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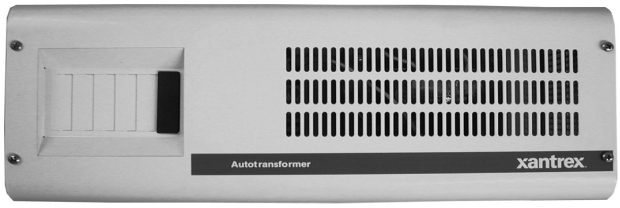

Installation Guide

TX Autotransformer

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Xantrex™ TX Autotransformer

Installation Guide

About Xantrex

Xantrex Technology Inc. is a world-leading supplier of advanced power electronics and controls with products from 50 watt mobile units to one MW utility-scale systems for wind, solar, batteries, fuel cells, microturbines, and backup power applications in both grid-connected and stand-alone systems. Xantrex products include inverters, battery chargers, programmable power supplies, and variable speed drives that convert, supply, control, clean, and distribute electrical power.

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About This Guide

Purpose

The purpose of this Installation Guide is to provide explanations and procedures for installing, operating, maintaining, and troubleshooting the Xantrex™ TX Autotransformer.

Scope

The Guide provides safety guidelines, detailed planning and setup information, procedures for installing the Autotransformer, as well as information about operating and troubleshooting the unit.

Audience

This Guide is intended for the experienced electrician who need to install the Xantrex™ TX Autotransformer into a power system. Only skilled personnel, such as certified electricians and certified renewable energy technicians should attempt installation of this equipment. Skills required include the ability to read and understand how to follow single line wiring diagrams.

Organization

This Guide is organized into two chapters and one appendix.

Chapter 1 contains information about the features and functions of the Xantrex™ TX Autotransformer.

Chapter 2 contains information about planning and performing the installation of the Xantrex™ TX Autotransformer.

Appendix A, “Multi-wire Branch Circuit Wiring”, supplies information about Multi-wire Branch Circuit Wiring Precautions when using stand-alone 120 Vac inverters or generators.

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

Abbreviations/ Acronym	Definition
AC	Alternating Current
AHJ	Authority Having Jurisdiction (i.e., Electrical Inspector)
CEC	Canadian Electrical Code
DC	Direct Current
NEC	National Electrical Code
UL	Underwriter's Laboratory

Related Information

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

Important Safety Instructions

WARNING

This chapter contains important safety and operating instructions. Read and keep this Installation Guide for future reference.

1. Before installing and using the Xantrex™ TX Autotransformer, read all instructions and cautionary markings on the TX Autotransformer, the batteries, and all appropriate sections of this guide.
2. This product is intended for indoor mounting. Do not expose the TX Autotransformer to rain, snow, or spray.
3. To reduce risk of fire hazard, do not cover or obstruct the ventilation openings. Do not install the TX Autotransformer in a zero-clearance compartment. Overheating may result. See “Mounting” on page 2–14 for clearance requirements.
4. Use only attachments recommended or sold by the manufacturer. Doing otherwise may result in a risk of fire, electric shock, or injury to persons.
5. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the TX Autotransformer with damaged or substandard wiring.
6. Do not operate the TX Autotransformer if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the TX Autotransformer is damaged, see the Warranty section.
7. Do not disassemble the TX Autotransformer. It contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the TX Autotransformer yourself may result in a risk of electrical shock or fire.
8. To reduce the risk of electrical shock, disconnect all AC power from the TX Autotransformer before attempting any maintenance or cleaning or working on any circuits connected to the TX Autotransformer. Turning off controls will not reduce this risk.
9. The chassis housing of the TX Autotransformer must be connected to a permanent grounding system as required by the National Electric Code, ANSI/NFPA 70-2002. This is the responsibility of the system installer. A grounding terminal strip is provided for connection of equipment grounding conductors.

Certifications

CSA certified to the following standards:

- UL 1741-2001 (First Edition), and
- CSA 22.2 No. 107.1-01
- Certified for use as a stand-alone product or mounted with other SW Plus components in a power panel configuration.

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1 Introduction

Chapter 1 contains information about the features and functions of the Xantrex™ TX Autotransformer.

For this subject:	See...
“Purpose”	page 1–2
“Features”	page 1–2
“Step-up Applications”	page 1–4
“Step-down Applications”	page 1–6
“Load Sharing Applications”	page 1–7

Purpose

The TX Autotransformer converts voltage from a 120 Vac inverter, 120/240 Vac AC generator, or conventional 120/240 Vac utility source to a voltage that is usable by the supported loads. It can transform power from 120 Vac to 240 Vac (step-up); or from 240 Vac to 120 Vac (step-down); or shares the output current of a generator for generator-only loads. It can also be used to provide a way to install single inverters into wiring systems that use “multi-branch” wiring.

WARNING

A possible fire hazard can exist if 120 Vac only sources (such as inverters and generators) are wired incorrectly into 120/240 Vac panels containing multi-wire branch circuits. This section describes how to check for multi-wire branch circuits in the load center and presents some possible solutions to this wiring method.

See Appendix A, “Multi-wire Branch Circuit Wiring” for additional information on using the TX Autotransformer in these situations.

Important:: These transformers are an “autotransformer” design which are inherently non-isolated. They do, however, provide an efficient method of voltage conversion. The terms “120 Vac side” and “240 Vac side” used in this manual are borrowed from isolated transformer terminology to facilitate an easier understanding for the installer.

Features

The TX Autotransformer is available in two sizes; a 4.2 kVa (TX4K) and a 6.0 kVa (TX6K) models.

The unit is housed in a powder coated, steel enclosure, rated for indoor installations and contains dual-knockouts for conduit connections (sized 1/2 and 3/4 inch and 3/4 and 1 inch) and space for additional breakers.

The TX Autotransformer utilizes a highly-efficient transformer constructed of high temperature materials and M-6 grade steel laminations, meeting UL Class-H standards for the TX4K model and Class-N standards for the TX6K model.

A DIN Rail is provided inside to support five additional, field-installed, Square D QOU™ circuit breakers.

Specifications

The following table provides the electrical and environmental specifications for both the TX4K and TX6K.

Table 1-1 Electrical and Environmental Specifications for the TX4K and TX6K

	TX4K	TX6K
Dimensions	10 7/8" (H) x 21" (W) x 8 7/8" (D) (276 mm x 533 mm x 225 mm)	10 7/8" (H) x 21" (W) x 8 7/8" (D) (276 mm x 533 mm x 225 mm)
Weight	42 pounds (19 kg)	60 pounds (27 kg)
Operating Voltage	120/240 Vac, 60 Hz split-phase	120/240 Vac, 60 Hz split-phase
Field-installed Hardware	Square D, QOU™ Breakers	Square D, QOU™ Breakers
Field-installed Wiring	• Wiring terminals accept #14 to #2/0 AWG copper wiring.* • Ground Bar accepts #14 to #4 AWG copper wiring.	• Wiring terminals accept #14 to #2/0 AWG copper wiring.* • Ground Bar accepts #14 to #4 AWG copper wiring.
Rated Temperature	0 to 25 °C (32 to 77 °F)	0 to 25 °C (32 to 77 °F)
Storage Temperature	-55 to +100 °C (-67 to 212 °F)	-55 to +100 °C (-67 to 212 °F)
Mounting	Approved for wall mounting (vertical or horizontal) or on a shelf.	Approved for wall mounting (vertical or horizontal) or on a shelf.
Enclosure	Indoor rated, White, Powdercoat Finish, Screened to prevent insect intrusion.	Indoor rated, White, Powdercoat Finish, Screened to prevent insect intrusion.
Ratings (Continuous)	120/240 Vac/60 hz., split-phase, 4.2 kVA	120/240 Vac/60 hz., split-phase, 6.0 kVa
Regulatory	Certified by CSA to UL 1741-2001 (First Edition) and CSA C22.2 No. 107.1-01	Certified by CSA to UL 1741-2001 (First Edition) and CSA C22.2 No. 107.1-01

Important: *The wiring terminals of the TX Autotransformer will accept #14 AWG to #2/0 AWG copper wiring, however, the maximum wire size for the NEC/CEC bending radius is #2 AWG. Be sure to consult with your AHJ to ensure code compliance.

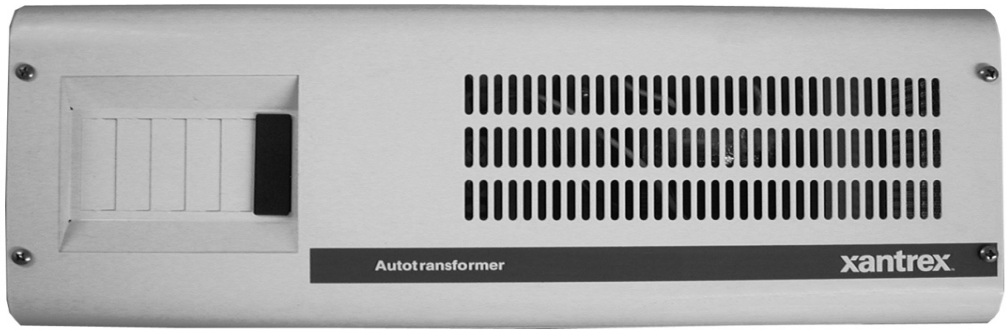


Figure 1-1 The TX Autotransformer

Applications

The TX Autotransformer is designed to perform one of the following voltage conversions.

- Steps up 120 Vac to 240 Vac.
- Steps down 240 Vac into one 120 Vac circuit.
- Load Sharing (Steps down 240 Vac into two 120 Vac circuits). This application is used to share the output current of an AC generator to an AC load.

However, both applications can not be used by the same TX Autotransformer at the same time. If both voltage conversions are required for the specific installation, then one TX Autotransformer will be required for each application. See “Dual TX Autotransformer Applications” on page 1–8 for more information.

Step-up Applications

In this function, the autotransformer increases the output voltage from 120 Vac to 240 Vac to provide power to loads requiring 240 Vac to operate.

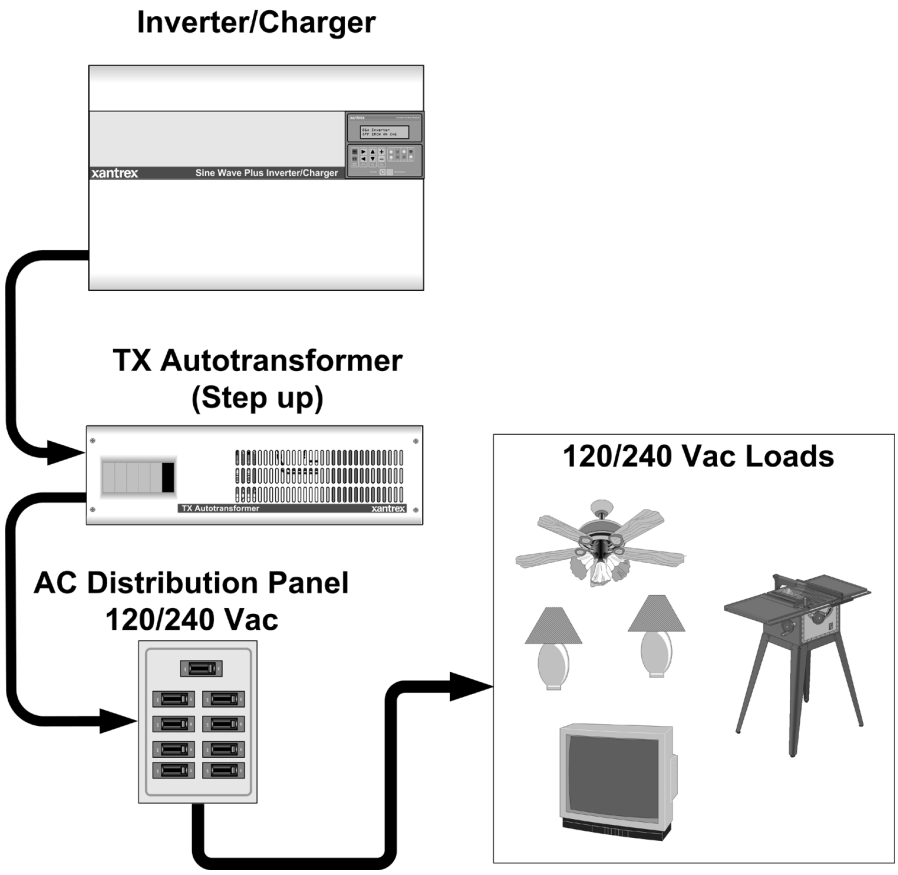


Figure 1-2 Basic Step-up Application

The standard step-up application can also be used in situations where multi-branch wiring exists to provide both L1 and L2 outputs. See Figure A-5, “Using an Step-up Autotransformer in Multi-wire Branch Circuit Wiring” on page A–6 for additional information.

A step-up configuration can also be used for “deep well pumping” applications. In this configuration, a control switch for the pump is connected between the 120 Vac source and the autotransformer. The control switch can be either a float, pressure, or manual type switch. Its purpose is to automatically disconnect power to the autotransformer when the pump is not active. This eliminates the idle power consumption from the autotransformer.

