# DURACELL®
## 15 AMP BATTERY CHARGER

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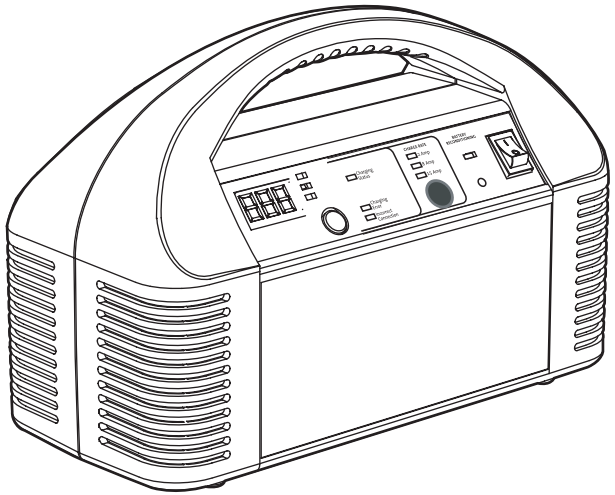

# Owner's Guide

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DURACELL®

15 AMP BATTERY CHARGER

# Owner's 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 1 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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## Date and Revision

April 2007 Revision A

## Part Number

975-0343-01-01

## Product Number

804-0157

## Contact Information

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# About This Guide

## Purpose

This guide introduces the Duracell® 15 AMP Battery Charger, describes the features, explains how the Duracell® Charger charges batteries, and provides procedures for operating the charger.

## Scope

This guide provides information for the Duracell® 15 AMP Charger.

This guide does not provide details about particular brands of batteries. You need to consult individual battery manufacturers for this information.

## Audience

The Guide is intended for anyone who needs to install and operate the Duracell® 15 AMP Battery Charger.

## Organization

This Guide is organized into 4 chapters and 2 appendices:

Chapter 1, “Introduction”, Chapter 1 contains information on the features available and the location of important parts on the front panel of the Duracell® Charger 15.

Chapter 2, “Operation”, Chapter 2 explains how to operate the Duracell® Charger efficiently to charge a vehicle battery.

Chapter 3, “Troubleshooting”, Chapter 3 will help you identify and remedy the common problems than can occur with the Duracell® Charger.

Appendix A, “Specifications”, Appendix A lists the specifications for the Duracell® Charger.

Appendix B, “Battery Charging”, Appendix B describes battery charging in more detail.

# Conventions Used

The following conventions are used in this guide.

**WARNING**

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

**CAUTION**

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

**Important:** These notes describe an important action item or an item that you must pay attention to.

# 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

The Duracell® 15 AMP Battery Charger generates a low DC voltage and high DC current to the battery being charged. Operating the Duracell® 15 AMP Battery Charger incorrectly or misusing them may damage the equipment or create hazardous conditions for the user.

Save these instructions. This guide contains important safety and operating instructions.

## WARNING: Explosion hazard

The Duracell® 15 AMP Battery Charger is designed to charge 12 V lead-acid batteries only. Do not use the product on batteries with other voltage ratings.

## WARNING: Shock hazard. Keep away from children.

The Duracell® 15 AMP Battery Charger generates a low voltage and high current DC to the battery being charged. Do not expose the charger to water, rain, snow or spray.
Do not open the Duracell® 15 AMP Battery Charger. There are no user-serviceable parts inside the unit.

## WARNING: Explosion hazard

Do not use this product where there are flammable fumes or gases, such as in the bilge of a gasoline-powered boat, or near propane tanks. Do not use this product in an enclosure containing lead acid batteries. These batteries vent explosive hydrogen gas which can be ignited by sparks from electrical connections.
When working on electrical equipment, always ensure someone is nearby to help you in an emergency.

## WARNING: Explosion hazard

Battery reconditioning mode works only on flooded lead-acid 12 V batteries. Do not attempt to recondition sealed lead-acid batteries.

## WARNING: Explosion hazard

During battery reconditioning phase, the battery generates potentially flammable gases. Follow all the battery safety precautions listed in this guide. Ventilate the area around the battery thoroughly and ensure that there are no sources of flame or sparks in the vicinity.

## WARNING: Heated surface

Ensure at least 2" (5 cm) air space is maintained on all sides of the Duracell® 15 AMP Battery Charger. During operation, keep away from materials that may be affected by high temperatures.

## WARNING: Explosion hazard

Never attempt to charge a frozen battery.

