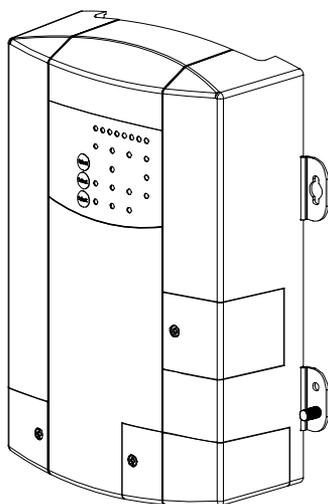


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TC1012	10A-12V
TC1512	15A-12V
TC2012	20A-12V
TC3012	30A-12V
TC4012	40A-12V
TC5012	50A-12V
TC6012	60A-12V
TC1524	15A-24V
TC2024	20A-24V
TC3024	30A-24V
TC5024	50A-24V

Installation Guide

TRUECHARGE™**2**

Series Battery Charger

This guide for use by qualified installers only

www.xantrex.com

Truecharge™ 2 Series Battery Chargers

Installation Guide

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Xantrex Technology Inc. is a world-leading supplier of advanced power electronics and controls with products ranging from small mobile units to 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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This guide for use by qualified installers only

About This Guide

Purpose

The purpose of this Installation Guide is to provide explanations and procedures for installing and configuring the Truecharge™ 2 Series Battery Charger.

Scope

The Guide provides safety guidelines, procedures for installing the battery charger, as well as information on configuring the battery charger. It does not provide details about particular brands of batteries. You need to consult individual battery manufacturers for this information.

Refer to Truecharge™ 2 Battery Charger Owner's Guide (doc. part number: 975-0401-01-01) for operational instructions.

Audience

The Guide is intended for qualified installers who need to install and configure any model unit of the Truecharge™ 2 Series Battery Charger. The installer should be a qualified technician or electrician.

Organization

This Guide is organized into two chapters and one appendix. Chapter 1 describes the standard features of a Truecharge™ 2 Battery Charger, as well as its protection features. It also provides information on the different parts of the Truecharge™ 2 Battery Charger including information on the optional remote panel.

Chapter 2 provides procedures for installing, testing and configuring the Truecharge™ 2 Battery Charger.

Appendix A contains physical, electrical performance, and regulatory approval specifications for the Truecharge™ 2 Battery Charger.

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.

This Guide contains information for 11 product models of the Truecharge™ 2 Series Battery Charger.

The 12V models are: TC1012, TC1512, TC2012, TC3012, TC4012, TC5012, and TC6012. When being referred to individually, the product will be referred to by its model name.

The 24V models are: TC1524, TC2024, TC3024, and TC5024. When being referred to individually, the product will be referred to by its model name.

When all models are being referred to, they will be referred to as Truecharge™ 2 Battery Chargers.

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

READ AND SAVE THIS INSTALLATION GUIDE FOR FUTURE REFERENCE.

This chapter contains important safety, installation, and operating instructions for the Truecharge™ 2 Series Battery Chargers.

1. Before installing and using a Truecharge™ 2 Battery Charger, read all instructions and cautionary markings on a Truecharge™ 2 Battery Charger unit, the batteries, and all appropriate sections of this guide.



CAUTION: Risk of injury

To reduce the risk of injury, charge only properly rated (such as 12 V and 24 V) lead-acid (GEL, AGM, Flooded, or lead-calcium) rechargeable batteries. Other battery types may burst, causing personal injury and damage.

-
2. Do not expose the Truecharge™ 2 Battery Charger to rain, snow, spray, or bilge water. To reduce risk of fire hazard, do not cover or obstruct the air intake vent openings. Do not install the Truecharge™ 2 Battery Charger in a zero-clearance compartment. Overheating may result.
 3. This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

4. 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 Truecharge™ 2 Battery Charger with damaged or substandard wiring.
5. The use of any attachments not recommended or sold by Xantrex, may result in risk of fire, electric shock, or injury to persons.
6. Do not operate the Truecharge™ 2 Battery Charger if it has received a sharp blow, been dropped, has cracks or openings in the enclosure (especially when the fuse cover has been damaged and will not close), or otherwise damaged in any other way. If the Truecharge™ 2 Battery Charger is damaged, see the Warranty section.
7. Do not disassemble the Truecharge™ 2 Battery Charger—there are hazardous voltages within. It contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the Truecharge™ 2 Battery Charger yourself may result in a risk of electrical shock or fire and will void your warranty. Internal capacitors remain charged after all power is disconnected.
8. To reduce the risk of electrical shock, disconnect both AC and DC power from the Truecharge™ 2 Battery Charger before attempting any maintenance or cleaning or working on any circuits connected to the Truecharge™ 2 Battery Charger. Turning off using the on/standby button on the remote panel will not reduce this risk.
9. The Truecharge™ 2 Battery Charger must be provided with equipment-grounding conductors connected to the AC and input ground, and from chassis to the DC ground.

**WARNING: Explosion hazard**

10. Working in the vicinity of lead-acid batteries is dangerous. Batteries generate explosive gases during normal operation. Therefore, it is of utmost importance that each time before servicing the charger in the vicinity of the battery, that you read this manual and follow the instructions exactly.
11. To reduce the risk of battery explosion, follow these instructions and those published by the battery manufacturer and the manufacturer of any unit you intend to use in the vicinity of the battery. Review cautionary markings on these products and on the engine

Personal Precautions When Working With Batteries

**WARNING: BATTERIES PRESENT RISK OF ELECTRICAL SHOCK, BURN FROM HIGH SHORT-CIRCUIT CURRENT, FIRE OR EXPLOSION FROM VENTED GASES. OBSERVE PROPER PRECAUTIONS.**

1. Have someone within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
3. Wear proper, non-absorbent gloves, complete eye protection, and clothing protection. Avoid touching your eyes and wiping your forehead while working near batteries.

4. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flood it with running cold water for at least twenty minutes and get medical attention immediately.
5. Never smoke or allow a spark or flame near the engine or batteries.
6. Use extra caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
7. Remove all personal metal items, like rings, bracelets, and watches when working with batteries. Batteries can produce a short circuit current high enough to weld metal to skin, causing a severe burn.
8. If you need to remove a battery, always remove the ground terminal from the battery first. Make sure all accessories are off so you don't cause an arc.
9. Never charge a frozen battery.

PREPARING TO CHARGE

10. Make sure the area around the battery is well ventilated.
11. Make sure the voltage of the batteries matches the output voltage of the battery charger.
12. Clean battery terminals. Be careful to keep corrosion from coming into contact with your eyes and skin.
13. Study and follow all of the battery manufacturer's specific precautions, such as removing or not removing cell caps while charging, whether equalization is acceptable for your battery, and recommended rates of charge.
14. Add distilled water in each cell until battery acid reaches the level specified by the battery manufacturer. This helps to purge excessive gas from cells. Do not overfill. For a battery without removable cell caps, carefully follow manufacturer's instructions.

BATTERY CHARGER LOCATION

15. Locate the Truecharge™ 2 Battery Charger unit away from batteries as practical in a well ventilated compartment.
16. Never place the Truecharge™ 2 Battery Charger unit directly above batteries; gases from a battery will corrode and damage the charger
17. Never allow battery acid to drip on the charger when reading gravity, or filling battery.
18. Do not operate the charger in a closed in area, or restrict the ventilation in any way.
19. Do not place a battery on top of the charger.
20. For North American marine installations, external connections to the charger shall comply with the United States Coast Guard Electrical Regulations (33CFR183, Sub Part I).

FCC Information to the User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

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1

Introduction

Chapter 1 describes the standard features of a Truecharge™ 2 Battery Charger, as well as its protection features. It also provides information on the different parts of the Truecharge™ 2 Battery Charger including information on the optional remote panel.

Truecharge™ 2 Battery Charger

The Truecharge™ 2 Battery Charger ships with the following items.

- one Truecharge™ 2 Battery Charger unit
- installation and operation guides
- rubber boots for DC terminals
- ring terminals, nuts, and washers
- strain relief clamp for AC input cables

Standard and Protection Features

The Truecharge™ 2 Battery Charger provides the following standard features:

- three¹ full current rated outputs
- battery monitoring functions while in float mode or rest mode
- correct charging voltage for your batteries when connected to almost any single phase AC power outlet in the world
- low electromagnetic interference (EMI)
- automatic charge resumption after AC power interruption
- programmable custom charge sequence²
- fully discharged battery charging³
- an optional remote panel⁴ which can be mounted up to 15 m (50 ft) away for remote control and monitoring.
- an optional battery temperature sensor⁵ (BTS) provides battery temperature voltage compensation from -25 to 70 °C (-13 to 158 °F)

1. Model TC1012 has one output and model TC1512 has two outputs. All other models have three outputs. Each output (for models with 2 or 3 outputs) can charge different batteries that either have the same chemistry or can tolerate the same charge sequence.

2. The charger can be programmed with custom charge setpoints using PC interface. This programming can only be done using a special configuration tool operated by Xantrex or a designated OEM.

3. The charger can initiate charging a non-damaged but zero voltage battery.

4. Part number: 808-8040-00

5. Part number: 808-0232-01

The Truecharge™ 2 Battery Charger provides the following protection features:

- reverse polarity protection via an output fuse to guard against reverse battery polarity
- AC input out-of-range protection shutdown
- ambient over temperature protection shutdown
- battery over-charging protection
- electronic current limiting provides protection against short circuit conditions on the charger's output
- ignition protected rating, enabling installation in engine spaces
- isolated design
- over temperature and short circuit protection for the BTS and communication connector ports
- drip-proof rubber boots for DC terminals for added moisture protection
- IP-32 drip protection rating¹
- fan lockout protection

The optional Battery Temperature Sensor (BTS) provides these protection features:

- battery under temperature charging protection preventing battery charging at -20 °C or below
- charging current compensation for different battery temperatures

1. In two specific installation orientations—see “Truecharge™ 2 Battery Charger Mounting Orientations” on page 2–7.

Truecharge™ 2 Battery Charger

This section describes the different parts of the Truecharge™ 2 Battery Charger.