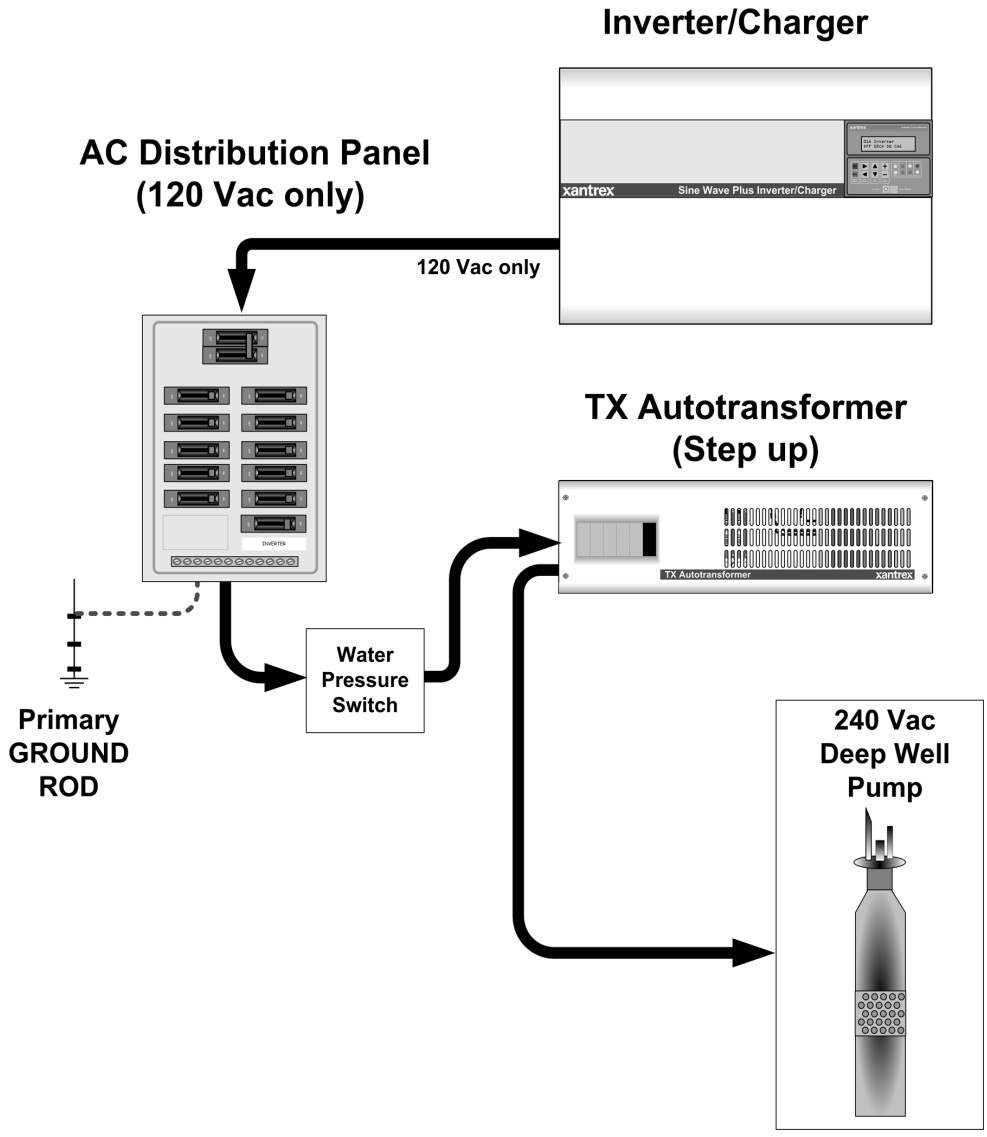


Figure 1-3 Step-up Application for Deep Well Pumping

Step-down Applications

In this function, the autotransformer decreases the output voltage from a 240 Vac-only source to 120 Vac to provide power to loads requiring 120 Vac to operate. This arrangement is useful for splitting the current of a battery charger between each leg of the 240 Vac source, reducing losses in the wiring. This is especially important in long cable runs or when charging from a 120/240 volt AC output generator.

Important: For proper current balancing in grid applications, a true isolation transformer could be used instead of an autotransformer if desired.

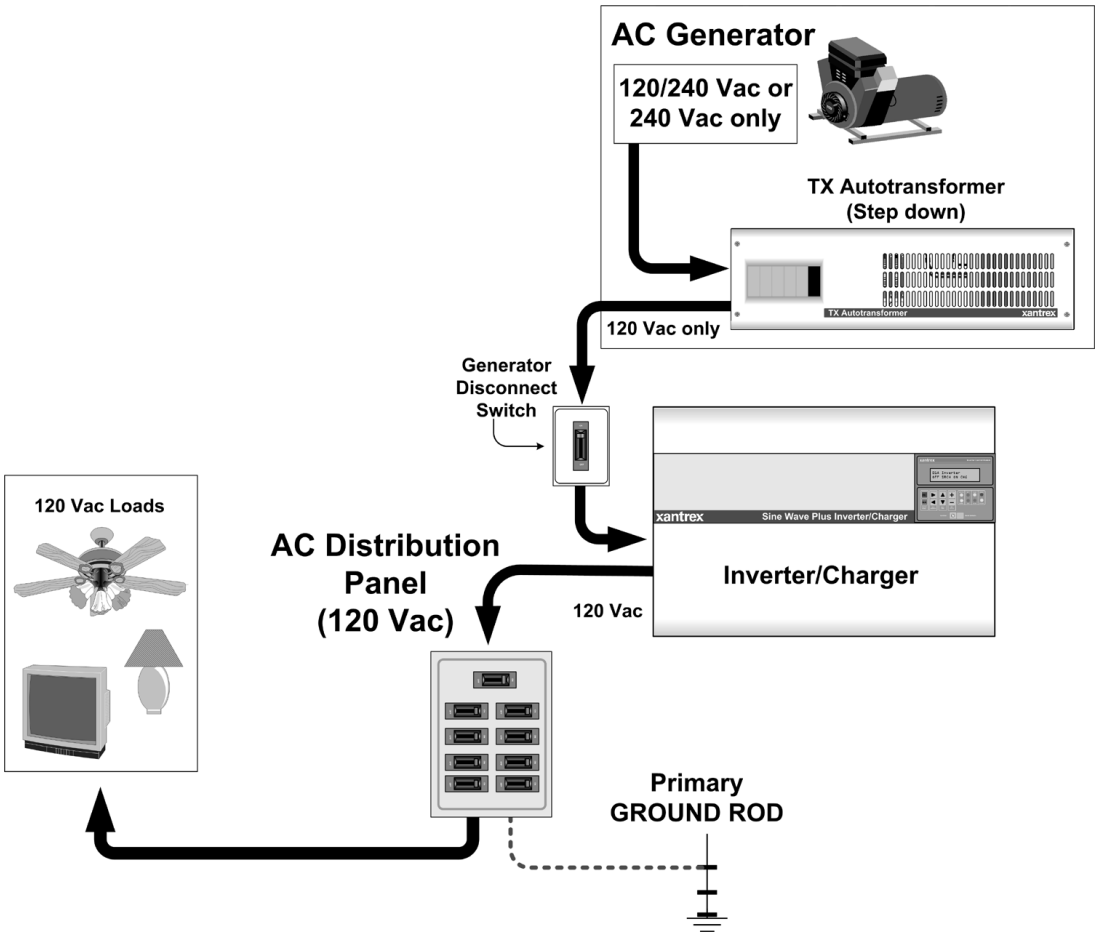


Figure 1-4 Basic Step-down Application

CAUTION: Equipment Damage

This application is not for use with an AC source that has a ground-to-neutral bond, 120/208 three-phase power, corner-grounded-deltas, or 230 Vac/50 Hz power.

Load Sharing Applications

In a Load Sharing Application, the autotransformer divides the power draw from a 120/240 Vac generator between each leg of power (L1 and L2). This improves generator performance and longevity.

Important: This application only works with an AC generator.

Important: Do not use this configuration on “series-stacked” inverters. A “backfeed” condition will exist for the second inverter, preventing their operation.

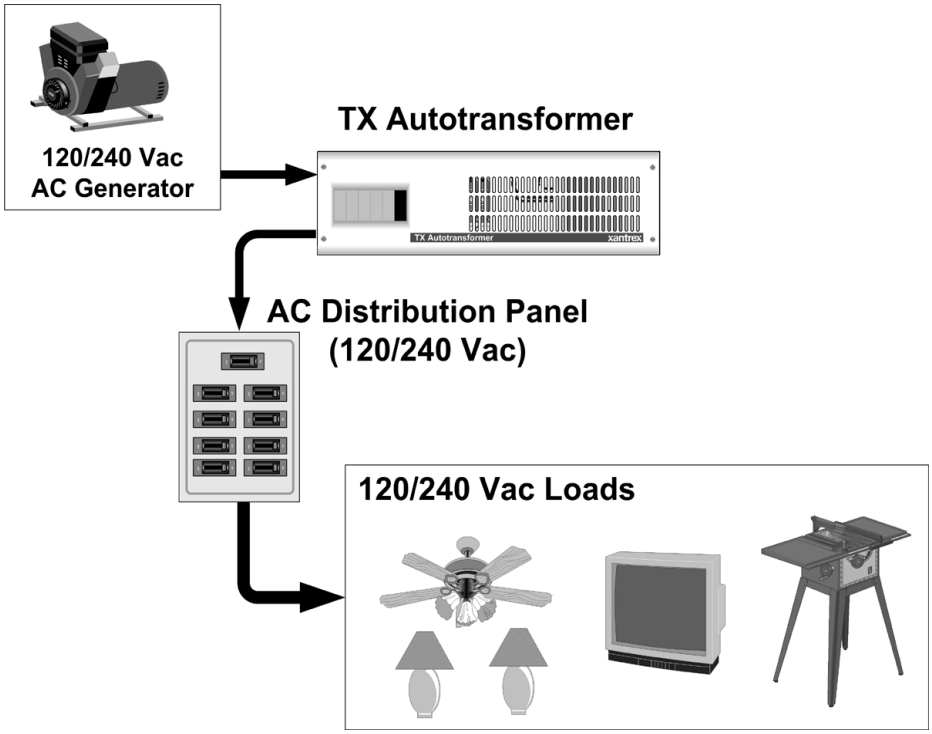


Figure 1-5 Load-sharing Application

Important: The ability of the TX Autotransformer to share the load depends upon the generator’s windings and voltage regulation it receives on each leg. If the voltages are not equal, a limited amount of current sharing will occur between the L1 and L2 legs of the generator.

Dual TX Autotransformer Applications

In applications where Step-up and Step-down voltage conversions are required, one TX Autotransformer is required for each application.

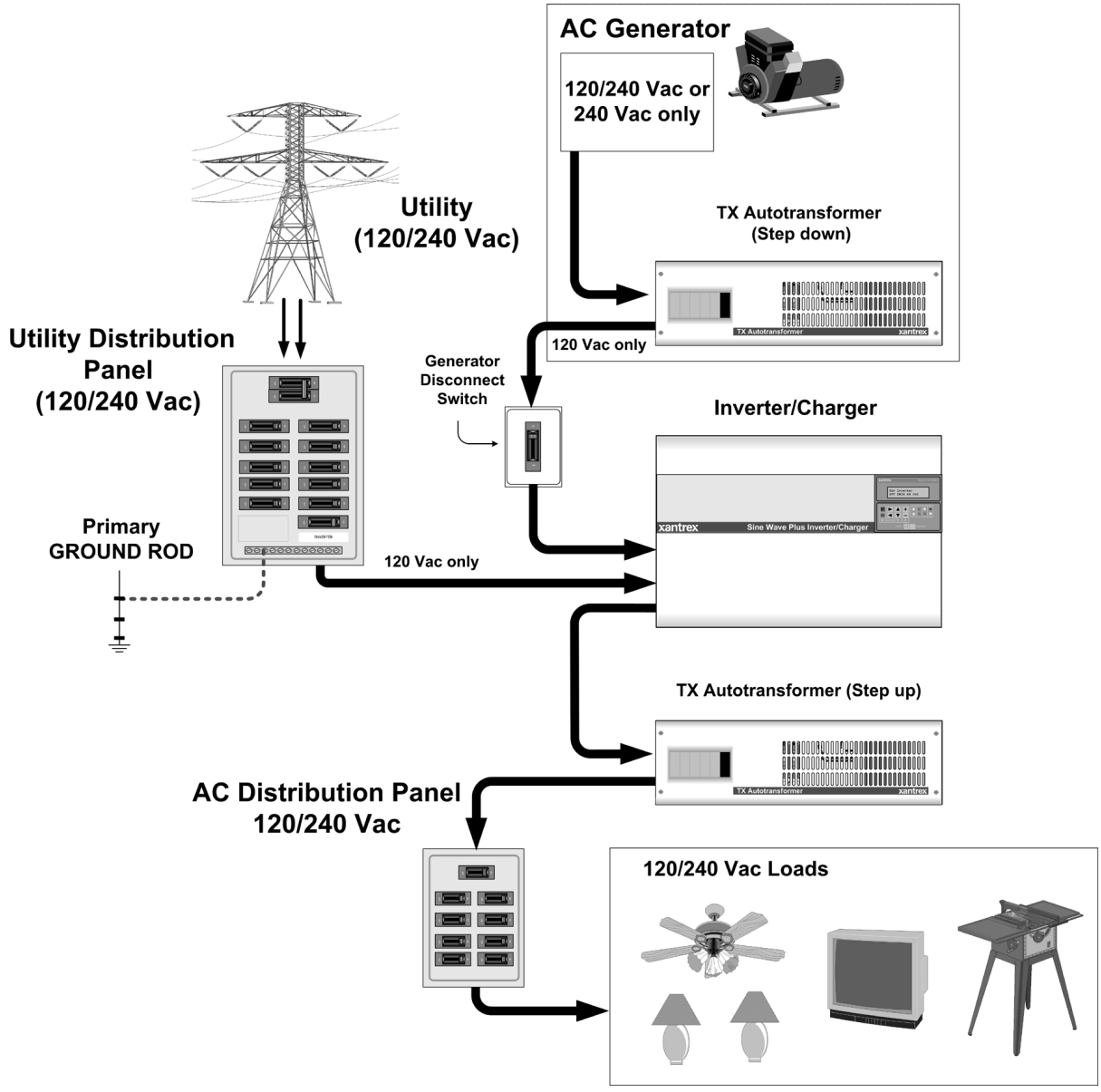


Figure 1-6 Dual TX Autotransformers in a Step-up and Step-Down Application

2 Installation

Chapter 2 contains information about planning and performing the installation of the Xantrex™ TX Autotransformer.