## WARNING: Shock hazard

To reduce the risk of electrical shock, disconnect both AC and DC power from the Duracell® 15 AMP Battery Charger before attempting any maintenance or cleaning or working on any circuits connected to the Duracell® 15 AMP Battery Charger. Turning AC ON/OFF switch to OFF will not reduce this risk.

## CAUTION

Do not expose the Duracell® 15 AMP Battery Charger to temperatures over 104 °F (40 °C).

# Precautions When Working With Batteries

## WARNING: Explosion or fire hazard

1. Follow all instructions published by the battery manufacturer and the manufacturer of the equipment in which the battery is installed.
2. Make sure the area around the battery is well ventilated.
3. Never smoke or allow a spark or flame near the engine or batteries.
4. Use caution to reduce the risk or dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
5. Remove all metal items, like rings, bracelets, and watches when working with lead-acid batteries. Lead-acid batteries produce a short circuit current high enough to weld metal to skin, causing a severe burn.
6. Have someone within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
7. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
8. Wear complete eye protection and clothing protection. Avoid touching your eyes while working near batteries.
9. 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.
10. If you need to remove a battery, always remove the ground terminal from the battery first. Make sure all accessories ar off so you don’t cause a spark.

# 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 instruction guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

# Contents

## B Battery Charging

# 1 Introduction

Chapter 1 contains information on the features available and the location of important parts on the front panel of the Duracell® 15 AMP Battery Charger.

## Duracell® Charger Features

The Duracell® Charger is an advanced battery charger designed specifically for high performance, deep-cycle lead-acid engine batteries. It is smaller and lighter than many other chargers.

Duracell® Charger changes the alternating current (AC) supply from the utility to the controlled low-voltage, direct current (DC) required to charge a 12 V battery by using high-frequency, switching-mode power conversion circuits. The high-frequency power conversion method is similar to that used in power supplies for computers and other electronic equipment. It results in a significantly smaller and lighter charger than other power conversion methods allow.

The Duracell® Charger has AC to DC isolation, a surge protector, and many other safety features which reduce potential shock and fire hazards.

## Continuous Charge Rating

The Duracell® 15 AMP Charger delivers 2/8/15 amp charging current. Traditional (low frequency) chargers only deliver their rated charging current for a short initial part of the charge cycle. The Duracell® Charger only reduces the charging current below these rated levels when the battery is approaching full charge. Because it delivers rated current over most of the charge cycle, Duracell® Charger charges your batteries faster than many other chargers with the same or higher rating.

## Wide Voltage Range

Duracell® Charger maintains the correct charging voltage for your battery when the AC line voltage drops as low as 104 VAC or rises as high as 127 VAC. A surge protector in Duracell® Charger protects it from surges and spikes on the AC power line.

## Protection Features

Duracell® Charger provides the following protection features:

- Overheating protection
- Reverse polarity warning indicator light
- Overvoltage protection
- Bad battery indication
- Over current protection
- Charging time out protection

## Isolated Design

The DC battery charging circuits of Duracell® Charger are galvanically isolated by a transformer from the AC power circuits. This feature reduces the risk of electric shock and helps to prevent corrosion in marine applications.

## Front Panel Selectors

Display Selection

The Display Selection push button allows you to toggle the display to show the vehicle battery voltage and charging current during the charging mode. The display indicates the battery capacity when the AC is not plugged in.

Charge Rate

The Charge Rate push button allows you to select the optimal charge current for your battery. Refer to Table 2-2 on page 2-5 for appropriate charge rate selections.

Battery Reconditioning

The Battery Reconditioning push button (pin-hole type) allows you to recondition a bad flooded battery that does not accept charge.

# Front Panel Indicator Lights and Settings

This section describes the parts of the Duracell® Charger. Figure 1-1 shows the front panel. Descriptions are provided in the table.