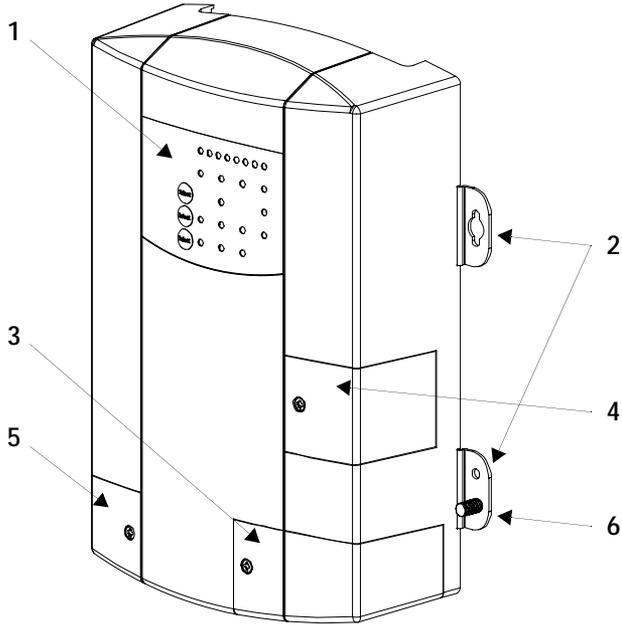


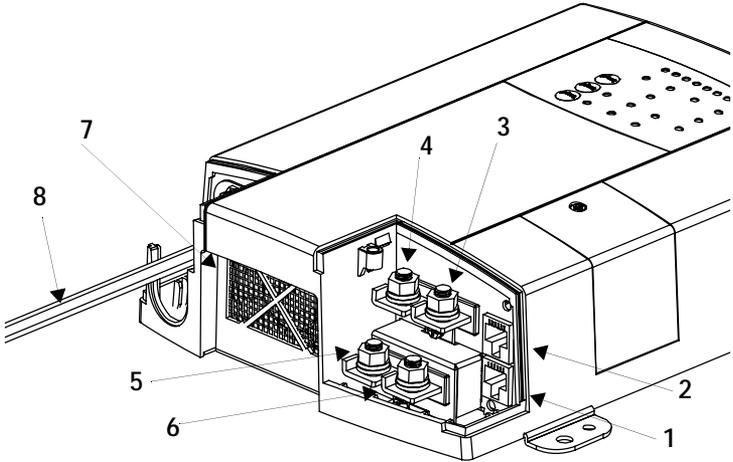
Figure 1-1 Truecharge™ 2 Battery Charger

Item	Description
1	Onboard control and status display panel or simply onboard display (see “Rear Panel” on page 1–6 for more information) for controlling the Truecharge™ 2 Battery Charger settings and for monitoring charger status and charging current.
2	Mounting flanges are used to permanently install the product.
3	DC wiring compartment cover protects the DC terminals, as well as the communication and BTS ports. Remove and replace when installing cables.

Item	Description
4	Fuse access panel cover provides access to the DC fuse in the event of an accidental reverse polarity installation.
5	AC wiring compartment cover provides the installer with easy access to the AC wiring compartment, to allow for a trouble free installation. Remove and replace when installing the product.
6	DC ground stud for connecting the charger's chassis to ground.

Rear Panel

This section describes the parts of the rear panel of the Truecharge™ 2 Battery Charger.



40 A model (TC4012) shown. Other models may vary.

Figure 1-2 Truecharge™ 2 Battery Charger Rear Panel

Item	Description
1	BTS port - battery temperature sensor port
2	Communication port - remote panel port
3	Battery positive (+) for bank 3 (6 mm stud)
4	Battery positive (+) for bank 2 (6 mm stud)
5	Battery positive (+) for bank 1 (6 mm stud) See Important note below.
6	Battery negative (-) , common for all three banks (6 mm stud) (common for both banks in model TC1512) (model TC1012 has a single bank only—one positive terminal and one negative terminal)

Item	Description
7	Air intake vent - located inside is the fan assembly
8	AC wiring - line, neutral, and ground input wires

Important: When installing only a single bank (or one battery) for Truecharge™ 2 Battery Chargers that have multiple outputs, positive bank 1 must be utilized. Bypassing bank 1 and using any of the other banks (bank 2 or bank 3) may render the charger to function improperly.

Onboard Control and Status Display Panel

This section describes the parts of the onboard control and status display panel of the Truecharge™ 2 Battery Charger.

Important: A “press and hold” action on any panel button means that the button must be held down for more than three seconds then released in order to send the instruction. A “press” action on any panel button means that the button must be pressed and released before two seconds have elapsed.

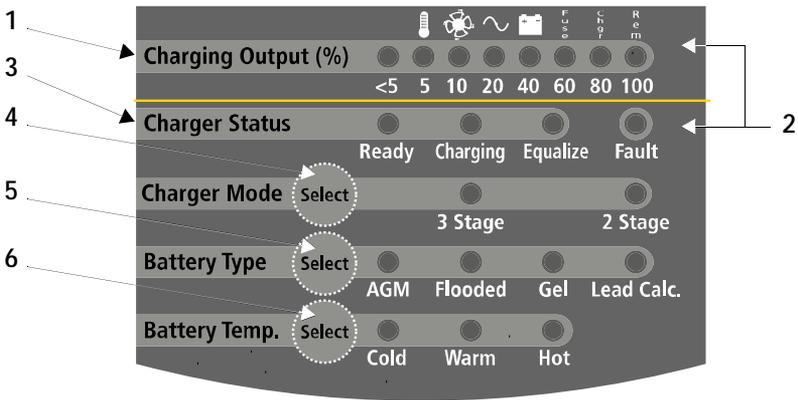


Figure 1-3 Onboard Control and Status Display Panel

To reduce current draw from the connected battery when AC power is not present, the panel’s LED control and status lights are automatically turned off and the buttons are disabled.

Item	Description
1	<p>Charging Output (%) LEDs</p> <ul style="list-style-type: none"> The LEDs illuminate like a progress bar displaying the present total output charge current as a percentage of the set maximum charge current. The numbers below the LEDs represent the percentage values. See Figure 1-4 on page 1–11. A single LED may flash intermittently in combination with a solid Fault LED (indicating a fault) or with a flashing Fault LED (indicating a warning). The icons above the LEDs represent the various types of fault and warning conditions. See Figure 1-4 on page 1–11.
2	<p>Fault LED</p> <p>The LED may illuminate a solid light (indicating a fault) or flash intermittently (indicating a warning) in combination with flashing Charging Output (%) LEDs. See Table 1-1, “Fault and Warning Indicators” on page 1–11 for details.</p>
3	<p>Charger Status LEDs</p> <p>Displays the current status of the charger.</p> <ul style="list-style-type: none"> Ready - a solid light indicates batteries are fully charged and in rest stage. Ready and Charging - solid lights indicate batteries are fully charged and in float stage. Charging - a solid light indicates charger is performing a normal charge cycle. Equalize - a solid light indicates that the charger is performing an equalization cycle. <ul style="list-style-type: none"> - a flashing light indicates that the equalization cycle will begin after the absorption stage is done.
4	<p>Charger Mode Select button</p> <ul style="list-style-type: none"> Press and hold the button for three seconds to select either of two settings. An indicator LED corresponds to each setting. Each setting optimizes the charging sequence differently in charging the batteries by stages. <ul style="list-style-type: none"> •Three-stage - Bulk, Absorption, and Float; default setting •Two-stage - Bulk and Absorption only When setting or cancelling an Equalization program: Press and hold both the Battery Temp. Select and Charger Mode Select buttons.

Item	Description
5	<p>Battery Type Select button</p> <p>Press and hold the button for three seconds to select either of five settings. An indicator LED corresponds to each setting. Each setting maximizes charger performance for its corresponding battery type.</p> <ul style="list-style-type: none"> • AGM - Absorbent Glass Mat lead-acid battery • Flooded - Lead-acid battery; default setting • GEL - Gel-type lead-acid battery • Lead Calc. - Lead-calcium battery • Custom - If a custom battery type has been programmed then all LEDs will illuminate
6	<p>Battery Temp. Select button</p> <ul style="list-style-type: none"> • Press and hold the button for three seconds to select one of three settings. An indicator LED corresponds to each setting. Each setting will change the charger's internal threshold to compensate for variance in battery voltage due to a change in temperature. <ul style="list-style-type: none"> • Cold - for battery temperature below 5 °C (41 °F) • Warm - for battery temperature between 5 and 30 °C (41 and 86 °F); default setting • Hot - for battery temperature above 30 °C (86 °F) • When setting or cancelling an Equalization program: Press and hold both the Battery Temp. Select and Charger Mode Select buttons.

The Fault LED works in conjunction with the Charging Current (%) LEDs. The icons at the top row above the Charging Current (%) LEDs represent the various types of fault and warning conditions. For example, a temperature warning is represented by a thermometer icon.

The Charging Current (%) LEDs will normally illuminate as a solid progress bar when they are indicating the amount of output charging current. If any of the LEDs start to flash intermittently at the same time that the Fault LED is either solid or flashing, a fault or warning condition is indicated.

Important: A warning condition notifies the user of an impending problem and will not stop the charger from charging, while a fault condition will stop the charger from charging the battery.

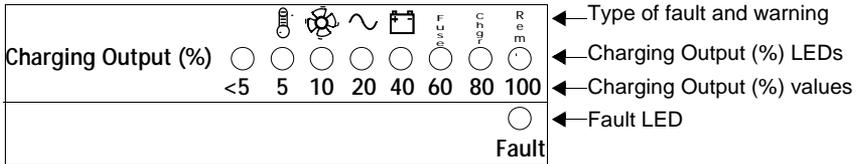


Figure 1-4 Charging Output (%) and Fault LEDs

Table 1-1 on page 1–11 summarizes the various fault conditions that might occur during the operation of the charger. For suggestions in what to do after a fault condition is detected, see Truecharge™ 2 Battery Charger Owner’s Guide (doc. part number: 975-0401-01-01) on Table 3-1, “Interpreting Fault and Warning Indicators” on page 3–4 in Chapter 3, “Troubleshooting”.