For this subject:	See...
“Pre-Installation Planning”	page 2–10
“Installing the TX Autotransformer”	page 2–14
“Wiring - General”	page 2–19
“Wiring: Specific Applications”	page 2–22
“Primary Grounding”	page 2–21
“Step-up Configuration”	page 2–22
“Step-up Configuration for Deep Well Pumps”	page 2–23
“Step-down Configuration”	page 2–24
“Load Sharing Configuration”	page 2–26

Pre-Installation Planning

Before any components are installed, take the time to pre-plan the installation. Pre-planning includes:

- Finding a suitable location
- Wire sizes required and wire routing
- Grounding requirements
- Code-compliance

Choosing a Location

When determining the location of the TX Autotransformer, consider the mounting requirements, orientation and clearance requirements, and any additional materials or hardware that may be required.

Important: *Failure to follow the recommended location criteria could cause damage to the unit. Damage caused by improper installation will void the limited warranty.*

Application considerations

Place the TX Autotransformer in a convenient location, depending on your application.

In a step-up application, locate the unit close to the input source (inverter, generator, or utility).

In a step-down application, locate the unit close to AC loads.

Orientation and clearance

The TX Autotransformer is intended for indoor use and can be mounted horizontally, vertically, or on a shelf. The environment into which is installed, should be clean and dry. Sufficient space must be allowed for around the TX Autotransformer to allow adequate ventilation. When mounting vertically, ensure the vents are positioned at the top.

CAUTION: Equipment Damage

Allow a minimum of 12 inches clearance around the sides with ventilation holes (front, top, and bottom) and 6 inches clearance on either end to ensure adequate ventilation. Failure to provide adequate ventilation can cause the unit to overheat and cause damage that will not be covered by the limited warranty. These requirements do not apply if you are using a Long AC and/or DC Conduit Box as these conduit boxes are designed to provide the required clearance and ventilation.

Location hazards

Do not mount the TX Autotransformer in locations where:

- it will be exposed to the weather or in a wet location.
- debris can easily accumulate or block the ventilation holes.
- liquids or other spillable substances are stored. Spills into the unit can cause irreparable damage and will not be covered by the limited warranty.

WARNING: Fire Hazard

Do not allow anything to touch, or sit on, the TX Autotransformer. This can inhibit proper ventilation causing the unit to overheat. A fire hazard can exist if the unit overheats.

WARNING: Fire Hazard

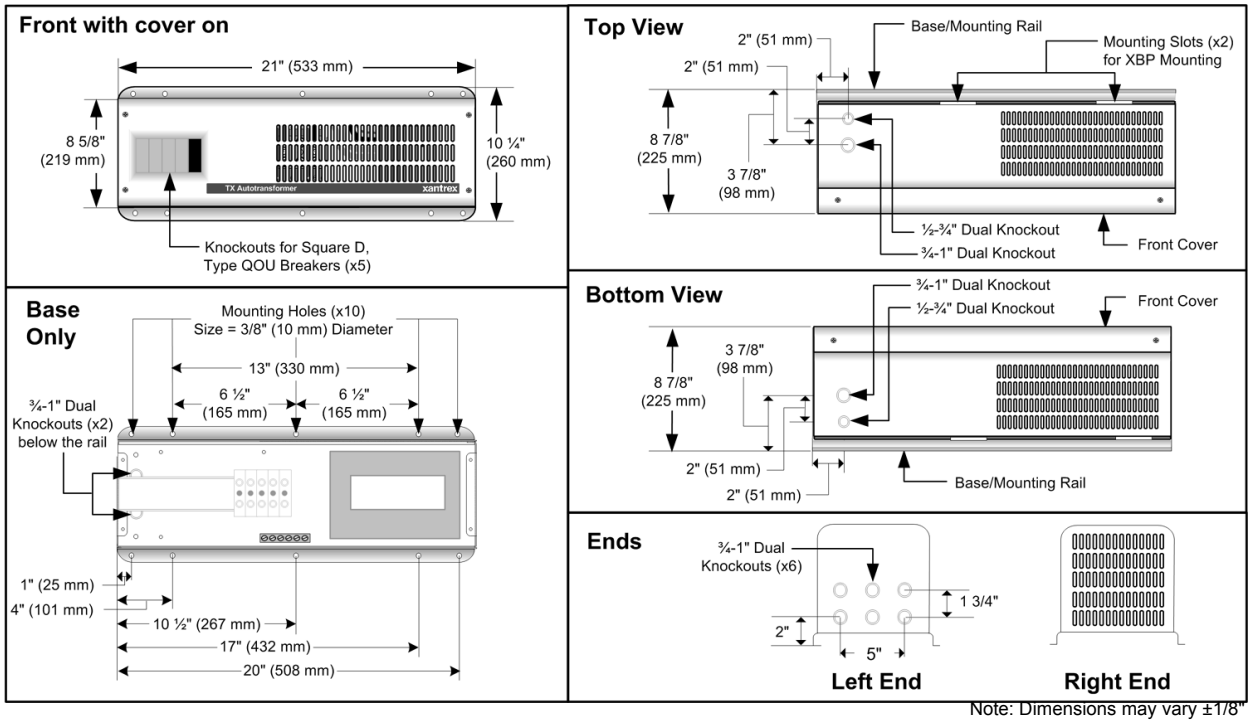
Do not mount the TX Autotransformer near batteries or any other flammable or combustible materials. Do not store combustible items (e.g., rags, cardboard, fire wood, chemicals etc.) near the TX Autotransformer. The TX Autotransformer produces heat during normal operation that could ignite combustible materials if stored too close.

Dimensions and Knockout Locations

Ten ¾-1" and two ½-¾"dual-knockouts are available to accommodate conduit runs into and out of the TX Autotransformer. See Figure 2-1 for knockout locations.

To prepare the knockouts:

1. Determine which knockouts will be required to accommodate the wiring and remove them.
2. Install bushings or conduit to protect the wires from the sharp edges of the knockout holes.
3. Ensure all metal pieces or shavings are removed before proceeding.



Note: Dimensions may vary ±1/8"

Figure 2-1 Dimensions (Not to scale) and Knockout Locations

Wire Sizes

Select and use appropriately sized wire based on the size of the connected loads.

Terminals
- The TX Autotransformer wiring terminals accept #14 AWG to #2/0 AWG sized wires.

Ground Bar
- The ground bar in the TX Autotransformer accepts #4 to #14 AWG wires.

Important: The wiring terminals of the TX Autotransformer will accept #14 AWG to #2/0 AWG copper wiring, however, the maximum wire size for the NEC/CEC bending radius is #2 AWG. Be sure to consult with your AHJ to ensure code compliance.

Determine the wire sizes and disconnect sizes required for the installation. See Table 2-1 for torque values.

Important: Only use copper conductors rated for 75 °C (or higher). All wiring within the TX Autotransformer enclosure shall be rated at least 300 V or a combination of 300 V (e.g., 150 V cable enclosed with 150 V insulation/heat shrink).

Table 2-1 Torque Values for Wiring

Wire Gauge	Torque Value	Wire Gauge	Torque Value
#14 – 10 AWG	20 in-lb	#6 – 4 AWG	36 in-lb
#8 AWG	25 in-lb	#4 – 2/0 AWG	50 in-lb

Overcurrent Protection

Depending on the installation, circuit breakers will be required to protect wiring and the unit itself from overcurrent conditions. Breakers should be located and sized according local code (NEC/CEC). Circuit Breakers can be located in the AC distribution panel, load center, or in the TX Autotransformer. Space is provided within the TX Autotransformer for up to five Square D, Type QOU™ circuit breakers.

Per NEC/CEC, the TX Autotransformer (both models) requires a field-installed breaker sized appropriately and placed in the "input" conductors to the autotransformer. The size and placement of this "input" breaker is dependent on the application in which it's being used (i.e., Step-up or Step-down). See Table 2-2 for maximum breaker sizes per model and per application.

The TX4K also requires an additional breaker in the 120 Vac side (35A maximum) to be installed in all applications. This breaker is used to prevent the TX4K from running above it's continuous rated capacity. See Table 2-2 for maximum breaker sizes per model and per application.

For example: When using a TX4K in a Deep Well-pump Step-Up Application (120 Vac Stepped-up to a 240 Vac Pump), the TX4k will be installed between the AC Distribution panel and the pump. The maximum breaker size that can be put in the AC distribution panel is a 35A single-pole breaker to feed the 120 Vac "input" of the TX4K.

Or, when using a TX4K in a Generator Step-down Application (240 Vac Stepped-down to 120 Vac), the TX4K will be installed between the generator and the

inverter. An "input" double-pole breaker (20A maximum) must be installed in the 240 Vac "input side wiring" and an "output" side-single-pole breaker (35A maximum) must be installed.

Table 2-2 Maximum Circuit Breaker Sizes per Application

Model	Application	AC Source Side (Input) Terminals	Maximum Breaker Size	AC Load Side (Output) Terminals	Maximum Breaker Size
TX4K	Step-up	120 Vac side	35A Single-Pole	240 Vac side	N/A
TX4K	Step-down	240 Vac side	20A Double-Pole	120 Vac side	35A Single-Pole
TX4K	Load Sharing	240 Vac side	20A Double-Pole	240 Vac side	35A Double-Pole
TX6K	Step-up	120 Vac side	50A Single-Pole	240 Vac side	N/A
TX6K	Step-down	240 Vac side	25A Double-Pole	120 Vac side	N/A
TX6K	Load Sharing	240 Vac side	25A Double-Pole	240 Vac side	N/A

This table lists breakers that are required to protect the TX4K and TX6K for full continuous power. Note all input and output wiring must be sized appropriately to the breakers being used.

See Figure 2-11, “Wiring for a Basic Step-up Application” on page 2–22 for an example of where the overcurrent circuit breaker should be placed in a Step-up Application.

See Figure 2-12, “Wiring for a Deep Well Pump Application” on page 2–23 for an example of where the overcurrent circuit breaker should be placed in a Deep Well Pump Application.

See Figure 2-13, “Wiring for a Basic Step-Down Application” on page 2–25 for an example of where the overcurrent circuit breakers should be placed in a Step-down Application.

See Figure 2-14, “Wiring for a Load Sharing Configuration” on page 2–26 for an example of where the overcurrent circuit breaker should be placed in a Load Sharing Application.

Grounding Requirements

The TX Autotransformer must be connected to a permanently grounded conductor such as a primary system ground rod. See Figure 2-10 on page 2–21 for an illustration of proper grounding. Be sure to consult your local code (NEC or CEC, for example) for additional grounding requirements depending on your installation.

Code Compliance

It is the responsibility of the installer to ensure all applicable local and national codes are adhered to and all appropriate permits are obtained prior to installing this unit.

Installing the TX Autotransformer

The following sections describe how to mount and wire the TX Autotransformer to the other components of the installation.

Required Tools

The following tools may be required for this installation.

- ❒ Wire strippers
- ❒ Phillips screw driver
- ❒ Slotted screw driver
- ❒ Torque wrench
- ❒ Knockout punch

Required Materials

The following materials may be required for this installation.