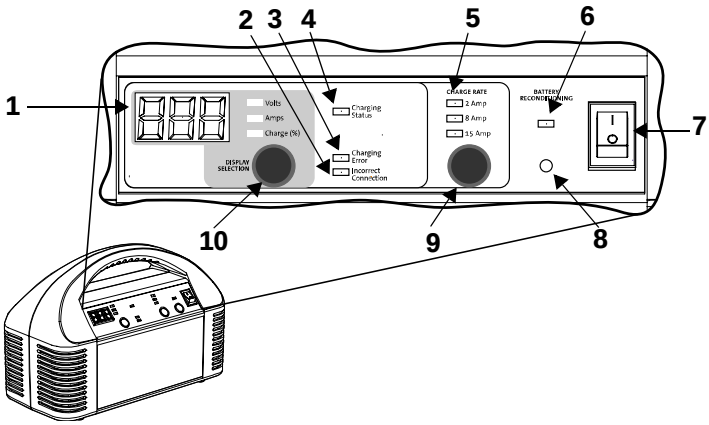



**Figure 1-1** Duracell® Charger Front Panel

| Panel Item | Description |
|---|---|
| 1 | **Digital Display** displays the numerical value of the battery voltage, charging current and capacity. The **Volts (V)**, **Current (A)**, **Battery %** lights indicate which condition is being reported.<br>The digital display is also used to indicate error codes when **Charging Error** light (Item 6) is illuminated. See Chapter 3, “Troubleshooting”. |
| 2 | **Incorrect Connection** light, under the Battery Charger section, illuminates when a reverse polarity is detected at the charging cable. |
| 3 | **Charging Error** light illuminates when a fault condition is detected. |
| 4 | **Charging Status** light indicates the charging status of the battery. A blinking light indicates that charging is in progress. A solid light indicates that the battery is fully charged. |

| Panel Item | Description |
|---|---|
| 5 | **Charge Rate** light indicates the selected charging current. Charge rate can be selected by pushing the **Charge Rate** button (Item 12). |
| 6 | **Battery Reconditioning** light indicates that the battery reconditioning function is activated. A blinking light indicates that the battery reconditioning process is in progress. A solid light indicates that the battery reconditioning process is finished. |
| 7 | AC power **ON/OFF** switch |
| 8 | **Battery Reconditioning** push button (pin hole type) allows you to recondition a bad flooded battery that is not accepting charge (see Item 9). |
| 9 | **Charge Rate** push button allows you to select the optimal charge current for your battery (see Item 8). |
| 10 | **Display Selection** push button allows you to toggle between the battery voltage and charging current during battery charging (see Item 4). It also indicates battery capacity when the unit is not connected to an AC standard wall outlet. |

## Charger Cable Storage Compartment

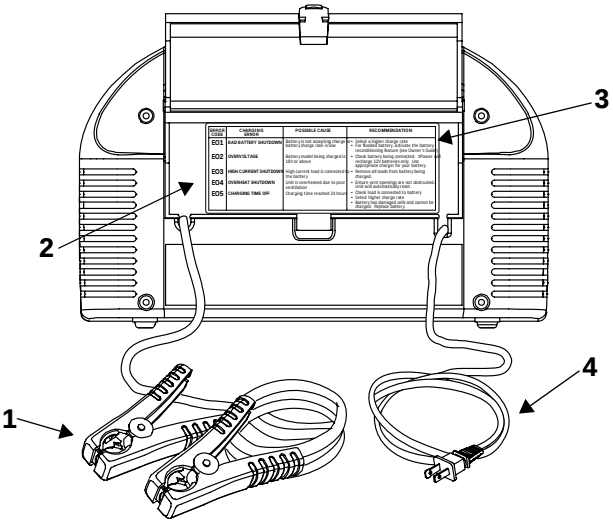



**Figure 1-2** Duracell® Charger Storage Compartment

| Panel Item | Description |
|---|---|
| 1 | **Battery Charging Clips** for charging your vehicle battery. |
| 2 | **Storage Compartment** for AC cable and battery clips. |
| 3 | **Error Code Reference Table** provides quick battery troubleshooting. |
| 4 | **AC Cable** connects the Duracell® Charger to the AC wall socket. |

# 2 Operation

Chapter 2 explains how to operate the Duracell® Charger efficiently to charge a vehicle battery.

## Operating Conditions and Guidelines

**CAUTION**

Read all operating instructions before operating the Duracell® Charger.

# Choosing a Location

## WARNING: Fire or explosion

The Duracell® Charger contains components that tend to produce arcs or sparks. To prevent fire or explosion, do not operate the Duracell® Charger in compartments containing flammable materials, or in locations that require ignition-protected equipment.