Table 1-1 Fault and Warning Indicators

Fault or Warning Condition	Temp 	Fan 	AC 	Battery 	Fuse 	Charger 	Remote 	Fault
High Battery Temp warning (>50°C) See Figure 1-6.								
High Battery Temp fault (>70°C) See Figure 1-6.								
Low Battery Temp warning (<0°C) See Figure 1-6.								



Table 1-1 Fault and Warning Indicators

Fault or Warning Condition	Temp 	Fan 	AC 	Battery 	Fuse F U S E	Charger C H G R	Remote R E M	Fault 
Low Battery Temp fault (< -25°C) See Figure 1-6.								
AC input out of range Warning (<104V and >90V) or (<264V and >255V) See Figure 1-5.								
AC input out of range fault (<90V or >265V) See Figure 1-5.								
AC frequency out of range fault (<45 Hz or >65 Hz)								
High Battery voltage fault (>16.6V)								
High Charger Temp warning (>50°C)								
High Charger Temp fault (>70°C)								
Locked Fan fault								
Loss of Remote Connection warning								

 Flashing LED  Solid LED

Table 1-1 Fault and Warning Indicators

Fault or Warning Condition	Temp 	Fan 	AC 	Battery 	Fuse F U S E 	Charger C H G E R 	Remote R E M 	Fault 
Reverse Polarity Fuse fault								
Internal fault								

 Flashing LED  Solid LED

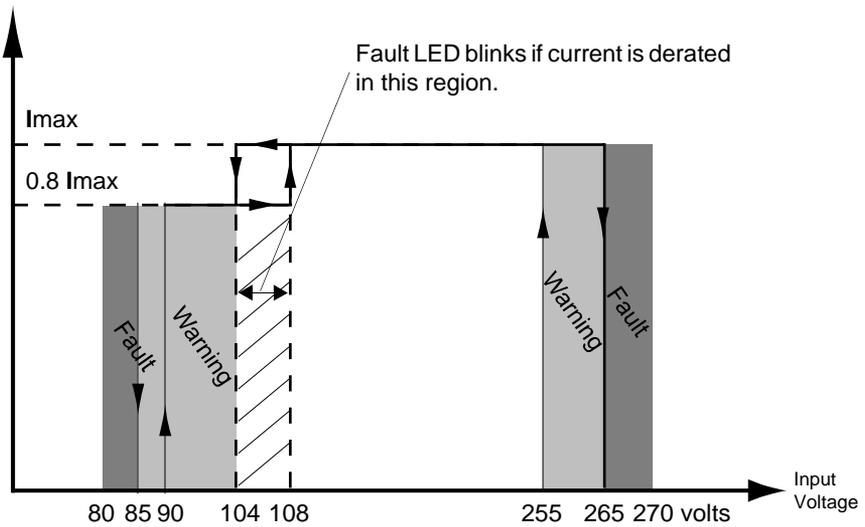


Figure 1-5 Input Voltage Operating and De-rating Curve

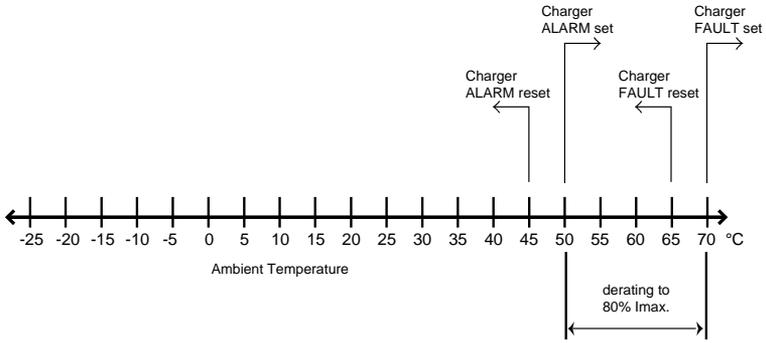


Figure 1-6 Battery and Charger Temperature Thresholds

Remote Panel (Sold Separately)

This section describes the parts of the optional remote panel (Part number: 808-8040-00) of the Truecharge™ 2 Battery Charger. The remote panel can be mounted using a communications cable up to 15 m (50 ft) from the Truecharge™ 2 Battery Charger connected via the communication port for convenience.

Important: A “press and hold” action on any panel button means that the button must be held down for more than three seconds then released in order to send the instruction. A “press” action on any panel button means that the button must be pressed and released before two seconds have elapsed.

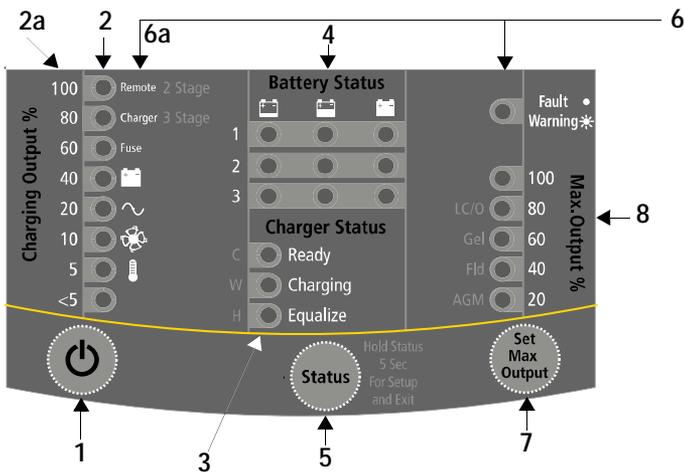


Figure 1-7 Truecharge™ 2 Battery Charger Remote Panel (optional)

The Remote Panel can be used to:

- Program the charger for battery type and temperature
- Set the charger mode (two or three-stage charging)
- Activate and terminate equalization (not allowed for GEL and AGM)

- Limit the maximum charger output current (20, 40, 60, 80, and 100% of charger rating) to lower the current drawn from the generator or AC source
- Set the charger to ON or on STANDBY
- Set or cancel an equalization cycle
- Display faults and warnings
- Display basic battery level and settings

Item	Description
1	<p data-bbox="187 500 418 526">ON/STANDBY Button</p> <ul data-bbox="187 532 934 716" style="list-style-type: none">• Press to enable or disable the charger while AC power is connected.• When in Setup Mode: Press to select the Charger Mode: two or three-stage.• To set or cancel an Equalization program: Press and hold both the Status and ON/STANDBY buttons.
2	<p data-bbox="187 740 511 766">Charging Output (%) LEDs</p> <ul data-bbox="187 773 938 1118" style="list-style-type: none">• The LEDs illuminate a progress bar displaying the present total output charge current as a percentage of the maximum charge current. The numbers below the LEDs represent the percentage values. See 2a on Figure 1-7 on page 1–15. NOTE: The charger maximum current can be set using the Remote Panel.• An LED may flash intermittently in combination with a solid Fault LED to indicate a fault or with a flashing Fault LED to indicate a warning condition. The icons on the right side of the LEDs represent different types of faults and warnings. See 6a on Figure 1-7 on page 1–15.

Item	Description
3	<p>Charger Status LEDs Displays the present status of the charger.</p> <ul style="list-style-type: none"> • Ready - a solid light indicates that all batteries are fully charged and in rest stage. • Ready and Charging - solid lights indicate that batteries are fully charged and in float stage. • Charging - a solid light indicates that the charger is performing a normal charge cycle. • Equalize - a solid light indicates that the charger is performing an equalization cycle. - a flashing light indicates that the equalization cycle will begin after the absorption stage is done.
4	<p>Battery Status LEDs Displays the present status of each battery (or each battery bank). Each row represents the battery (or battery bank) number designation—1, 2, or 3. Each column represents Low, Medium, or Full battery capacity. NOTE: This feature is available only on the Remote Panel.</p>
5	<p>Status Button</p> <ul style="list-style-type: none"> • Press and hold to enter or exit Setup Mode. • When in Setup Mode: Press to select the Battery Temperature: <u>C</u>old, <u>W</u>arm, or <u>H</u>ot. • When setting or cancelling an Equalization program: Press and hold both the Status and ON/STANDBY buttons.
6	<p>Fault/Warning LED The LED displays a solid light to indicate a fault condition or flashes intermittently in combination with a flashing Charging Output (%) LED to display a warning condition (6a). See Table 1-1, “Fault and Warning Indicators” on page 1–11 for details.</p>
7	<p>Set Max Output Button</p> <ul style="list-style-type: none"> • Press to select the desired maximum charging output current. NOTE: This feature is available only on the Remote Panel. • When in Setup Mode: Press to select the Battery Type: AGM, Flooded, GEL, Lead-Calcium/OEM
8	<p>Max. Output (%) LED The LED illuminates a solid light corresponding to the Maximum Charger Output % setting.</p>

2 Installation

Chapter 2 provides procedures for installing, testing and configuring the Truecharge™ 2 Battery Charger.

It covers the following major topics:

- “Preparing for Installation” on page 2–2.
- “Installing the Truecharge™ 2 Battery Charger” on page 2–12
- “Installing Optional Accessories” on page 2–24
- “Configuring the Truecharge™ 2 Battery Charger” on page 2–26
- “Installing Batteries” on page 2–32

Preparing for Installation



WARNING

The battery charger must be properly installed with in accordance with all local and application-specific codes and ordinances before it is used.

The Truecharge™ 2 Battery Charger is designed to be permanently mounted. Figure 2-1 shows a typical installation with three batteries, a battery temperature sensor (BTS) and a remote panel (both optional). It also shows the AC and DC wiring and protection devices required for a typical installation. Means of disconnection must be incorporated into the fixed wiring, in accordance with the electrical code that governs each installation.

NOTE: Not to scale. For illustration purposes only.