- ❒ Backing support material (such as plywood or 2x4's)
- ❒ #10 × 1" (or longer) wood screws (or ½" × 1 ¼" lag bolts) with washers
- ❒ Appropriately sized wiring for AC connections
- ❒ Bushings or conduit

Mounting

Important: The TX Autotransformer weighs approximately 42-60 pounds (19-27 kg). Use appropriate wall anchors or backing material (plywood, 2 x 4's, etc.) that will support its weight.

The TX Autotransformer can be mounted horizontally or vertically on a wall. It can also be secured to a shelf.

If using a vertical orientation, the unit must be mounted with the circuit breakers and knockouts toward the bottom and the ventilation holes toward the top.

Horizontal	See Figure 2-2 on page 2–15 for an illustration of a horizontal mounting using plywood for a supportive backing.
Vertical	See Figure 2-3 on page 2–16 for an illustration of a vertical mounting using plywood for a supportive backing.
Using 2x4s	See Figure 2-4 on page 2–17 for an illustration of a horizontal mounting using 2x4 supports.
Using a Shelf	See Figure 2-5 on page 2–17 for an illustration of a horizontal mounting on a shelf.
XPB	See Figure 2-6 on page 2–18 for an illustration of a horizontal mounting using the the Xantrex Back Plate (XBP).

