 MVX or Xantrex GT500 MVX PG and other system components and will void the terms of the warranty.

Environmental Specifications

Table A-1 Environmental Specifications

Specification	Value
Dimensions	2246 mm H x 2286 mm W x 1260 mm D (88.4 in. H x 90.0 in. W x 49.6 in. D)
Unit Weight	1587 kg (3500 lbs)
Allowable Ambient Temperature	
Operating	-20 °C to 50 °C Maximum (-4 °F to 122 °F)
Storage	-20 °C to 50 °C Maximum (-4 °F to 122 °F)
Relative Humidity	Up to 95%, non-condensing
Elevation	2000 m (6600 ft)
Protection Class	NEMA 3R, zinc plated, highly reflective, powder coating finish.
Clearance (ventilation and serviceability)	
Top	305 mm (12 in)
Front	800 mm (31.5 in) (door clearance) plus local safety standards
Sides	0 mm (0 in)
Rear	0 mm (0 in)
Cabinet Color	Reflective white

Electrical Specifications

The Xantrex GT500 MVX and Xantrex GT500 MVX PG are designed and certified for full power operation at ambient temperatures up to 45 °C. Operation between 45 °C and 50 °C will result in reduced output power, and the front panel display will show that the inverter is in the “PV Derating” state. During this state, the inverter will regulate output power between 400 kW and 500 kW.

Table A-2 provides the AC and DC specifications for the Xantrex GT500 MVX and Xantrex GT500 MVX PG.

Table A-2 Electrical Specifications

Specification	Value
Nominal AC Output Voltage (+10% to -12% acceptable range)	208 Vac (183 to 229 Vac)
Maximum Continuous AC Output Current	1400 A_{rms}
Nominal AC Input Frequency (+0.5 to -0.7 Hz acceptable range)	60 Hz (59.3 to 60.5 Hz)
Line Power Factor	>0.99
Nominal Output Power	500 kW 45 C with derating to 50 C
Sell Power Range	1 kW to 500 kW
Peak Power Tracking Window	310 to 480 VDC
Maximum Open Circuit Voltage	600 VDC
Nominal DC Voltage	345 VDC
Maximum DC Current	1700 A
DC Current Ripple	< 2% at rated power
Maximum Array Short Circuit Current	2850 Adc
DC Back-feed Current	0 A
AC Current Distortion	< 5% THD at rated power
CEC Efficiency	97.0% (without transformer) 95.5% (with transformer)
Standby and Night-time Tare Loss	< 161 W

Regulatory Specifications

Certified by CSA (Canadian Standards Association) to the applicable requirements of the following Regulatory Standards:

- UL 1741 — Inverters, Converters, Controllers, and Interconnection System Equipment for use with Distributed Energy Resources, 2nd Edition (Includes IEEE 1547, 1547.1)
- CAN/CSA-C22.2 No. 107.1 — General Use Power Supplies
- CAN/CSA-C22.2 No. 0.4-04 — Bonding of Electrical Equipment
- CAN/CSA-C22.2 No.0-M91 — General Requirements - Canadian Electrical Code - Part II

Over Voltage, Under Voltage and Frequency Ranges

Table A-3 provides the over voltage, under voltage, over-frequency, and under-frequency detection limits for the Xantrex GT500 MVX and Xantrex GT500 MVX PG. These detection limits have been factory tested and deemed to be in compliance with UL 1741, 2nd Edition and IEEE 1547 requirements for utility interaction.

Table A-3 Over/Under Voltage and Over/Under Frequency Ranges

Vac Condition (% of Nominal)	Xantrex GT500 MVX Voltage Range	Trip Time
Vac = 88% (Fast Under-voltage)	Vac = 183	2 cycles
Vac < 88% (Under-voltage)	Vac < 183	2 cycles
88% < Vac <= 110% (Nominal)	183 < Vac <= 229	normal operation
110% < Vac < 120% (Over-voltage)	229 < Vac < 250[a]	12 cycles
120% >= Vac (Fast Over-voltage)	250 >= Vac	2 cycles
Over Voltage Reconnect Limit	106% <Vac < 120%[a] (106% default)	N/A
f < rated – 0.8 (Fast Under Frequency)	f < 59.3	2 cycles
f < rated – 0.7 (Under Frequency)	59.3 < f < 59.8 (59.3 default)	6 – 300 cycles[a] (10 cycles default)

Table A-3 Over/Under Voltage and Over/Under Frequency Ranges

Vac Condition (% of Nominal)	Xantrex GT500 MVX Voltage Range	Trip Time
f > rated + 0.5 (Over Frequency)	f > 60.5	2 cycles
Tolerance Table	Voltage +/–1% Frequency +/– 0.5Hz	+/– 1.5 cycles for under frequency

[a] Adjustable, password-protected.