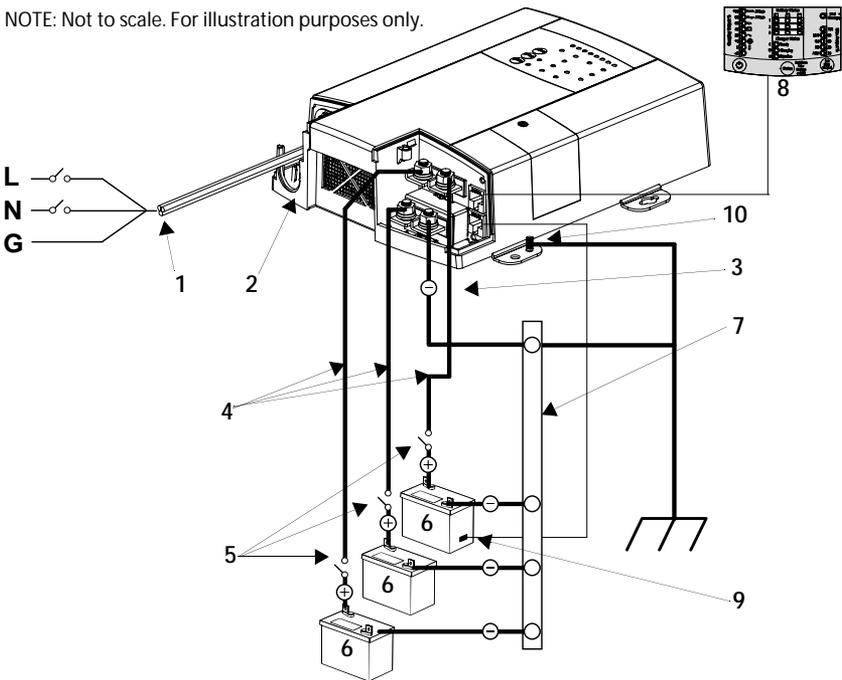


Figure 2-1 Typical Truecharge™ 2 Battery Charger System Installation

1	AC mains source protected by correct size and type of branch rated circuit breaker
2	AC input wiring compartment
3	DC negative cable
4	DC positive cables
5	DC circuit breakers or DC fused disconnects
6	Battery or battery bank
7	Engine ground bus or DC negative bus
8	Remote panel (optional accessory part number: 808-8040-00)
9	Battery temperature sensor (optional accessory part number: 808-0232-01)
10	DC chassis ground (earth)

Tools and Materials

To mount and connect the Truecharge™ 2 Battery Charger you need the following tools:

- 10 mm socket wrench and extension for the DC terminals and ground stud
- Phillips screwdriver for removing and re-securing the AC and DC wiring compartment covers
- power drill/screwdriver
- drill bit for pilot holes for mounting screws (if using #6 mounting screws, use 1/16 drill)
- wire stripper
- manufacturer's recommended crimp tool for any crimp terminals that are being used

You need the following materials:

- 3 conductor AC input wiring
Use the information in “Planning AC Wiring” on page 2–15 and your local electrical codes to determine the correct wire and breaker or fuse.
- AC cable strain relief (if the one included is not compliant with your local electrical code requirements)
- appropriately sized DC cables for each battery, with suitable connectors at the battery end
- appropriately sized DC chassis ground (earth) with suitable connectors
- ring terminals to fit 6 mm (1/4 in.) studs at the charger end (Marine grade hardware is recommended).
- DC fused disconnect or properly rated circuit breaker for each battery bank
- mounting screws, M3 or #6 marine grade, corrosion resistant (4 pieces) (Length dependent on mounting surface).

Location

Install the Truecharge™ 2 Battery Charger in a location that meets the following requirements:

Condition	Requirement
Dry	The Truecharge™ 2 Battery Charger must be installed in a dry location not subject to moisture especially rain, spray, or splashing bilge water.
Clean	The Truecharge™ 2 Battery Charger should not be exposed to metal filings or any other form of contamination.
Cool	The ambient air temperature should be between 0 °C - 50 °C (32 °F - 122 °F) for best performance.
Ventilated	There must be at least 10 cm (4 in.) of clearance on the top and bottom ends of the Truecharge™ 2 Battery Charger for air flow and at least 6 cm (2.5 in.) of clearance on either side (see Figure 2-3). Ventilation openings on the charger must not be obstructed. If the charger is mounted in a tight fitting compartment, the compartment must be ventilated with cut-outs to prevent the charger overheating.
Safe	This battery charger is ignition protected, so it can be installed in areas containing gasoline tanks or fittings which require ignition protected equipment. Xantrex recommends, however, that it is safest not to install electrical equipment in these areas.
Close to batteries	The Truecharge™ 2 Battery Charger should be installed as close as possible to the batteries, but not in the same compartment to prevent corrosion. Avoid excessive cable lengths and use the recommended wire sizes. Xantrex recommends installing with cables sized to achieve less than 3% voltage drop on battery cables under full load. This will maximize the performance of the charger.

When planning to install the Truecharge™ 2 Battery Charger, be sure that you consider the location and orientation carefully. The Truecharge™ 2 Battery Charger is considered to have an IP rating of IP-32, if installed in either of two specific orientations [shown in Figure 2-2 a) and b)]. This

rating means that it meets European and U.S. standards in preventing dripping water from entering the enclosure, and causing shock hazard and damage to equipment.

The other possible mounting orientations will not prevent the entry of dripping water, and are not suitable for marine, or a moist environment without the installation of additional drip protection. They are only acceptable for use in locations that are always dry [shown in Figure 2-2 c) and d)].

The environment, therefore, will determine the mounting orientations that are suitable for each installation. Is the installation environment one that will always be dry or will moisture or condensation sometimes enter the area?

Important: In marine environments, there is a likelihood that condensation will be present, and may drip on to the charger. Use the appropriate mounting orientations as shown in Figure 2-2.

For marine installations, the mounting orientations a) and b) in Figure 2-2 meet the North American and European marine requirements. Marine products are required to meet drip-proof tests to ensure safety in the presence of condensation.

If you are certain your installation is not subject to moisture, mounting orientations c) and d) in Figure 2-2 may be used.

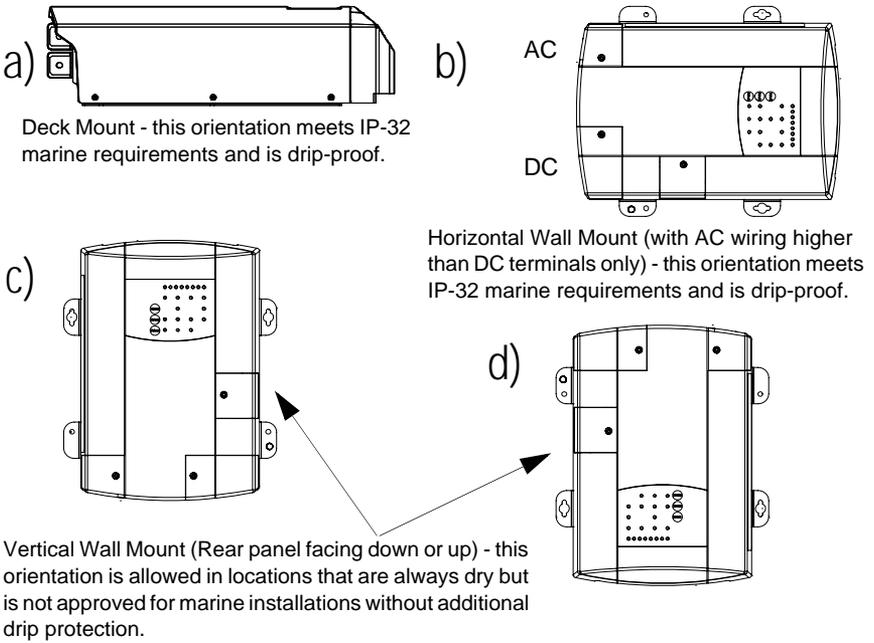


Figure 2-2 Truecharge™ 2 Battery Charger Mounting Orientations

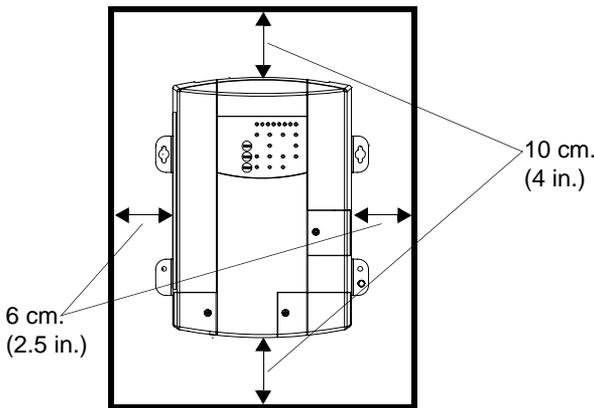


Figure 2-3 Ventilation Clearance

Wiring Requirements



WARNING: Shock and fire hazard

Wiring and fuse sizes are governed by electrical codes and standards. Different requirements apply in different countries and to different types of installations, for example, boat, home or RV. It is the responsibility of the installer to ensure that each installation complies with all applicable codes and standards.



WARNING: Shock and fire hazard

Ensure that both wires and fuses are correctly sized. Maximum continuous current available from the charger may be an additional 6–10% above the nominal current rating of the charger. Output current may also vary depending on ambient temperature conditions.

DC Wiring

The following two tables show some typical wire sizes, based on 3% voltage drop on DC cables, 75 °C (167 °F) rated wire and wiring being inside the engine compartment – assumed ambient of 50 °C (122 °F).

Table 2-1 DC Wiring Requirements for 12 V chargers

Wire Length (max length one way)		Wire Size (AWG and mm ²)						
feet	meters	TC1012	TC1512	TC2012	TC3012	TC4012	TC5012	TC6012
5	1.5	No. 14 2 mm ²	No. 12 3.3 mm ²	No. 10 5.3 mm ²	No. 10 5.3 mm ²	No. 8 8.4 mm ²	No. 6 13.3 mm ²	No. 6 13.3 mm ²
7.5	2.25	No. 12 3.3 mm ²	No. 10 5.3 mm ²	No. 10 5.3 mm ²	No. 8 8.4 mm ²	No. 6 13.3 mm ²	No. 6 13.3 mm ²	No. 4 21.2 mm ²
20	6	No. 8 8.4 mm ²	No. 6 13.3 mm ²	No. 6 13.3 mm ²	No. 4 21.2 mm ²	No. 2 33.6 mm ²	No. 2 33.6 mm ²	No. 1 42.4 mm ²

Table 2-2 DC Wiring Requirements for 24 V chargers

Wire Length (max length one way)		Wire Size (AWG and mm ²)			
feet	meters	TC1524	TC2024	TC3024	TC5024
5	1.5	No. 16 1.3 mm ²	No. 14 2 mm ²	No. 12 3.3 mm ²	No. 10 5.3 mm ²
7.5	2.25	No. 14 2 mm ²	No. 12 3.3 mm ²	No. 10 5.3 mm ²	No. 8 8.4 mm ²
20	6	No. 10 5.3 mm ²	No. 8 8.4 mm ²	No. 6 13.3 mm ²	No. 4 21.2 mm ²

Over-current protection disconnect

Electrical codes require the DC circuit from each battery to the charger to be equipped with a disconnect and an over-current protection device, usually within 7 inches (17.8 cm) of each battery¹. The devices are usually DC-rated circuit breakers, fused disconnects, or a separate fuse and disconnect for each circuit. These devices must be rated for DC voltage and current and be rated to withstand the short circuit rating of each battery. Do not substitute devices rated only for AC voltage; they may not operate properly.