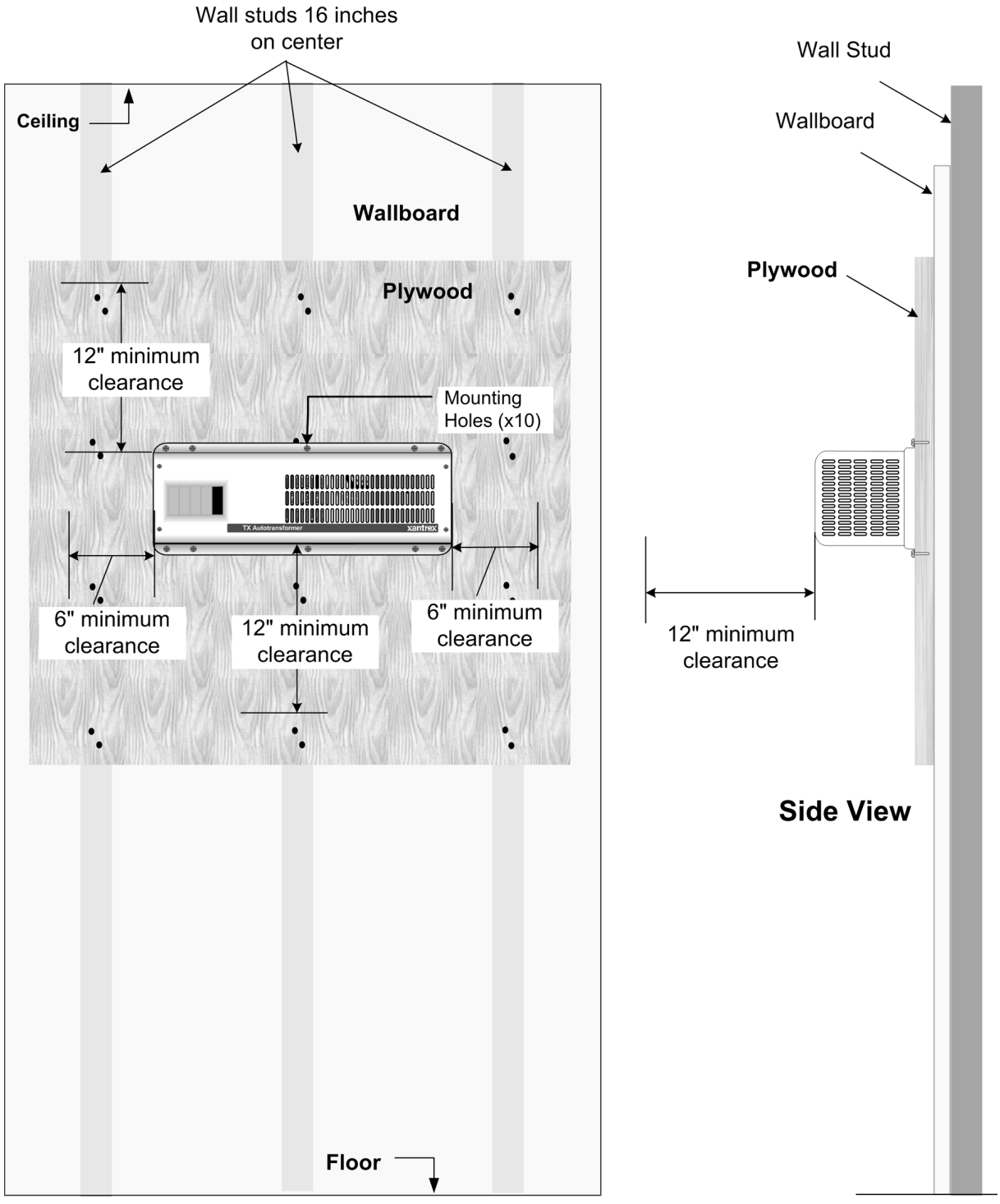


Figure 2-2 Mounting the TX Autotransformer Horizontally on Plywood

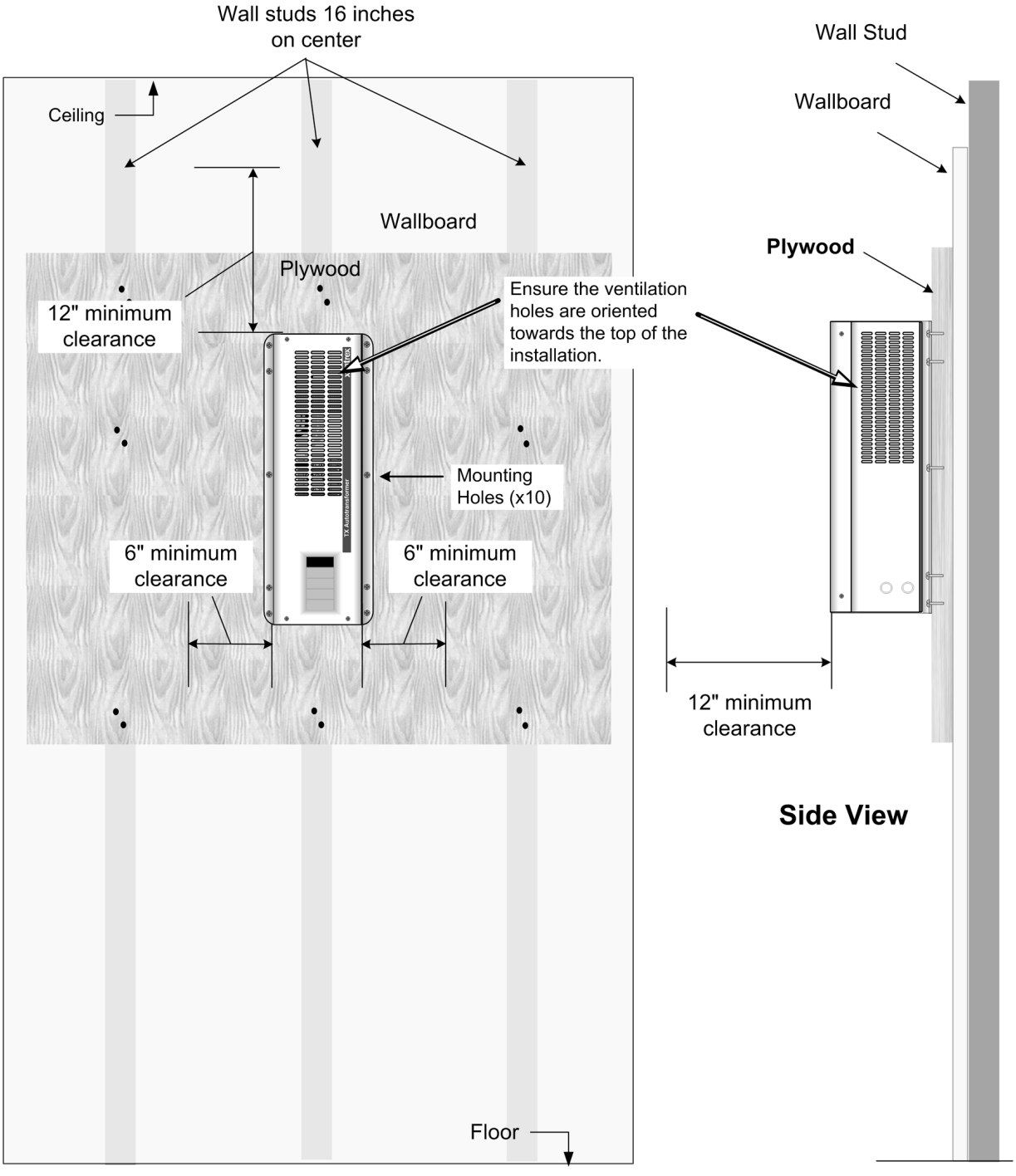


Figure 2-3 Mounting the TX Autotransformer Vertically on Plywood

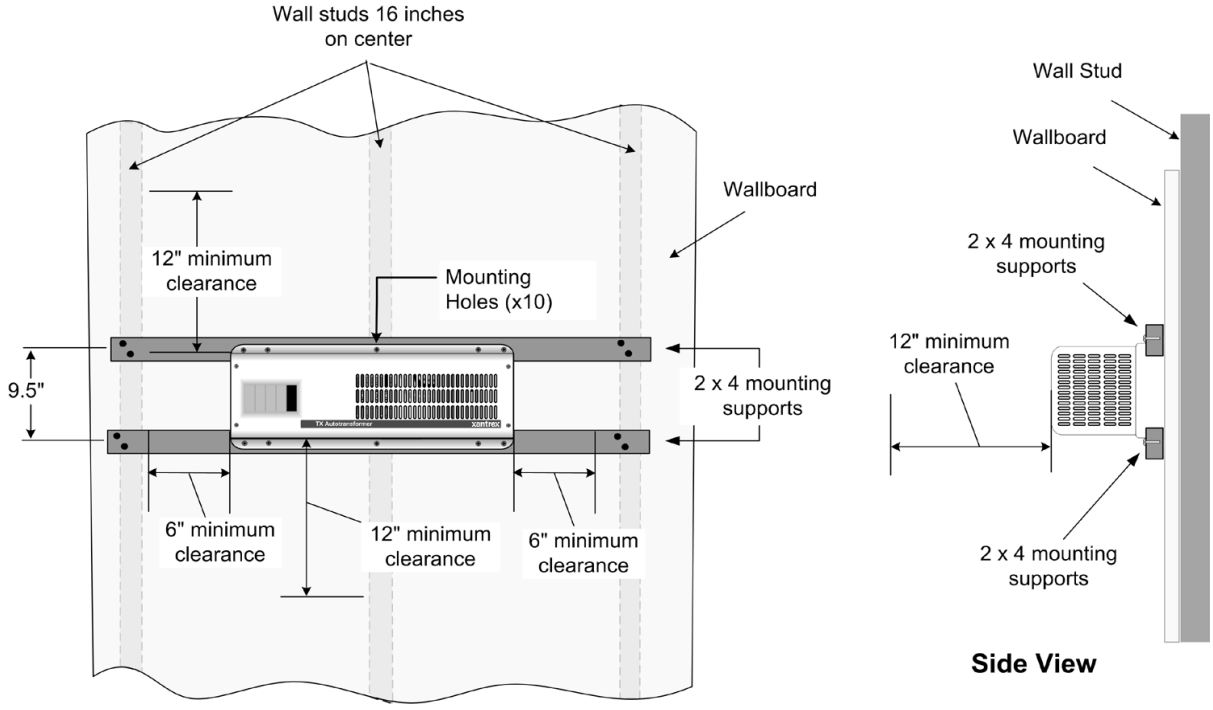


Figure 2-4 Mounting the TX Autotransformer Horizontally on 2x4s

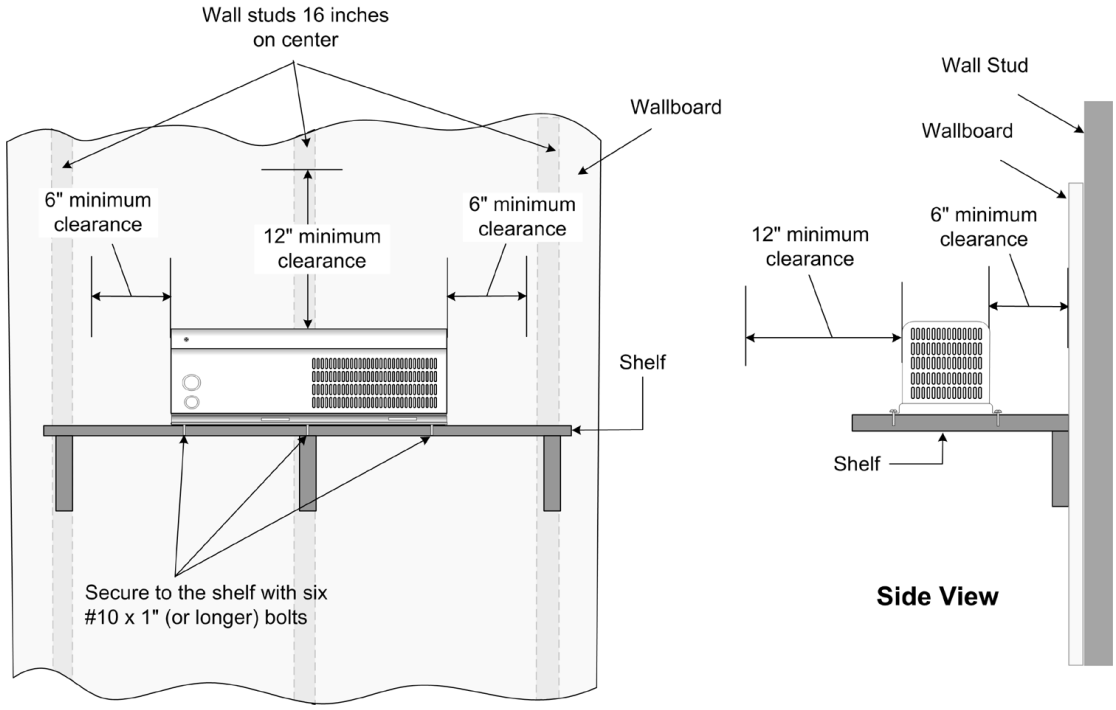


Figure 2-5 Mounting the TX Autotransformer Horizontally on a Shelf

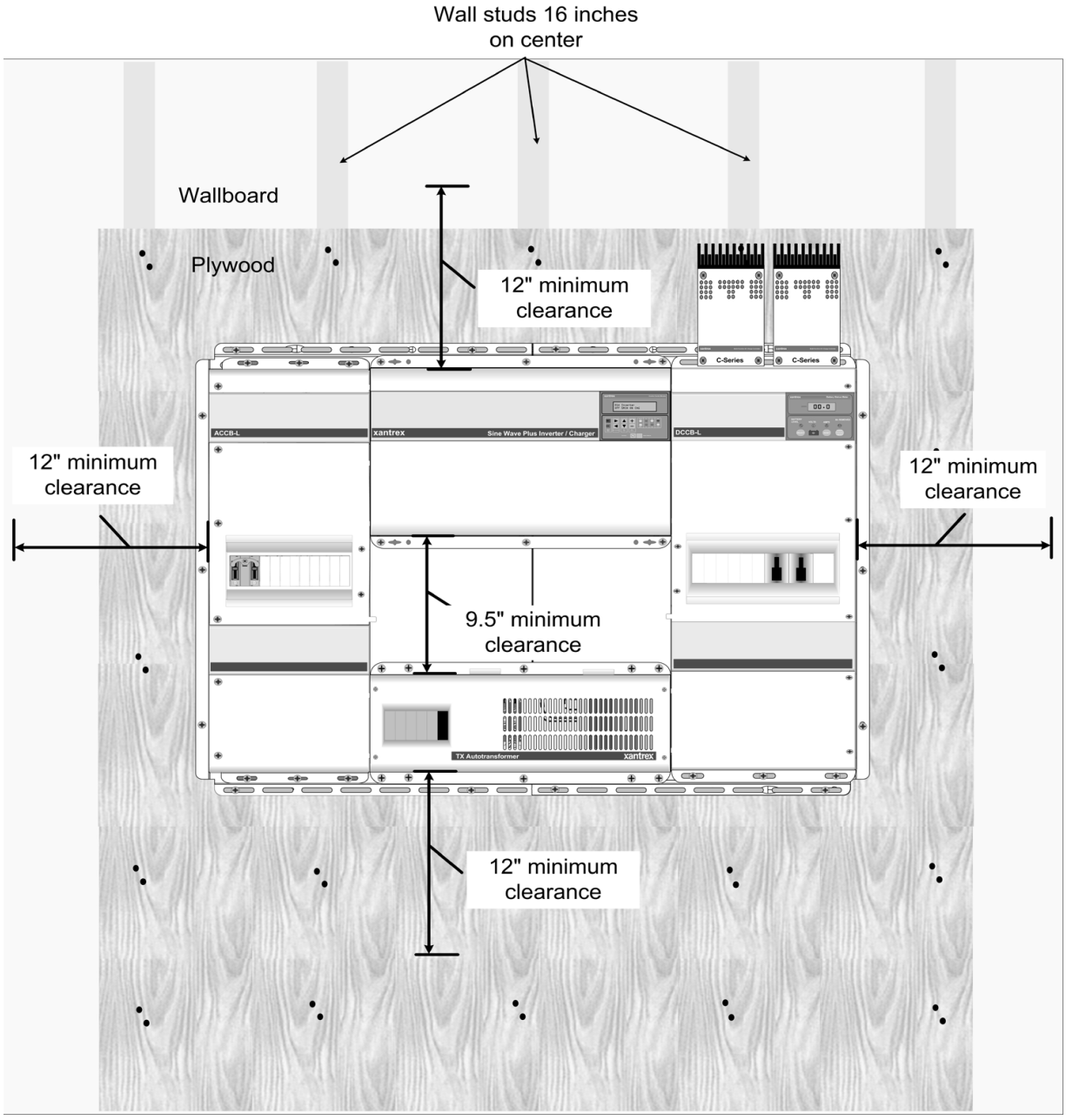


Figure 2-6 Mounting the TX Autotransformer on the Xantrex Back Plate (XBP)

Wiring - General

Important: *Installations should meet all local codes and standards.* Installations of this equipment should only be performed by skilled personnel such as qualified electricians and Certified Renewable Energy (RE) System Installers. For a list of Xantrex Certified RE dealers, please visit our website at www.XantrexREdealers.com.

WARNING: Shock Hazard

Before wiring the TX Autotransformer, ensure that all sources of power are disconnected. Never work on a live circuit.

CAUTION: Equipment Damage

The configuration of the autotransformer is for step-up, step-down, or load sharing for a generator. It does not provide isolation between input and output. Do not use the autotransformer as an isolation device.

Removing or Replacing the Front Cover

To remove the front cover:

1. Remove the #12 screws located on the Front Cover. Put in a safe location so they won't get lost.
2. Life the Front cover away from the base.

To replace the front cover:

3. Place the front cover over the base ensuring that the ventilation holes are placed over the transformer and the square knockout holes are placed of the Din Rail.
4. Replace the #12 screws and torque to 26 to 28 in-lb. (3 n-m.

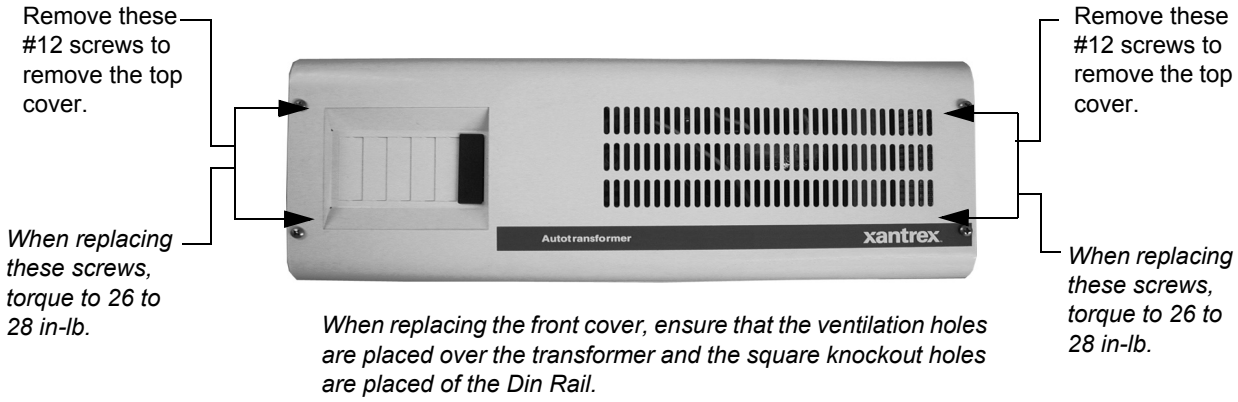


Figure 2-7 Removing or Replacing the Front Cover

Internal Components

The internal components consist of the following:

- Three wiring terminals are provided for the "240 Vac side"—one for the neutral connection and one for each leg (L1 and L2).
- Two wiring terminals are provided for the "120 Vac side"—one for the neutral connection and one for L1 only.
- A ground bar is provided to connect the chassis to the primary system ground.
- One DIN Rail for additional, field-installed, Square D, Type QOU circuit breakers.

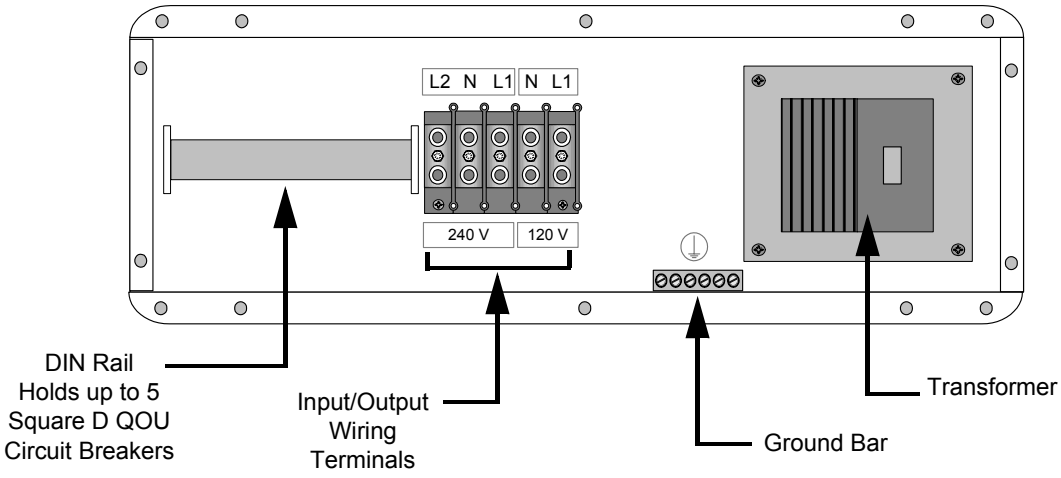
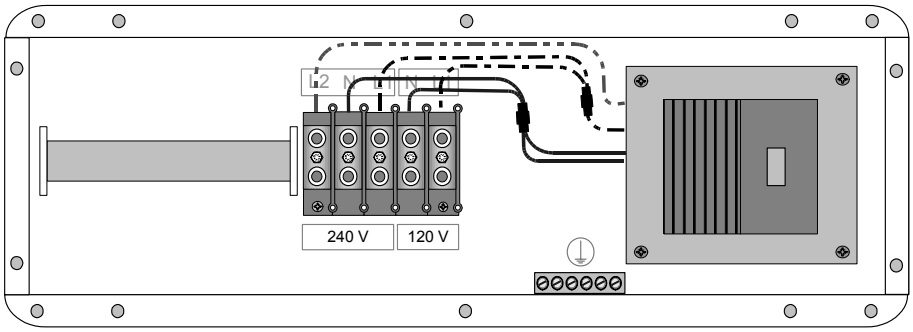


Figure 2-8 TX Autotransformer Internal Components

- Factory-installed wiring connects the transformer to the wiring terminals. Factory wiring may vary slightly between the TX4K and the TX6K. *Under no circumstances should this factory-installed wiring be removed or altered.*



(DO NOT REMOVE OR ALTER THE FACTORY INSTALLED WIRING!)

Figure 2-9 TX Autotransformer Factory-Installed Wiring

Primary Grounding

To properly ground the TX Autotransformer:

1. Connect a ground wire to the ground bar in the TX Autotransformer.
2. Connect the other end of that ground wire to the main Utility Distribution panel or the AC Distribution Panel whichever is connected to the primary system ground.