Bolt Sizing and Torque Requirements

Table A-4 provides acceptable bolt sizes, conductor range, and torque values for AC terminal connections.

Table A-4 AC Terminal Bolt Size and Torque Values

AC Terminal Connections	Max. # of Conductors per Terminal	Bolt (Hardware) or Hole Size	Torque Requirements
TB2 GND (Enclosure Ground)	2	M10	49.3 Nm (36.4 ft-lb) Maximum based on Standard stainless hardware (Class 5.8)
TB1-A, TB1-B, and TB1-C	3	Thru M10	49.3 Nm (36.4 ft-lb) Maximum based on Standard stainless hardware (Class 5.8)

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

Table A-5 DC Terminal Bolt Size and Torque Values

DC Terminal Connections	Max. # of Conductors per Terminal	Bolt (Hardware) Size	Torque Requirements
TB3, TB4, and TB5	16	M10	49.3 Nm (36.4 ft-lb) Maximum based on Standard stainless hardware (Class 5.8)

Table A-6 provides acceptable screw sizes and torque values to be connected to the Xantrex GT500 MVX and Xantrex GT500 MVX PG auxiliary control interface terminal connections.

Table A-6 Auxiliary Control Interface Screw Size and Torque Values

Aux Control Connections	Max. # of Conductors per Terminal	Screw (Hardware) Size	Torque Requirements	Signal Type
TB7-3,4 Aux Enable/Disable	1	6-32 × 0.5, Pan Hd Phil (provided)	1.35 Nm (12 lb in)	N.C. Contact @15 VDC, 10 mA
TB7-5,6 Night Time Disconnect	1	8-32 × 0.5, Pan Hd Phil (provided)	1.8 Nm (16 lb in)	AC Power, 30 V, 1A

Table A-7 provides acceptable screw sizes and torque values to be connected to the Xantrex GT500 MVX and Xantrex GT500 MVX PG auxiliary external control interface terminal connections.

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

Aux. External Control Power Connections	Max. # of Conductors per Terminal	Screw (Hardware) Size	Torque Requirements	Signal Type
TB6-2 Phase A	1	8-32 x 0.5, Pan Hd (provided)	1.8 Nm (16 lb in)	AC Power, 208 V, 30 Amps
TB6-6 Phase B	1	8-32 x 0.5, Pan Hd (provided)	1.8 Nm (16 lb in)	AC Power, 208 V, 30 Amps
TB6-9 Phase C	1	8-32 x 0.5, Pan Hd (provided)	1.8 Nm (16 lb in)	AC Power, 208 V, 30 Amps
TB6-10 Ground	1	8-32 x 0.5, Pan Hd (provided)	1.8 Nm (16 lb in)	Ground