The current rating of the DC fuses must be correctly matched to the size of the DC wiring used, in accordance with the applicable codes. This helps to protect the installation against fire in case of any overcurrent or short circuit fault.

The DC chassis ground (earth) should also be sized correctly to provide ground fault protection (see Table 2-1). Refer to the local electrical codes for your specific installation to determine the correct gauge and length.

¹Recommended by the American Boating and Yachting Council.



WARNING: Risk of fire

Use only on circuits provided with 20A maximum branch circuit protection in accordance with National Electrical Code, NFPA 70.

The AC wiring must meet be of sufficient size, and it must be protected by the appropriate size and type of input breaker, based on the jurisdiction and application. Some basic examples are given below.

The AC input wiring for the Truecharge™ 2 Battery Charger should be three-conductor cable, providing a line, neutral, and ground conductor (or L, N, GND) in an outer jacket, rated a minimum of 75C.

For example, in North America for 120 Vac application, you may use a 14 AWG wire with a 15 A breaker (or 12 AWG for a 20 A breaker) or for 230 Vac application, you may be able to use either a 2.5mm² wire with a 16 A, double pole breaker or fuses or use 1.5 mm² wire with a 10 A, double pole breaker or fuses. Note that every jurisdiction will have different requirements as will each application, so research the regulations for your local jurisdiction to determine which wire size and type is correct. Another example:

- for marine applications, the United States American Yachting and Boating Council (ABYC) requires stranded wire, which is more robust than solid wire when exposed to vibration
- for RV applications, the United States National Electrical Code (NEC) allows solid wire in multi-conductor cable, however, stranded wire is also acceptable which will withstand vibration better.

The circuit supplying the Truecharge™ 2 Battery Charger must be protected by the correct size and type of breaker to meet the code for your local jurisdiction and application. If a branch rated fuse is used, a correctly rated disconnect switch is required ahead of the fuse so that power can be turned off, allowing safe repair, or replacement of products on the mains circuit.

Battery Bank Size Requirements

The Truecharge™ 2 Battery Charger is designed to work with a minimum battery bank size. Each bank should meet the minimum Ah rating shown in Table 2-3.

Note: If the battery manufacturer has specified the maximum charge current, please follow their recommendation.

Table 2-3 Minimum Battery Bank Size

12 V Models	Minimum Battery Bank Size (Ah)
TC1012	30
TC1512	30
TC2012	80
TC3012	80
TC4012	80
TC5012	100
TC6012	100
24 V Models	Minimum Battery Bank Size (Ah)
TC1524	30
TC2024	50
TC3024	60
TC5024	100

Installing the Truecharge™ 2 Battery Charger



WARNING: Shock and Energy Hazards

Be sure to read the safety guidelines and pay attention to all cautions and warnings throughout the installation procedure. The installer is responsible for ensuring compliance with the installation codes for your particular application.

Disconnect all sources of AC and DC power before proceeding.

Installation Sequence

To make charger installation quick and easy, Xantrex recommends that the installation tasks be performed in the following sequence:

1. Select charger mounting position and plan AC and DC cable routing.
2. Plan DC cable runs and install fuses or breakers (page 2–13).
3. Plan the AC connections at the charger (page 2–15).
4. Mount the charger in position (page 2–18).
5. Make the final DC (see page 2–19) and then AC cable connections (including earth grounds) (page 2–19).
6. Apply DC to the charge by closing the DC breakers or disconnects (page 2–23).
7. Apply mains AC to the charger by closing the AC input breaker.

Planning DC Wiring

The procedure for installing the DC wiring applies to a single battery, as well as multiple batteries or battery banks.



WARNING: Fire or burn hazard

To help prevent accidental shorts or sparks, leave the DC disconnects or breakers in the Off position or DC fuses removed from their fuse holders until installation is complete.



WARNING: Fire or burn hazard

The rubber boots must be installed over the Truecharge™ 2 Battery Charger DC terminals to provide drip protection, and protect against short circuits between output terminals. See “To install rubber boots:” on page 2–20.

1. Identify the battery or bank that most frequently becomes deeply discharged. This bank will often be a deep cycle battery referred to as the House Bank on a boat, as opposed to an engine Start Battery. This high priority bank should be connected to bank 1 on the Truecharge™ 2 Battery Charger, which is the default bank.
2. Plan the route that the DC wires will follow, keeping it as short as possible. Measure and cut the required wire length, after allowing some extra length for connections and to provide slack in the wires for strain relief.
3. Identify the positive wires, by using color-coded wire, or by marking both ends of the wire with colored tape, or similar kind of marking. Repeat with a different color for the negative. Most installation codes recommend coloring the positive red and the negative black.

Important: You may find it helpful to label each cable, associating it with the battery bank it is connected to. For example, bank 1 (–), bank 1 (+), bank 2 (–).

4. Install a DC circuit breaker or fused disconnect in each positive cable within 7 inches (17.8 cm) of each battery. Consult your local electrical codes regarding the distance between the battery and the disconnect device. Be sure the breaker or fused disconnect is open.
5. Route the wiring to the batteries and to the Truecharge™ 2 Battery Charger. Avoid routing wiring through an electrical distribution panel, battery isolator, or other device that will add voltage drops.
6. Install crimp lugs on each end of the DC battery cables using the crimp manufacturer's instructions and tool.
7. Install the provided rubber boots over the charger end of the DC cables. Install rubber boots over the Truecharge™ 2 Battery Charger DC terminals to provide drip and added corrosion protection. Follow the procedure on page 2–24 to install rubber boots.
8. Route the optional battery temperature sensor (BTS) from the battery (one which is located in the warmest ambient temperature) to the charger location.
9. Proceed to “Planning AC Wiring”.

Planning AC Wiring

Before connecting AC wiring, make sure the AC source circuit is protected by a breaker switch of the correct size and type, to comply with the electrical code for your location and application. The current rating of the input breaker should not be larger than 20A.

1. Disconnect the AC source by turning off the breaker feeding the circuit, unplugging from shorepower and disconnecting any other power sources (such as a generator).
2. Plan the route that the AC wiring will follow from the source (usually an AC distribution panel) to the Truecharge™ 2 Battery Charger. Measure and cut the required length of three-conductor cable allowing some extra length for connections and providing some slack. For example, in North America for 120 Vac application, you may use a 14 AWG wire with a 15 A breaker (or 12 AWG for a 20 A breaker) or for 230 Vac application, you may be able to use either a 2.5mm² wire with a 16 A, double pole breaker or fuses or use 1.5 mm² wire with a 10 A, double pole breaker or fuses. Note that every jurisdiction will have different requirements as will each application, so research the regulations for your local jurisdiction to determine which wire size and type is correct.
3. Make the AC connections to the charger when it is sitting on a table or other convenient work surface. Route the AC cables to the source after the charger is securely mounted in position, using all four mounting holes.
4. Unscrew the wiring compartment cover from the left rear of the Truecharge™ 2 Battery Charger to expose the AC wiring access hole.
5. Carefully remove 50 – 75 mm (2 – 3 in.) of the outer jacket from the source panel wiring, being careful not to cut or nick the insulation on the individual conductors.

6. Remove the AC (L, N, GND) wires from the AC wiring compartment of the charger.
7. Feed the source AC wire through the included strain relief. Position approximately 1" from end of jacketed portion of the AC wiring.
8. Connect the AC wiring to the Truecharge™ 2 Battery Charger pigtail wires, being sure to connect the line conductor to the line, the neutral to the neutral, and the ground to the ground. The pigtail wires are color coded as follows:

Conductor	Color code
Line	Black or brown
Neutral	White or blue
Ground	Green with yellow stripe

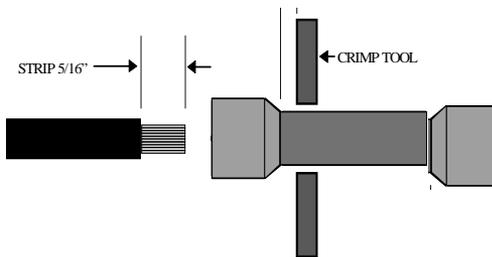
Make the connections using crimp-on connectors or with other approved connectors required by your code, and suitable for your installation. For example, the ABYC Standards and Recommended Practices for Small Craft prohibit twist-on connectors for AC connections on a boat. For other types of installation, refer to your applicable code.

For marine installations, follow the connector manufacturer's procedure for installing butt splice connectors.

To connect AC wires with the crimp-on butt-splice connector:

Important: You must exercise care when crimping butt-splice connectors. Use the crimp tool recommended by the manufacturer for the connector used.

- a) Using a wire stripper, carefully strip 8 mm (5/16 in.) from the ends of the two wires being connected.
- b) Insert one wire into one end of the butt-splice, until the insulation hits the internal metal crimp section, insert the butt-splice into the crimping tool, and crimp firmly. The proper location for the crimp is approximately 1.6 mm (1/16 in.) past where the butt-splice insulation tapers down as shown.



- c) Repeat Step b for the other end of the butt-splice.
9. Slide the strain relief into the bottom half of the strain relief retention hole in the charger.
10. When all connections are completed, push the wiring and connectors inside the AC wiring compartment. Install the wiring compartment cover and tighten the screw on top to secure the cover. Do not over-tighten.
11. Proceed to “Mounting the Optional Remote Panel” on page 2–24, if you have the optional remote panel otherwise, proceed to “Mounting the Truecharge™ 2 Battery Charger” on page 2–18.