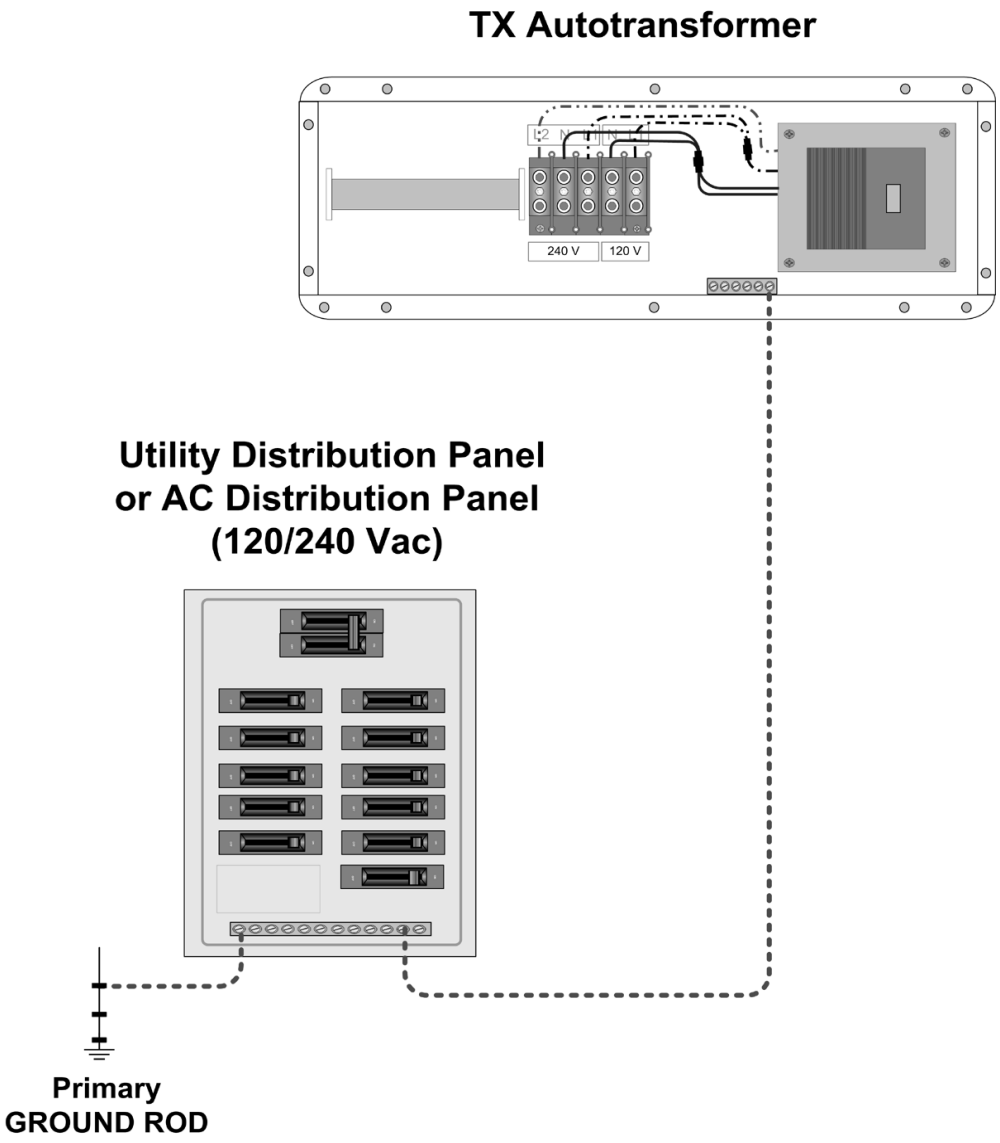


Figure 2-10 Grounding the TX Autotransformer

Important: Consult your local electrical code for possible additional grounding requirements.

Wiring: Specific Applications

Important: The following illustrations assume the ground connection to the primary system ground has already been established as described in “Grounding Requirements” on page 2–13. Therefore, the primary system ground is not shown.

Step-up Configuration

This configuration allows for a 240 volt AC load to be supplied from a 120 volt AC input source (such as an inverter or an AC generator). The voltage output of the autotransformer doubles (from 120 to 240 volts AC) and the 120 Vac input current will be twice the 240 Vac load current.

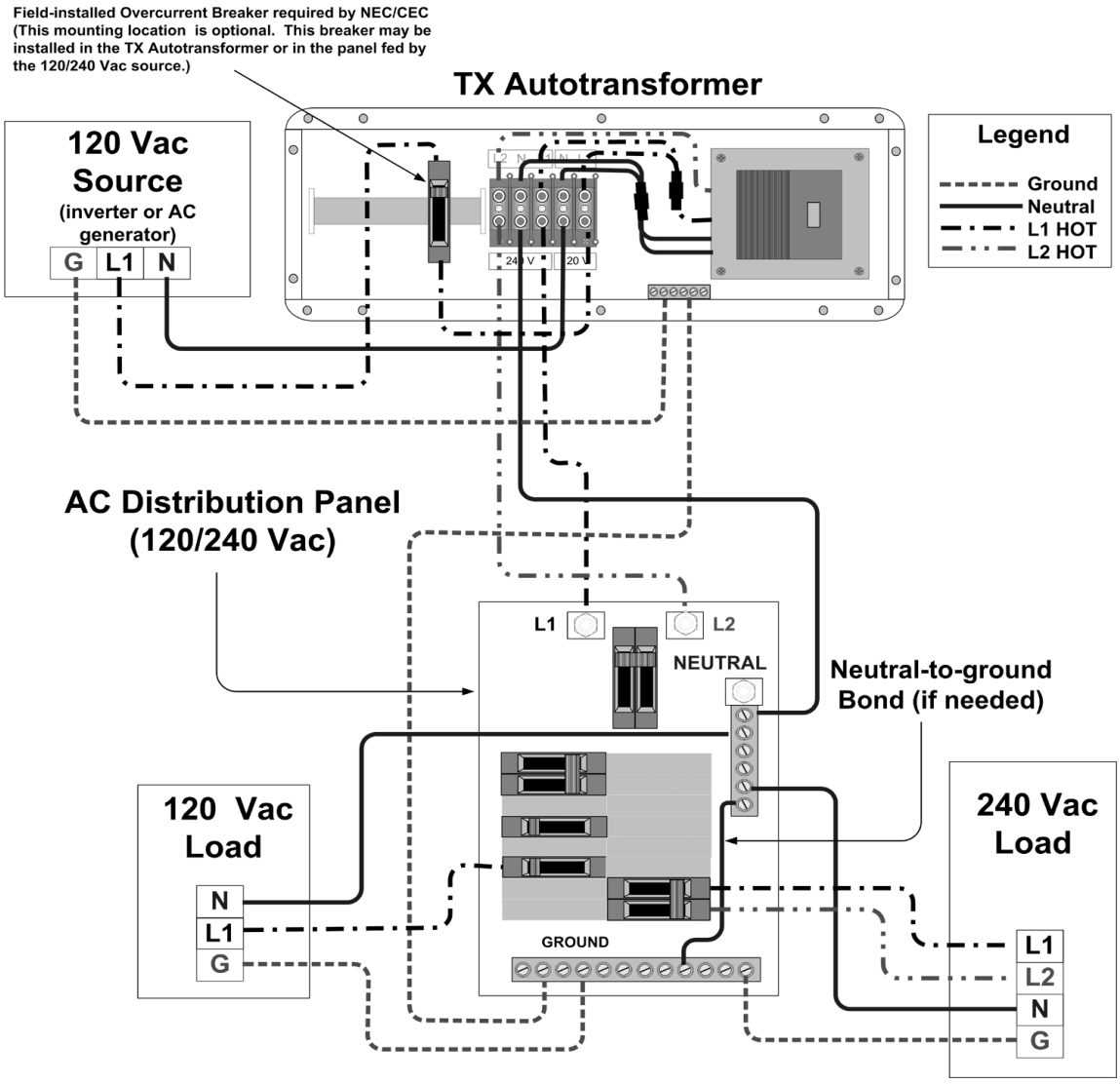


Figure 2-11 Wiring for a Basic Step-up Application

Step-up Configuration for Deep Well Pumps

This wiring configuration allows a control switch for the pump to be connected between the 120 Vac Input source and the TX Autotransformer. In this arrangement, there is no transformer idle power consumption when the switch is open and the pump is not running.

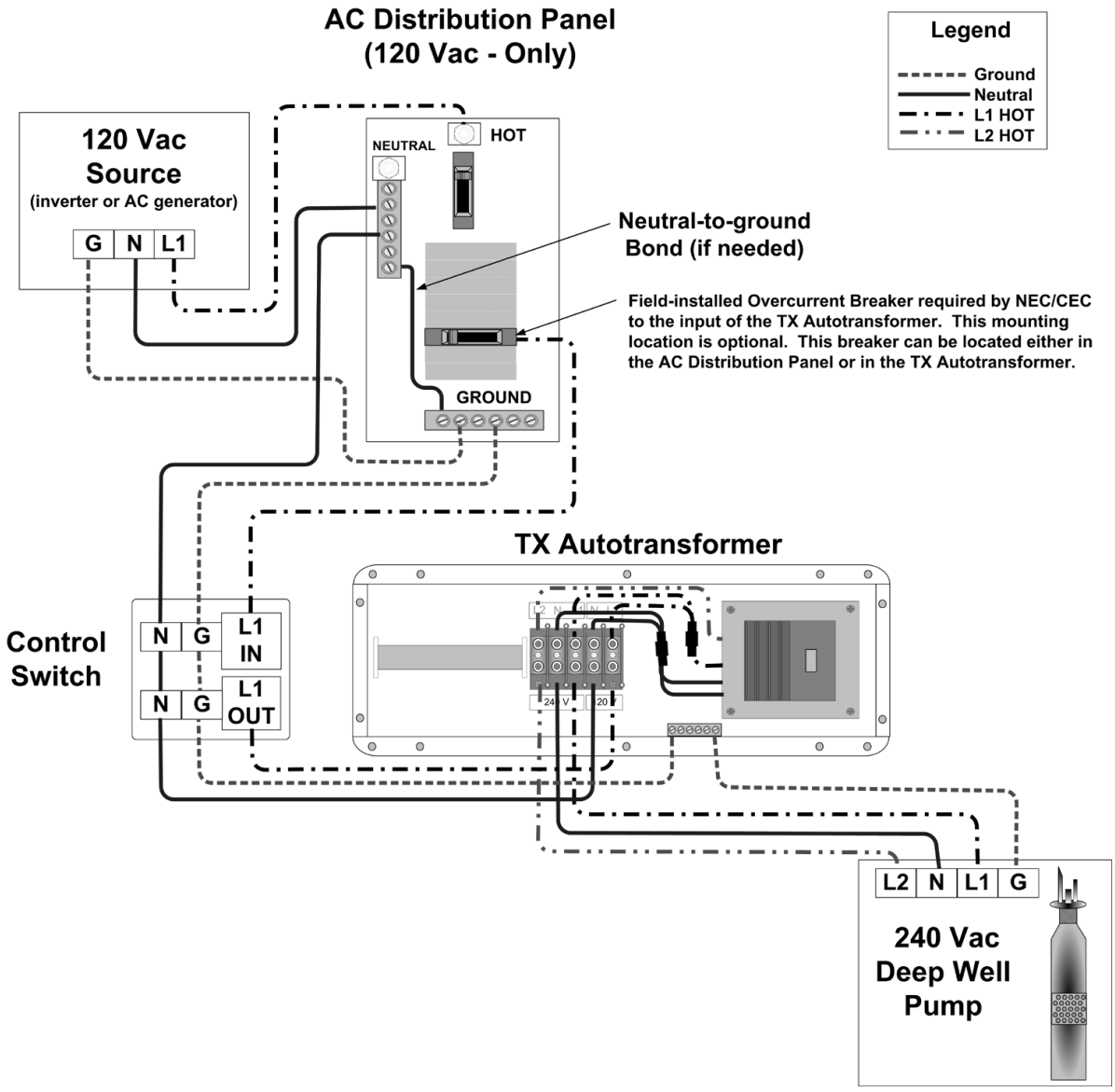


Figure 2-12 Wiring for a Deep Well Pump Application

Step-down Configuration

This configuration allows a 120 Vac load to be supplied from a 120/240 Vac output source such as a 240 Vac-Only generator. The voltage output of the autotransformer halves (from 240 to 120 Vac) and the total output current available for the 120 Vac output doubles.

If stepping down the power from a 120/240V generator uneven L1 and L2 currents may happen when the neutral is used.

When the neutral is used, the ability of the TX autotransformer to load the generator legs evenly depends on the generator's windings and voltage regulation it receives on each leg. If the voltages are not equal, or if there are other loads on the legs, then the current in each leg will not be equal.

To have equal leg currents, two steps must both be done for this to operate correctly and safely.

1. Do not wire a neutral conductor between the generator and the autotransformer.
2. Ensure the generator does not have a Ground to Neutral bond in place. This unbonds the generators neutral from ground. This "neutral" should be now considered as a "Hot" wire and treated as such. Failure to do so will result in current flow in the equipment grounding conductors between the autotransformer and the generator in this configuration.

WARNING: Shock Hazard

When the generator is used in this configuration all loads and outlets on or wired to the generator that have a neutral connection (i.e. 120v and 120/240v aka "3-wire plus ground") must not be used as they are no longer "neutral" in potential (voltage) from ground (the generator frame). The code compliance of this configuration is up to the AHJ and the installation that prevents inadvertent usage of outlets or loads that use the "neutral" on the generator while the autotransformer is connected.