Dimensions

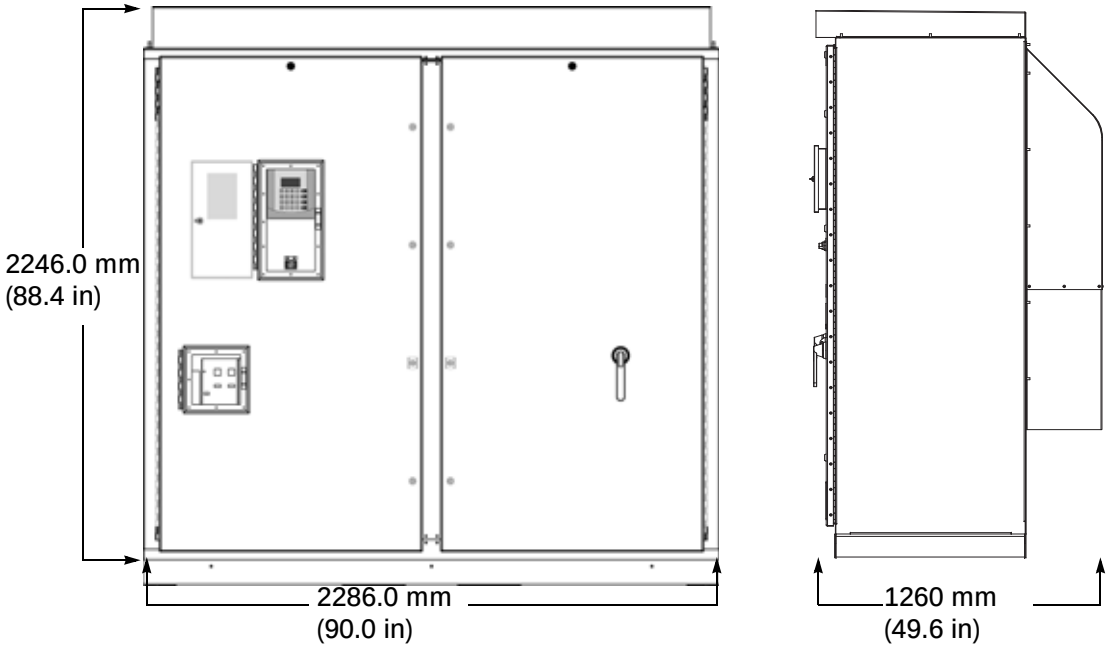


Figure A-1 Dimensions

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 workmanship and materials in your Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverter. This warranty period lasts for five (5) years starting three (3) months from the date of purchase at the point of sale to you, the original end user, unless otherwise agreed in writing (the "Warranty Period"). Your warranty claims are conditional upon and subject to (i) your demonstration of proof of purchase of the product as described in "What proof of purchase is required?" and (ii) the product having been commissioned and the completion and return of a Commissioning Test Record as described in "What is commissioning of the product?". This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period. Warranty claims of subsequent owners are also subject to the same proof of purchase and commissioning requirements referenced above and described below.

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

If the initial assessment suggests that the defect is such that it may not be covered by this Limited Warranty, billing information will be required. If it is ultimately determined that the product is performing to the manufacturer's specifications and that no repair is required, you will be billed for the service call at Xantrex's standard billing rates. If a required repair is not covered under this Limited Warranty, you will be responsible for all costs associated with such non-covered repair, including costs for replacement parts and labor at Xantrex's standard billing rates.

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

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

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

www.schneider-electric.com

			
North America	1 408 987 6255	1 925 245 1022	re.techsupport@schneider-electric.com
France	0 825 012 999		fr-re-techsupport@fr.schneider-electric.com
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For other country details please contact your local Schneider Electric Sales Representative or visit our website at: http://www.schneider-electric.com/sites/corporate/en/support/operations/local-operations/local-operations.page

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

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

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

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

What is commissioning of the product? Any warranty claim is conditional upon the commissioning of the product in accordance with the commissioning procedure set forth in the product's manual and the completion and return to Xantrex of the Commissioning Test Record in the product's manual within 30 days after the completion of the commissioning. Failure to promptly return the completed Commissioning Test Record may result in the delay of warranty claim service or loss of warranty coverage for the product. If a third party (hereinafter, an "integrator") commissions the product on behalf of an end user of such product and the integrator fails to complete and timely return a Commissioning Test Record, then Xantrex shall have the right to fulfill such end user's warranty claims and recover from such integrator all costs and expenses incurred by Xantrex in connection with such warranty claims.

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

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

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

Disclaimer

Product

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

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

Exclusions

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

Return Material Authorization Policy

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

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

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

Record these details in “Information About Your System”.

Return Procedure

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

Include the following:

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

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

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

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

Out of Warranty Service

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

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

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

Information About Your System

As soon as you open your Xantrex GT500 MVX and Xantrex GT500 MVX PG 500 kW Grid-Tied Photovoltaic Inverter package, record the following information and be sure to keep your proof of purchase.

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

Schneider Electric

www.schneider-electric.com

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