Mounting the Truecharge™ 2 Battery Charger

Mount the Truecharge™ 2 Battery Charger using all four mounting slots and holes which are provided. For marine only installations, the mounting orientations a) and b) in Figure 2-2 meet the North American and European marine requirements. Marine products are required to meet drip-proof tests to ensure safety in the presence of condensation. The other possible mounting orientations c) and d) also shown in Figure 2-2 will not prevent the entry of dripping water, and are not suitable for marine, or a moist environment without the installation of additional drip protection. They are only acceptable for use in locations that are always dry.

Important: Be sure to measure your AC and DC cables and plan the routing of the cables before drilling the pilot holes for mounting the Truecharge™ 2 Battery Charger.

To mount the Truecharge™ 2 Battery Charger:

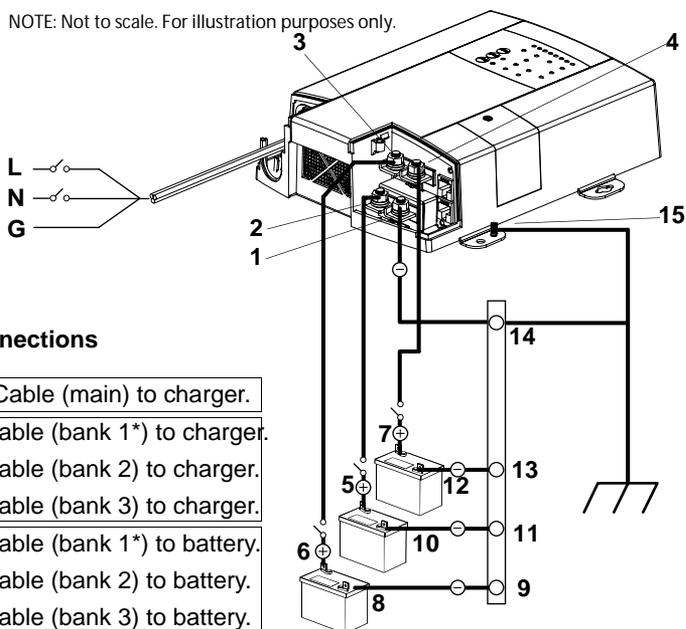
1. Keep the carton and packing material in case you need to return the Truecharge™ 2 Battery Charger for servicing.
2. Ensure that you have selected a mounting surface that is clear, flat and allows for a minimum of 10 cm (4 in.) of clearance on the top and bottom ends for air flow and at least 6 cm (2.5 in.) of clearance on either sides (see Figure 2-3, “Ventilation Clearance” on page 2–7)
3. Drill the four pilot holes for the mounting screws, taking care that there is nothing behind the surface that can be damaged by the drill.
4. Mount the Truecharge™ 2 Battery Charger using corrosion resistant, #6 (3 mm) round, pan head (or similar) screws.

The top two keyhole-style mounting holes can be used to hold the Truecharge™ 2 Battery Charger in place while fastening the bottom two screws. For secure, permanent mounting, use the holes in all four mounting flanges and fasten all four screws. The keyhole slots should not be used solely for the installation of the charger.

Make the Final Connections

After planning the DC and AC connections and mounting the charger, the last procedures, including installing the DC terminal rubber boots for drip protection, will finalize the wiring connections.

NOTE: Not to scale. For illustration purposes only.



DC connections

- | |
|--|
| 1. Negative Cable (main) to charger. |
| 2. Positive Cable (bank 1*) to charger. |
| 3. Positive Cable (bank 2) to charger. |
| 4. Positive Cable (bank 3) to charger. |
| 5. Positive Cable (bank 1*) to battery. |
| 6. Positive Cable (bank 2) to battery. |
| 7. Positive Cable (bank 3) to battery. |
| 8. Negative Cable (A) to battery terminal (bank 1*). |
| 9. Negative Cable (A) to DC negative bus (bank 1*). |
| 10. Negative Cable (B) to battery terminal (bank 2). |
| 11. Negative Cable (B) to DC negative bus (bank 2). |
| 12. Negative Cable (C) to battery terminal (bank 3). |
| 13. Negative Cable (C) to DC negative bus (bank 3). |
| 14. Negative Cable (main) to negative bus bar. |
| 15. Ground Cable to DC ground stud. |

* see Important note below.

Important: When installing only a single bank (or one battery) for Truecharge™ 2 Battery Chargers that have multiple outputs, positive bank 1 must be utilized. Bypassing bank 1 and using any of the other banks (bank 2 or bank 3) may render the charger to function improperly.

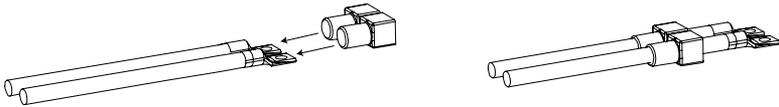
Figure 2-4 Final DC Wiring Connection Order

Installing the Drip Protection Rubber Boots

Xantrex recommends that you install the supplied rubber boots over the Truecharge™ 2 Battery Charger DC terminals to provide drip and short circuit protection.

To install rubber boots:

1. Before making the DC connections to the charger, feed the rubber boot over the charger end of the DC cables.



2. Perform all other DC connections as described in “Planning DC Wiring” on page 2–13.
3. After the DC cables are connected to the charger, slide the boot up the cables and over the DC terminals. If you are only using one battery, slide the spare boots over the unused DC terminals.

The Truecharge™ 2 Battery Charger is provided with drip protection rubber boots for the DC terminals.

Final DC Connections



WARNING: Fire and burn hazard

Make sure that the DC fuse and circuit breaker are open.

To make the final DC connections (see Figure 2-4 on page 2–19):

1. Connect the negative cable from the negative terminal on the battery (if you are using only one battery or bank), or the negative ground bar or bus (if you are using more than one battery or bank), to the negative DC terminal on

the Truecharge™ 2 Battery Charger (Figure 2-4, item 1). Use a flat washer, a lock washer and a nut (5 included in the installation kit) to secure the connection.

Tighten the nuts to 2.3 N-m (20 lb-in.) torque and test that the wire is secure. Do not over-tighten as this may result in damage to the charger.

2. Connect each positive cable to the correct positive DC terminal on the Truecharge™ 2 Battery Charger (Figure 2-4, items 2 to 4). Use a flat washer, a lock washer and a nut (5 included in the installation kit) to secure the connection.

Tighten the nuts to 2.3 N-m (20 lb-in.) torque and test that the wire is secure.

3. Connect the free end of each positive cable to the correct positive terminal of the battery (Figure 2-4, items 5 to 7), using sufficient torque as recommended by your battery manufacturer.
4. Connect the free end of the negative cable to the negative terminal on the battery (Figure 2-4, items 8, 10, and 12), using sufficient torque as recommended by your battery manufacturer.

NOTE: If you are using more than one battery, you will need to connect the negative cable from each of the batteries to the negative ground bar or bus (Figure 2-4, items 9, 11, and 13). The negative ground bar or bus will then have a single negative cable connecting to the negative charger terminal (Figure 2-4, item 14).



CAUTION: Reverse polarity damage

Before proceeding, carefully check the wiring polarity – make sure the positive terminals of the Truecharge™ 2 Battery Charger are connected to the correct terminals of the battery (fuses or breakers) and from there to the positive terminals of the battery. Make sure the negative terminal of the Truecharge™ 2 Battery Charger is connected to the battery negative terminal (or DC negative bus). Do not reverse the connections.

5. Install the DC chassis ground (earth) from the ground stud on the Truecharge™ 2 Battery Charger to the engine bus or DC ground bus (Figure 2-4, item 15). Use a flat washer, a lock washer and a nut (included in the installation kit) to secure the connection.

Tighten the nuts to 2.3 N-m (20 lb-in.) torque and test that the wire is secure. Do not over-tighten as this may result in damage to the charger.
6. Connect any optional accessories. See “Installing Optional Accessories” on page 2–24.
7. Secure cables in place using tie-wraps, P-clamps or cable straps according to electrical codes. Coil and tie any BTS or remote panel extension cable.
8. The DC breakers may be closed at this time.

Final AC Connections

To make the final AC connections:

1. Complete the installation by routing the AC cable to the AC source.
2. Connect the AC cable to the AC disconnect breaker and ground in accordance with the color codes on page 2–16.
3. Secure cables in place using tie-wraps, P-clamps or cable straps according to electrical codes.
4. The AC mains may be applied at this time by closing the breaker.

Grounding Instructions



WARNING: Electric shock hazard

Have an electrician install a properly grounded circuit if one is not available. Improper connection can result in risk of an electric shock.

The Truecharge™ 2 Battery Charger Battery Charger must be connected to a grounded, metal permanent wiring system, or an equipment-grounding conductor should be run with the circuit conductors and connected to equipment-grounding lead on the charger. Connections to the battery charger should comply with all local and application-specific codes and ordinances.

Xantrex recommends that you install a DC chassis ground (earth) from the ground stud on the Truecharge™ 2 Battery Charger to the engine bus or DC ground bus. The DC chassis ground (earth) should be sized correctly with the power conductors, and both must be sized for the battery fuses that are used to protect the DC wiring. Refer to your local electrical codes to verify the requirements in your jurisdiction for your application.

Powering Up

Make one last check that all connections and connectors are secure.

The Truecharge™ 2 Battery Charger charger may now be powered up. Switch the AC power on at the source breaker. It is normal to see a 7-10 second delay while the charger powers up. During this time, the indicator LEDs on the onboard display and the remote panel will illuminate for a second (power on test) before reporting charging and battery status information.

Note: The indicator LEDs will also illuminate when DC power is applied and battery bank 1 voltage is above 9V.

Installing Optional Accessories

Optional accessories are available for purchase at Xantrex. Call Customer Service to order the accessories below:

- Remote Panel (Part number: 808-8040-00)
- Battery Temperature Sensor (Part number: 808-0232-01)

Mounting the Optional Remote Panel

To mount the remote panel:

1. Choose a location for the remote panel that is within 15 m (50 ft.) from the charger. Use only the four-conductor communications cable (RJ-11) that came with the remote panel.
2. Use the enclosed mounting template to predrill mounting holes.
Take care that there is nothing behind the surface for you to damage such as other cables or pipes.
3. Connect the RJ-11 connector to the remote panel and route it to the charger. Be careful not to damage the connector locking tab when routing the cable. You can use some tape to protect the locking tab from catching on something and breaking off when routing the cable.
4. Once the Truecharge™ 2 Battery Charger is mounted, plug the other RJ-11 connector into the Remote port on the rear panel of the Truecharge™ 2 Battery Charger.