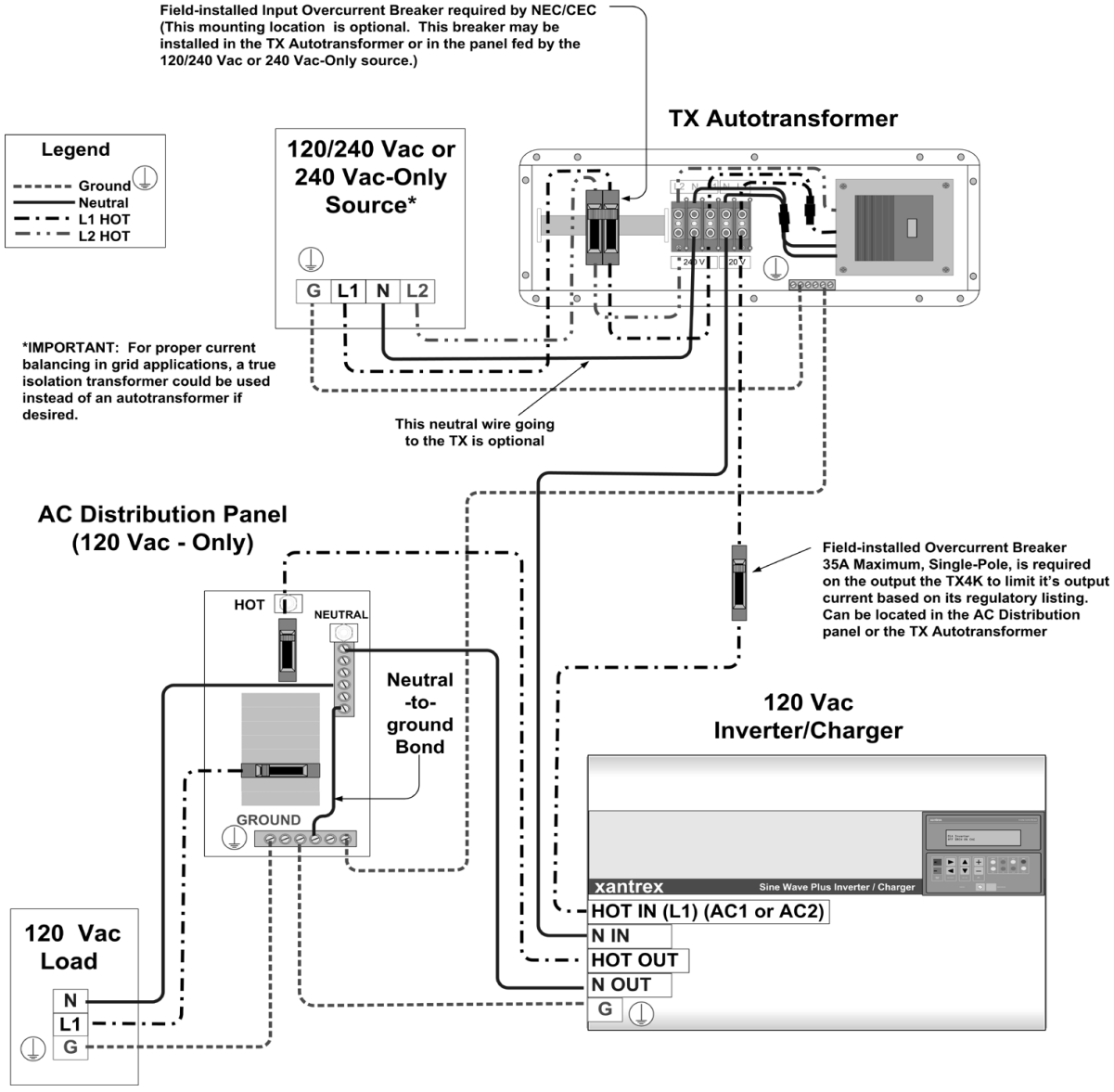


Figure 2-13 Wiring for a Basic Step-Down Application

Load Sharing Configuration

A Load Sharing configuration allows the 120/240 volt AC generator output to be divided between its L1 and L2 outputs. It can either use both the L1 and L2 outputs to supply a high current 120 Vac Load or it can use them to supply two separate 120 Vac loads. If one leg of the generator is pulling a heavier load than the other, both legs divide the current, thereby sharing the generator's output.

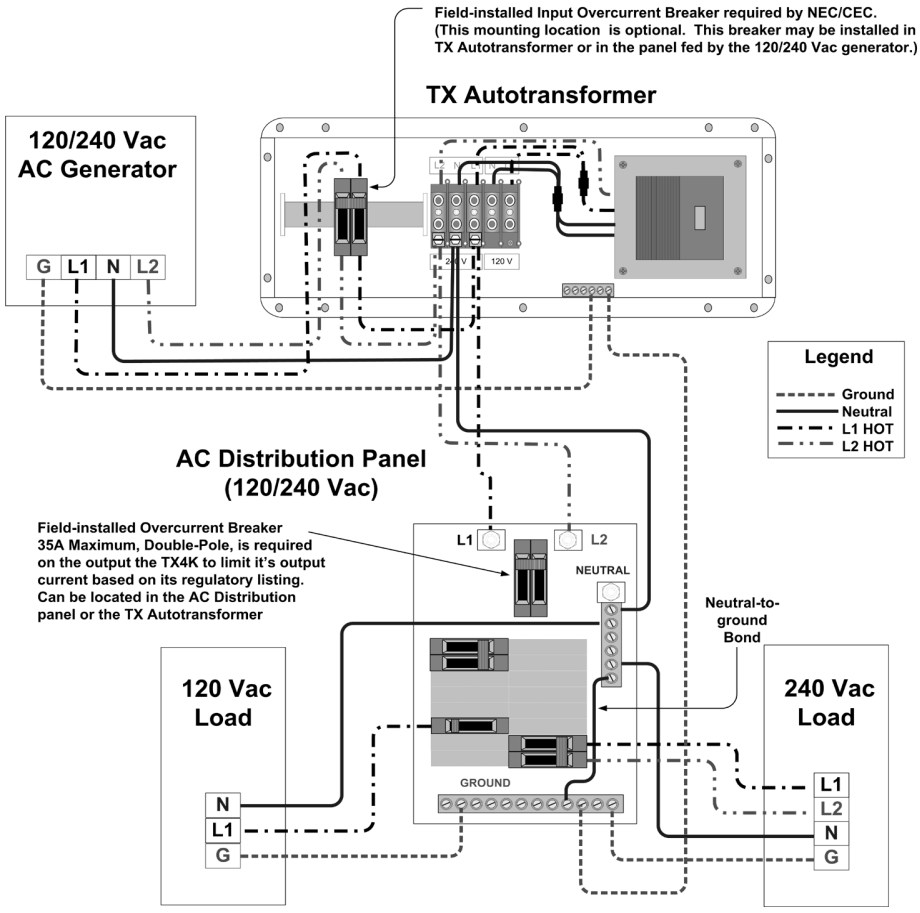


Figure 2-14 Wiring for a Load Sharing Configuration

Important: This application only works with an AC generator.

Important: Do not use this configuration on "series-stacked" inverters. A "backfeed" condition will exist for the second inverter, preventing their operation.

Important: The ability of the TX Autotransformer to share the load depends upon the generator's windings and voltage regulation it receives on each leg. If the voltages are not equal, a limited amount of current sharing will occur between the L1 and L2 legs of the generator.

A Multi-wire Branch Circuit Wiring

Appendix A, “Multi-wire Branch Circuit Wiring”, supplies information about Multi-wire Branch Circuit Wiring Precautions when using stand-alone 120 Vac inverters or generators.

WARNING

A possible fire hazard can exist if 120 Vac only sources (such as inverters and generators) are wired incorrectly into 120/240 Vac panels containing multi-wire branch circuits. This section describes how to check for multi-wire branch circuits in the load center and presents some possible solutions to this wiring method.

Multi-wire Branch Circuits

Problem — A potential safety problem exists when installing stand-alone 120 Vac inverters into existing 120/240 Vac wired panels where multi-wire branch circuit wiring methods were used.

Legacy situation — Multi-wire branch circuits are wired differently from “home run” type wiring (Figure A-1) in that only one neutral wire is used to provide the neutral-return path for each circuit connected to both phases of the AC grid. This method has been employed by electricians in recent years to keep construction costs down by saving copper and labor costs involved in running a separate Romex™ for each circuit.

Normal condition — Under normal conditions, this technique is quite safe and meets code requirements. When used as originally installed, the current for each circuit is 180° out-of-phase with each other, so the neutral wire never receives more current than it was designed to handle as the current from each circuit subtracts (or cancels out, leaving only the difference current between the two circuits). Refer to Figure A-2.

Safety issue — A safety problem occurs when a stand-alone 120 Vac inverter is installed to power these circuits, causing the one neutral wire to now carry the in-phase currents for both circuits. Since the current is in-phase, the two circuits add instead of subtract, potentially doubling the current flow in the neutral return wire! Refer to Figure A-3. The branch circuit breakers do not protect the neutral wire from overload under this condition. This excess current will overheat the neutral wire, potentially creating a fire hazard.