Installing the Optional Battery Temperature Sensor (BTS)

Xantrex strongly recommends that you install the optional Battery Temperature Sensor (BTS) to protect your battery and improve charging accuracy. If no BTS is connected, the charger defaults to the charging temperature settings (Cold, Warm, or Hot). It is important to set this before the BTS is installed to ensure that even when the BTS connection is subsequently lost due to a BTS malfunction or a severed or loose wire connection, an approximate representation of the battery temperature is passed on to the charger.

To install a BTS:

1. Switch off all devices operating from the battery.
2. Connect the ring terminal on the sensor directly on to the negative battery stud, or affix the double-sided adhesive backing to the sensor back and attach the sensor to the side of the battery to be monitored.

NOTE: If there are multiple batteries, attach the BTS to the battery that is located in the warmest ambient temperature.

3. Route the sensor cable to the charger and plug it to the BTS port on the rear panel.

Important: To minimize noise interference, the remote and BTS cables should be routed away from the AC mains line and DC battery cables.

Also, if the BTS is unplugged after a battery overtemperature fault, the charger will stop charging. Use the onboard display to set the appropriate temperature setting to restart charging.



CAUTION: Battery damage

In the absence of a BTS, setting a battery temperature that is lower than the actual temperature will cause the battery to be overcharged and may damage or reduce the life of the battery or cause a hazard. Setting the temperature higher than the actual temperature will result in under-charging the battery.

Configuring the Truecharge™ 2 Battery Charger

Once the charger is connected to a battery on bank 1 or to AC, it is live and it may be configured. The indicator LEDs on the onboard display will illuminate for a second (power on test) before reporting charging and battery status information.

When the remote panel is connected, there will be a short delay of about 1three seconds before reporting charging and battery status information. The remote panel will use this time to query the charger for the current operating conditions.

If AC was already applied, ensure that the charger is ON by pressing ON/STANDBY if necessary.

Configuring the Charger Mode

Using the Onboard Display Panel

To configure the charger mode:

Note: By default, the Charger Mode is set to three-stage.

1. Press and hold the Charger Mode Select button for three seconds.
2. Select the proper charger mode.
The LEDs will indicate which of the two modes is being selected: three-stage (default) or two-stage.

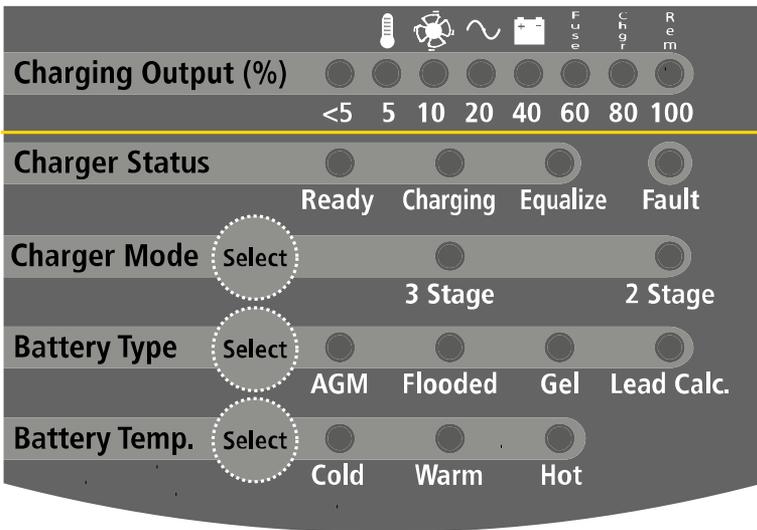


Figure 2-5 Onboard Display Panel

Using the Remote Panel

To configure the charger mode:

Note: By default, the Charger Mode is set to three-stage.

1. Press and hold the Status button for three seconds to enter the Setup mode.
Entering the Setup mode will enable you to select the charger mode.
2. Press ON/STANDBY button to select the desired charger mode.
The LEDs will indicate which of the two types is being selected: three-stage (default) or two-stage.
3. Press and hold the Status button for three seconds to exit the Setup mode.

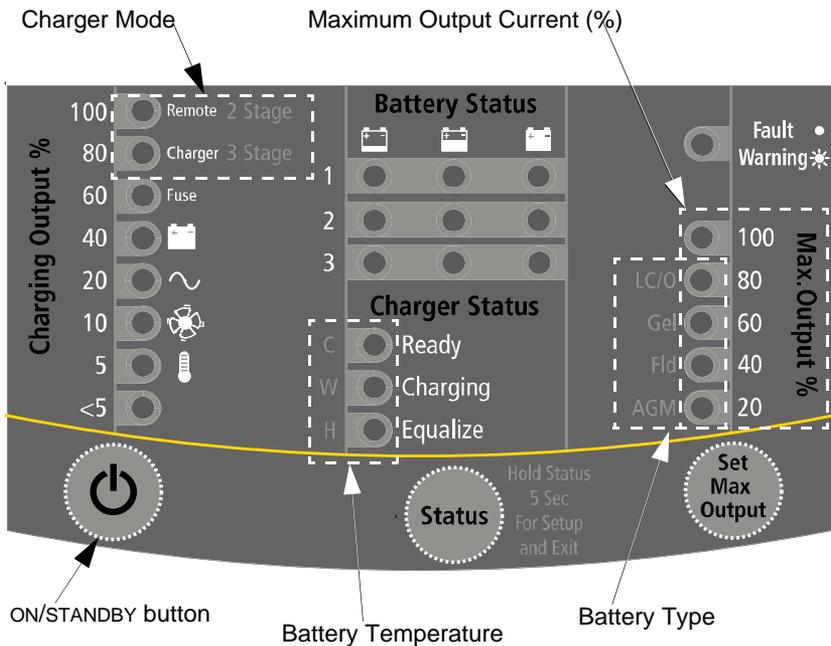


Figure 2-6 Remote Panel

Configuring the Battery Bank Type

Using the Onboard Display Panel

To configure the battery bank type:

Note: By default, the battery type is set to Flooded.

1. Press and hold the Battery Type Select button for three seconds.
2. Select the proper battery type.
The LEDs will indicate which of the four types is being selected: Flooded (default), GEL, Lead Calc., AGM. However, if a custom battery type has been programmed by the OEM, all four LEDs will light up to indicate a fifth type.

Using the Remote Panel

To configure the battery bank type:

Note: By default, the battery type is set to Flooded.

1. Press and hold the Status button for three seconds to enter the Setup mode.
Entering the Setup mode will enable you to select the battery type.
2. Press Set Max Output button to select the proper battery type.
The LEDs will indicate which of the four types is being selected: Flooded (default), GEL, Lead Calc., or AGM. However, if a custom battery type has been programmed by the OEM, all four LEDs will light up to indicate a fifth type.
3. Press and hold the Status button for three seconds to exit the Setup mode.

Configuring the Battery Temperature without the BTS

Using the Onboard Display Panel

To configure the battery temperature:

Note: By default, the Battery Temp. is set to Warm.

1. Press and hold the Battery Temperature Select button for three seconds.
2. Select the appropriate battery temperature setting.
The LEDs will indicate which of the three types is being selected: Warm, Hot, or Cold.

Note: Cold is for battery temperature below 5 °C (41 °F). Warm is for battery temperature between 5 and 30 °C (41 and 86 °F); default setting. Hot is for battery temperature above 30 °C (86 °F). See “Battery Temperature Compensation Levels” on page 2–31 to see how output voltage is offset by varying the temperature selection.

Using the Remote Panel

To configure the battery temperature:

Note: By default, the Battery Temp. is set to Warm.

1. Press and hold the Status button for three seconds to enter the Setup mode.
Entering the Setup mode will enable you to select the battery temperature setting.
2. Press Status button to select the appropriate battery temperature setting.
The LEDs will indicate which of the three types is being selected: W(arm), H(ot), or C(old).
3. Press and hold the Status button for three seconds to exit the Setup mode.

Table 2-4 Battery Temperature Compensation Levels

Temperature Selection	Recommended for battery temperature of:	Voltage added for temperature compensation offset from 25 °C	
Cold	below 5 °C (41 °F)	Flooded/PbCa/Gel	0.675
		AGM	0.525
Warm	between 5 and 30 °C (41 and 86 °F)	Flooded/PbCa/Gel	0
		AGM	0
Hot	above 30 °C (86 °F)	Flooded/PbCa/Gel	-0.27
		AGM	-0.21

Configuring the Maximum Output Current Percentage

Using only the Remote Panel

To configure the maximum output current:

Note: By default, the Max. Output % is set to 100.

Press the Set Max Output button to select the appropriate maximum output setting.

The LEDs will indicate which of the five values is being selected: 100, 80, 60, 40, or 20.

Installing Batteries

Replacing old or defective batteries (even installing new batteries) require that you disconnect all AC and DC sources prior to installation.



WARNING

Battery installation should always be treated like a brand new installation. This means, that all safety and precautionary guidelines that were followed prior and during the installation of the charger, must again be followed in order to avoid risks of electrical shock, injury, or death.

To replace an old battery:

1. Turn off the AC source by disconnecting the AC line.
2. Switch off all devices operating from currently installed batteries.
3. Disconnect the battery cables from the old battery.
NOTE: Disconnect the negative cable first, then the positive cable. Inspect all AC and DC cables for damage and repair, if necessary.
4. Replace the old battery with the new battery.
5. Reconnect the battery cables to the new battery.
NOTE: Reconnect the positive cable first, then the negative cable.

Important: If the new battery is different from the old one in chemistry, temperature, or size, remember to re-configure the battery settings accordingly.

A Specifications

Appendix A contains physical, electrical performance, and regulatory approval specifications for the Truecharge™ 2 Battery Charger.

Note: Specifications are subject to change without notice.

Physical Specifications

<p>Base Unit Dimensions: L × W × H</p>	<p>TC1012, TC1512: 200 × 170 × 70mm (7.87 × 6.70 × 2.76 in.) TC2012, TC3012, TC4012: 250 × 170 × 70mm (9.84 × 6.70 × 2.76 in.) TC5012, TC6012: 350 × 170 × 70mm (13.78 × 6.70 × 2.76 in.) TC1524, TC2024: 250 × 170 × 70mm (9.84 × 6.70 × 2.76 in.) TC3024, TC5024: 300 × 210 × 125mm (11.81 × 8.27 × 4.92 in.)</p>
<p>Weight</p>	<p>TC1012, TC1512: 2.0 kg (4.4 lbs) TC2012, TC3012, TC4012: 2.2 kg (4.8 lbs) TC5012, TC6012: 4.5 kg (9.9 lbs) TC1524, TC2024: 2.2 kg (4.8 lbs) TC3024, TC5024: 5.0 kg (11.0 lbs)</p>
<p>AC input connections</p>	<p>Two color-coded No. 14 AWG wires (L, N) and one No. 14 AWG (G) minimum 152 mm (6 in.) long in a separate AC wiring enclosure with 21.3 mm (0.84 in.) hole provision for connection of a ½ inch North American "trade size" cable clamp (included).</p>
<p>DC output connections</p>	<p>TC1012: Two M6 studs (1 positive and 1 common negative) for battery cable ring terminals and one M6 mm DC equipment ground</p> <p>TC1512: Three M6 studs (2 positives and 1 common negative) for battery cable ring terminals and one M6 mm DC equipment ground</p> <p>TC2012, TC3012, TC4012, TC5012, TC6012, TC1524, TC2024, TC3024, TC5024: Four M6 studs (3 positives and 1 common negative) for battery cable ring terminals and one M6 mm DC equipment ground</p>

Electrical Specifications

Number of isolated battery bank outputs	TC1012: 1 output TC1512: 2 separated outputs TC2012, TC3012, TC4012, TC5012, TC6012, TC1524, TC2024, TC3024, TC5024: 3 separated outputs															
Nominal battery voltage	12 V units:12 Vdc 24 V units:24 Vdc															
Normal operating output range	12 V units: 0 – 16 Vdc 24 V units: 0 – 32 Vdc															
Nominal operating AC input voltage	110 – 250 Vac															
Maximum DC output current (total)	TC1012: 10 ±10% A TC1512: 15 ±10% A TC2012: 20 ±10% A TC3012: 30 ±10% A TC4012: 40 ±10% A TC5012: 50 ±10% A TC6012: 60 ±10% A TC1524: 15 ±10% A TC2024: 20 ±10% A TC3024: 30 ±10% A TC5024: 50 ±10% A															
Absorption voltage: ±0.1 V for 12 V units ±0.2 V for 24 V units	<table border="1"> <thead> <tr> <th></th> <th>12 V units 25 °C (77 °F)</th> <th>24 V units 25 °C (77 °F)</th> </tr> </thead> <tbody> <tr> <td>Flooded</td> <td>14.4</td> <td>28.8</td> </tr> <tr> <td>GEL</td> <td>14.2</td> <td>28.4</td> </tr> <tr> <td>AGM</td> <td>14.3</td> <td>28.6</td> </tr> <tr> <td>Lead-calcium</td> <td>15.5</td> <td>31.0</td> </tr> </tbody> </table>		12 V units 25 °C (77 °F)	24 V units 25 °C (77 °F)	Flooded	14.4	28.8	GEL	14.2	28.4	AGM	14.3	28.6	Lead-calcium	15.5	31.0
	12 V units 25 °C (77 °F)	24 V units 25 °C (77 °F)														
Flooded	14.4	28.8														
GEL	14.2	28.4														
AGM	14.3	28.6														
Lead-calcium	15.5	31.0														

Specifications

Float voltage: ±0.1 V for 12 V units ±0.2 V for 24 V units	12 V units	24 V units
	25 °C (77 °F)	
Flooded	13.5	27.0
GEL	13.8	27.6
AGM	13.4	26.8
Lead-calcium	13.5	27.0
Equalize mode current	50% rated output ±6%	
Equalize mode— maximum output voltage	12 V units: 16 ±0.1 Vdc 24 V units: 32 ±0.2 Vdc	
Off-state current draw (without remote installed)	12 V units: <30 mA 24 V units: <20 mA	

AC Input Specifications

AC input voltage range	Nominal: 120 Vac, 230 Vac, 240 Vac Full Performance: 105 – 265 Vac \pm 4 Vac Automatic derating to 80%: 90 – 104 \pm 4 Vac																								
Maximum AC input current	<table border="0"> <thead> <tr> <th>at 104 Vac</th> <th>at 208 Vac</th> </tr> </thead> <tbody> <tr> <td>TC1012: 2.5 A</td> <td>TC1012: 1.5 A</td> </tr> <tr> <td>TC1512: 3.5 A</td> <td>TC1512: 2.0 A</td> </tr> <tr> <td>TC2012: 4.5 A</td> <td>TC2012: 2.5 A</td> </tr> <tr> <td>TC3012: 7.0 A</td> <td>TC3012: 3.5 A</td> </tr> <tr> <td>TC4012: 9.0 A</td> <td>TC4012: 4.5 A</td> </tr> <tr> <td>TC5012: 11.5 A</td> <td>TC5012: 5.5 A</td> </tr> <tr> <td>TC6012: 13.5 A</td> <td>TC6012: 6.5 A</td> </tr> <tr> <td>TC1524: 7.0 A</td> <td>TC1524: 3.5 A</td> </tr> <tr> <td>TC2024: 9.0 A</td> <td>TC2024: 4.5 A</td> </tr> <tr> <td>TC3024: 13.5 A</td> <td>TC3024: 7.0 A</td> </tr> <tr> <td>TC5024: 22.5 A</td> <td>TC5024: 11.5 A</td> </tr> </tbody> </table>	at 104 Vac	at 208 Vac	TC1012: 2.5 A	TC1012: 1.5 A	TC1512: 3.5 A	TC1512: 2.0 A	TC2012: 4.5 A	TC2012: 2.5 A	TC3012: 7.0 A	TC3012: 3.5 A	TC4012: 9.0 A	TC4012: 4.5 A	TC5012: 11.5 A	TC5012: 5.5 A	TC6012: 13.5 A	TC6012: 6.5 A	TC1524: 7.0 A	TC1524: 3.5 A	TC2024: 9.0 A	TC2024: 4.5 A	TC3024: 13.5 A	TC3024: 7.0 A	TC5024: 22.5 A	TC5024: 11.5 A
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TC3024: 13.5 A	TC3024: 7.0 A																								
TC5024: 22.5 A	TC5024: 11.5 A																								
Power factor at rated load	\geq 0.95																								
Frequency	47 – 63 Hz																								
Efficiency – peak	12 V units: 77% @ 120 Vac, 80% @ 230 Vac 24 V units: 85% @ 120 Vac, 87% @ 230 Vac																								
Surge protection	Line-to-neutral surge protector rated at 275 Vac																								

DC Output Specifications

DC output voltage range including dead battery charging voltage	12 V units: 0 – 15.5 Vdc 24 V units: 0 – 31 Vdc
Maximum equalization voltage (no BTS installed)	12 V units: 16 Vdc 24 V units: 32 Vdc
Voltage accuracy (no load)	12 V units: ± 0.1 Vdc at 14.4 Vdc @ 25 °C (77 °F) 24 V units: ± 0.2 Vdc at 28.8 Vdc @ 25 °C (77 °F)
Voltage regulation	Uncompensated load voltage regulation < 0.1Vdc drop from 0 Amps to rated current output at charger output terminals (adds in series with recommended 3% limit for user's battery cable voltage drop).

Temperature Specifications

Nominal ambient	25 °C (77 °F)
Operating range (full performance)	-20 – 50 °C (-4 – 122 °F)
Current de-rating (above 50 °C ambient temperature)	upto 80% derating I _{max} (50 – 65 °C) (122 – 149 °F)
Storage	-40 to 80 °C (-40 to 176 °F)
Humidity	5 – 95%, RH non-condensing

Protection Features

Battery reverse polarity	Protected by a replaceable DC output fuse
Over-voltage limits	The Truecharge™ 2 Battery Charger will stop charging any bank if the output voltage is above 16.6 ± 0.5 Vdc.
Output current limit	TC1012: 10 \pm 10% A (up to 15.5 V) TC1512: 15 \pm 10% A (up to 15.5 V) TC2012: 20 \pm 10% A (up to 15.5 V) TC3012: 30 \pm 10% A (up to 15.5 V) TC4012: 40 \pm 10% A (up to 15.5 V) TC5012: 50 \pm 10% A (up to 15.5 V) TC6012: 60 \pm 10% A (up to 15.5 V) TC1524: 15 \pm 10% A (up to 31 V) TC2024: 20 \pm 10% A (up to 31 V) TC3024: 30 \pm 10% A (up to 31 V) TC5024: 50 \pm 10% A (up to 31 V)
Over-temperature	Internal charger temperature is measured. Charger shuts down and restarts as follows: <ul style="list-style-type: none"> • Shutdown at 70 °C (158 °F) • Restart at 65 °C (149 °F)
Current derating in ambient temperatures	Rated current to 50 °C (122 °F) derating to 80% I _{max} above 50 °C (122 °F)
Battery over-temperature protection	Battery temperature, as sensed by the battery temperature sensor (if installed), results in the charger no longer charging the individual battery or bank at a battery temperature of 70 °C (158 °F).

Approvals

Safety	<p>NRTL approved to CSA E60335-2-29 and UL1236, including the marine supplement, ignition protection, and UL1564 CE marked, complying with Low Voltage Directive 2006-95-EC, complying with EN60335-2-29 Battery Chargers, including Australian deviations ISO 8846: Ignition Protection for Small Craft ABYC E11 - Alternating Current and Direct Current Electrical Systems on Boats ABYC A31 - Battery Chargers and Inverters NFPA70/2008 US NEC for home and RV installation requirements</p>
EMC	<p>FCC Class B CE marked, meeting EMC Directive 2004-108-EC</p>
Other	<p>KKK-A-1822 Rev F - Federal Specification for the Star-of-Life Ambulance</p>

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