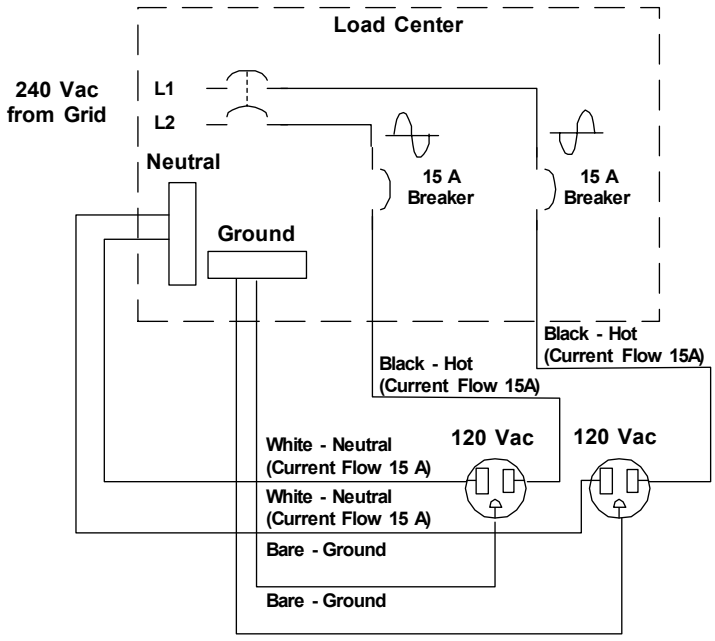


Figure A-1 Conventional Home-type Wiring

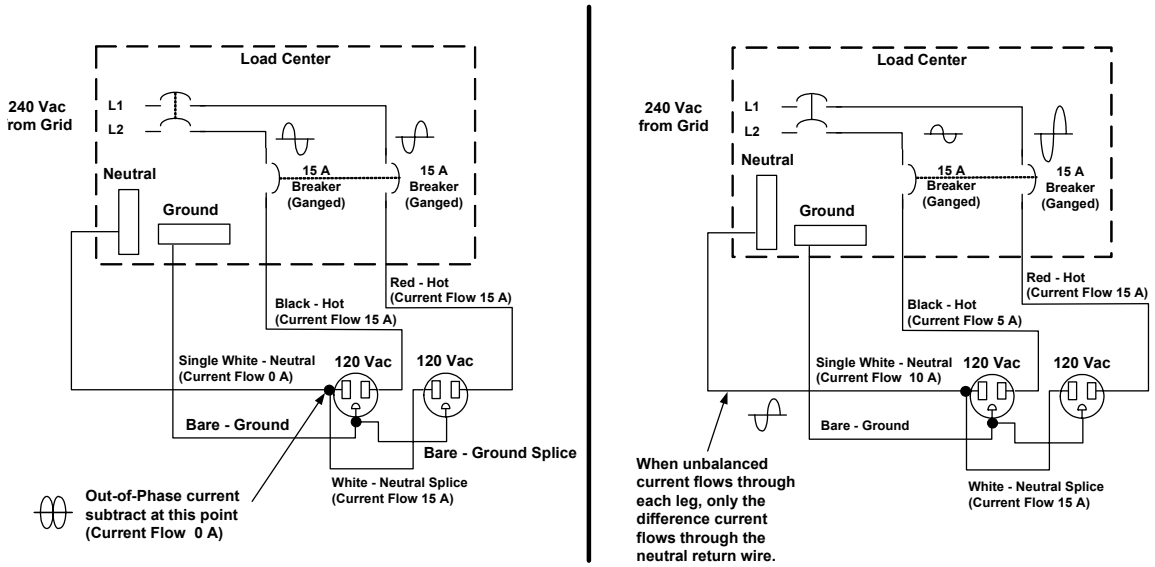


Figure A-2 Multi-wire Branch Circuit Wiring and Current Flow

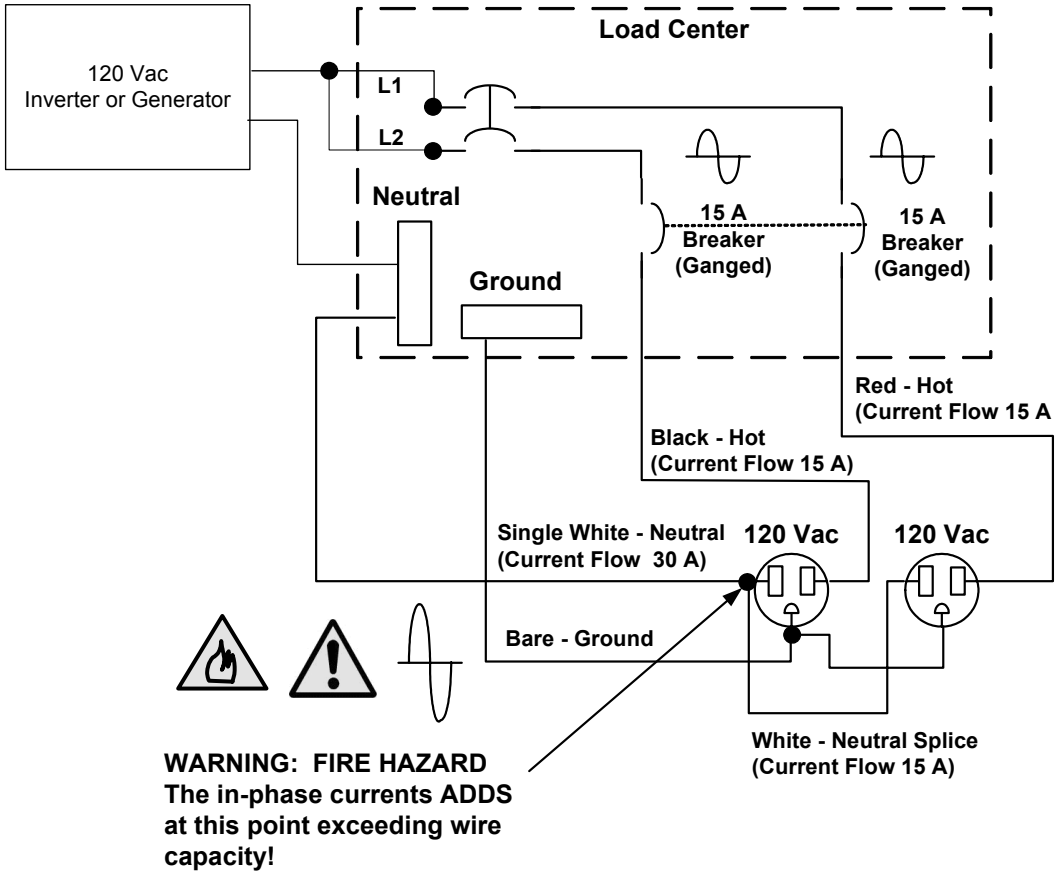


Figure A-3 120 Vac Inverter Incorrectly Wired in a Multi-wire Branch Circuit

Identifying Multi-wire Branch Circuits

> **WARNING: Shock Hazard**
> The next step involves opening the load center, exposing live circuits. This procedure should only be performed by qualified persons or electricians.

Identifying characteristic

Multi-wire branch circuits can be identified by removing the cover on the load center and inspecting the wiring. Conventional 120 Vac circuits are identified by a 2-wire-plus-ground (black, white, and copper) “romex” for each circuit. Multi-wire branch circuits use a 3-wire-plus-ground arrangement (black, red, white and copper) for each circuit run.

If this arrangement exists in the panel and it is being powered by a stand-alone 120 Vac inverter, a potential fire hazard exists! For safety, these circuits must be rewired to meet code.

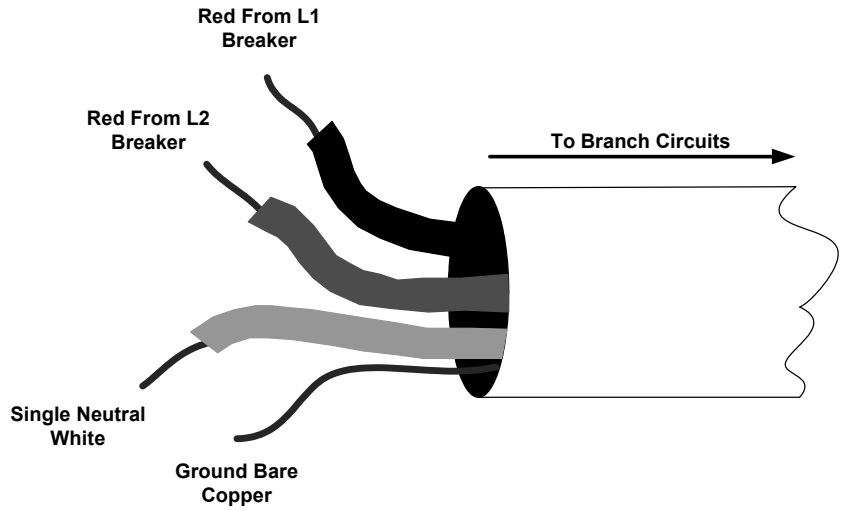


Figure A-4 Multi-wire Branch Circuit Wiring

Correcting Multi-wire Branch Circuit Wiring

Acceptable options

Correcting multi-wire branch circuit wiring is not easy. Two options which will correct multi wiring branch circuit wiring are:

- Rewire existing multi-wire branch circuits to conventional “home run” wiring. This requires a qualified electrician (knowledgeable about multi-wire branch circuit wiring) and is expensive. There may be multiple multi-wire branch circuits located throughout the structure, requiring complete rewiring.
- Add a second inverter in a “series stacked” arrangement. This is an expensive solution, but would restore the original 240 Vac split-phase configuration. This solution may actually be less expensive than having an electrician re-wire the multi-wire branch circuits. It also provides increased power backup protection and can power 240 Vac loads.

Recommended option

Add a step-up autotransformer to the output of the inverter to restore the split-phase configuration. This is the least expensive and easiest method to correct for multi-wire branch circuit wiring. Refer to Figure A-5. Using this method, half of the current is supplied to one leg of the circuit and half to the other in a split-phase arrangement (180° out-of-phase). This will restore the original functionality and safety to the multi-wire branch circuit.

WARNING: Fire Hazard

Until one of the solutions above is implemented, a stand-alone 120 Vac inverter (or generator) must not be installed where multi-wire branch circuits exist.

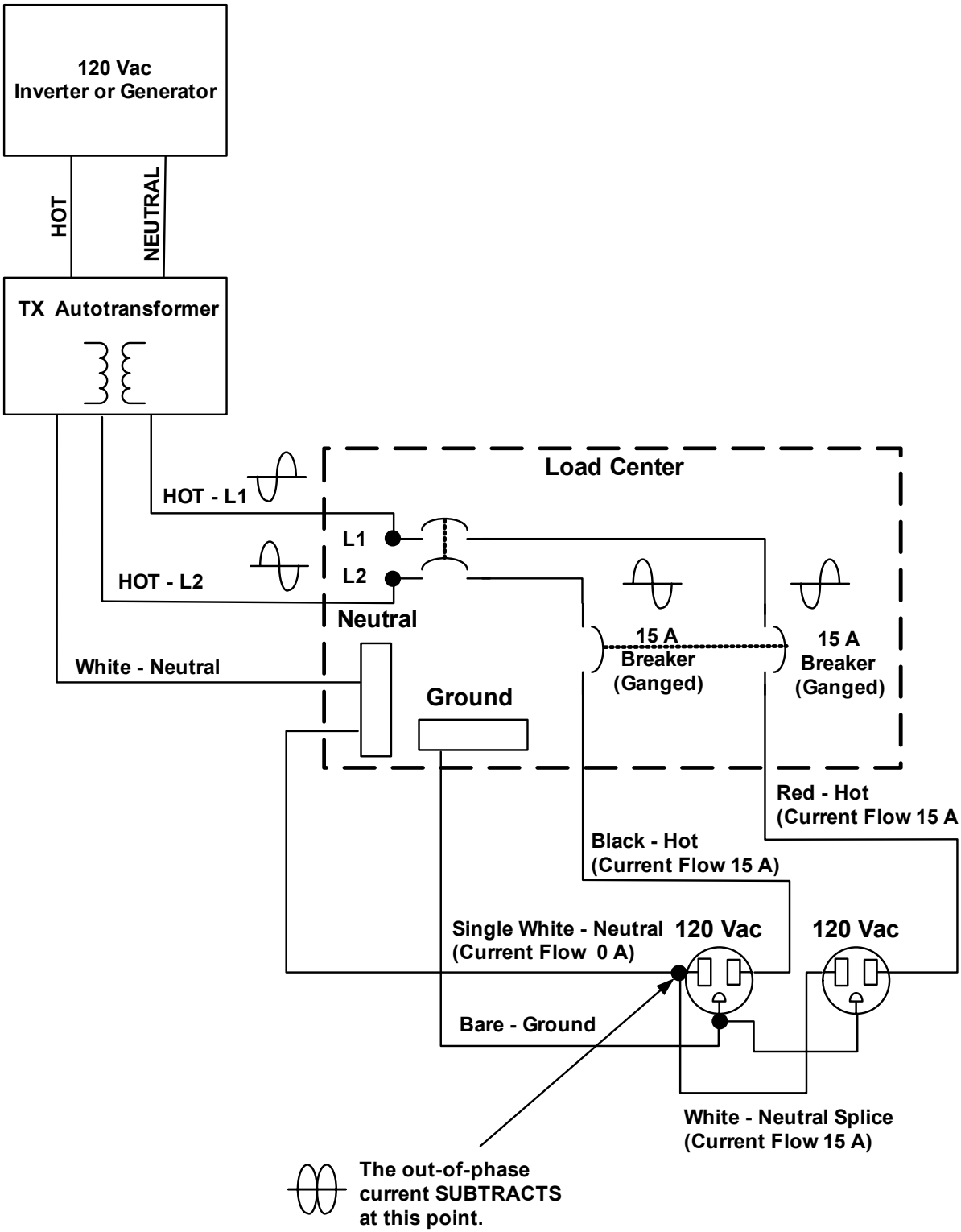


Figure A-5 Using an Step-up Autotransformer in Multi-wire Branch Circuit Wiring

Warranty and Return Information

Warranty

What does this warranty cover? This Limited Warranty is provided by Xantrex Technology, Inc. ("Xantrex") and covers defects in workmanship and materials in your Xantrex™ TX Autotransformer. This warranty period lasts for two-year from the date of purchase at the point of sale to you, the original end user customer. You require proof of purchase to make warranty claims.

This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period. Subsequent owners also require proof of purchase.

What will Xantrex do? Xantrex will, at its option, repair or replace the defective product free of charge, provided that you notify Xantrex of the product defect within the two-year warranty period, and provided that Xantrex through inspection establishes the existence of such a defect and that it is covered by this Limited Warranty.

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

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

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

Telephone:	1 800 670 0707 (toll free North America) 1 360 925 5097 (direct)
Fax:	1 800 994 7828 (toll free North America) 1 360 925 5143 (direct)
Email:	customerservice@xantrex.com

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

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

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

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

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

a) the product if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment;

b) the product if it has been subjected to fire, water, generalized corrosion, biological infestations, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Xantrex product specifications including high input voltage from generators and lightning strikes;

c) the product if repairs have been done to it other than by Xantrex or its authorized service centers (hereafter "ASCs");

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

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

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 ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING WHETHER IN CONTRACT OR TORT INCLUDING WITHOUT RESTRICTION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, ANY PERSONAL INJURY, ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF MISUSE OR ABUSE, OR THE INCORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT.

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 and provinces 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 or province to province.

Warning: Limitations On Use

Please refer to your product manual for limitations on uses of the product.

SPECIFICALLY, PLEASE NOTE THAT THE XANTREX™ TX AUTOTRANSFORMER SHOULD NOT BE USED IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, XANTREX MAKES NO REPRESENTATIONS OR WARRANTIES REGARDING THE USE OF THE XANTREX XANTREX™ TX AUTOTRANSFORMER IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES.

lease note that the Xantrex™ TX Autotransformer is not intended for use as an uninterruptible power supply and Xantrex makes no warranty or representation in connection with any use of the product for such purposes.

Return Material Authorization Policy

Before returning a product directly to Xantrex you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. 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 on page WA–4.

Return Procedure

1. Package the unit safely, preferably using the original box and packing materials. Please ensure that your product is shipped fully insured in the original packaging or equivalent. This warranty will not apply where the product is damaged due to improper packaging.
2. Include the following:
   - The RMA number supplied by Xantrex Technology, Inc. clearly marked on the outside of the box.
   - A return address where the unit can be shipped. Post office boxes are not acceptable.
   - A contact telephone number where you can be reached during work hours.
   - A brief description of the problem.
3. Ship the unit prepaid to the address provided by your Xantrex customer service representative.

If you are returning a product 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.

Out of Warranty Service

If the warranty period for your Xantrex™ TX Autotransformer 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 inverter may be serviced or replaced for a flat fee.

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

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

Information About Your System

As soon as you open your Xantrex™ TX Autotransformer package, record the following information and be sure to keep your proof of purchase.

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

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

- ❒ Type of installation (e.g. RV, truck) _____
- ❒ Length of time inverter has been installed _____
- ❒ Battery/battery bank size _____
- ❒ Battery type (e.g. flooded, sealed gel cell, AGM) _____
- ❒ DC wiring size and length _____
- ❒ Alarm sounding? _____
- ❒ Description of indicators on front panel _____
- ❒ Appliances operating when problem occurred _____
- ❒ Description of problem _____

_____

_____

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