The Duracell® Charger should be operated only in a location that meets these requirements:

| | |
|---|---|
| **Dry** | Do not allow water or other liquids to drop or splash on the Duracell® Charger. |
| **Cool** | Ambient air temperature should be between 32 and 104ºF (0 and 40ºC)—the cooler the better within this range. |
| **Ventilated** | Leave at least 2" (5 cm) clearance around the Duracell® Charger for air flow. Ensure that the ventilation openings are not obstructed. |
| **Safe** | Do not operate the unit in any compartment capable of storing flammable liquids like gasoline. |
| **Protected from battery gases** | Do not operate the Duracell® Charger where it will be exposed to battery gases. These gases are very corrosive, and prolonged exposure will damage the Duracell® Charger. |

# Charging 12 Volt Batteries

Before you start to charge batteries read the “Important Safety Instructions” on page v and take all safety precautions when working with batteries.

The Duracell® Charger has been designed to provide fully automatic recharge of 12 V, automotive, marine, deep-cycle, AGM and gell cell batteries.

## WARNING: Explosion hazard

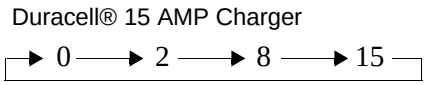
The Duracell® 15 AMP Battery Charger is designed to charge 12 V lead-acid batteries only. Do not use these products on batteries with other voltage ratings.

**To charge your 12 volt battery:**

1. If possible, disconnect all loads from the battery, by removing battery cables, opening a disconnect switch, or switching loads off.
   The charger detects a battery is fully charged when its charging current drops below a preset limit. The presence of electrical loads on the battery may interfere with this detection method. The 24-hour timer-based charging shutdown feature acts as a backup, but the charging current- based method is preferable.
2. Apply AC power to the Duracell® Charger, turn the AC power ON/OFF switch to ON.
3. Connect the red positive (+) clip of the charger cables to the positive (+) terminal of the vehicle battery.
   The battery’s positive terminal is usually larger in diameter than the negative terminal. In most vehicles, the battery’s positive terminal has a red wire connected to it.
4. Connect the black negative (–) clip of the charger cables to the negative (–) battery terminal.
   If the red Incorrect connection indicator light on the

Battery Charger function illuminates, reverse polarity has been detected. Correct polarity must be established before proceeding. Go back to Step 3.

5. The Charge Rate indicator light will blink. Select the suitable charging current for your battery (see Table 2-2 on page 2-5) by toggling the Charge Rate push button located below the indicator light. If the charging current is not selected within 10 seconds, the unit will set to a default charge rate of 2 A.
6. The Charging Status indicator light on the Battery Charger function section will blink and the fully-automatic charging sequence begins.
7. During charging, the charging current can be set to a different charge rate or terminated at any time by toggling the Charge Rate push button.




8. During charging, you can toggle the Display Selection push button to show either the charging voltage or the charging current on the Digital Display.
9. When the charging process is complete, the Charging Status indicator light on the Battery Charger function section changes from blinking to solid.
   A 24-hour timer is built into the unit to avoid battery overcharging.
   The charger will automatically recharge the battery if the charge current rises above the threshold specified in Table 2-1.

**Table 2-1** Duracell® 15 AMP Charger

| Charging Rate | Threshold |
|---|---|
| 2 A | 0.6 |
| 8 A | 1.5 |
| 15 A | 2.0 |

10. Turn the AC power ON/OFF switch to OFF.
11. Remove the black negative (–) clip and the red positive (+) clip from the vehicle's battery terminals.
12. Store the charging cables in the storage compartment at the back of the unit.

## Charging Rates Selection Guide

Use Table 2-2 to determine the charging rate.

**Table 2-2** Duracell® 15 AMP Charger

| Charging Rate | Recommended Battery Size |
|---|---|
| 2 A | 6 Ah or above |
| 8 A | 20 Ah or above |
| 15 A | 40 Ah or above |

# Reconditioning (Equalizing) Flooded Type Batteries

### WARNING: Explosion hazard

Battery reconditioning feature works only on flooded lead-acid batteries. Do not attempt to recondition sealed lead-acid batteries.

### WARNING: Explosion hazard

During the battery reconditioning process, the battery generates potentially flammable gases. Follow all the battery safety precautions listed in this guide. Ventilate the area around the battery thoroughly and ensure that there are no sources of flame or sparks in the vicinity.

### CAUTION

Turn off or disconnect all loads on the battery during reconditioning. The voltage applied to the battery during reconditioning may be above the safe levels for some loads. Be sure to check battery electrolyte before and after reconditioning. Fill only with distilled water.

**Important:** The battery reconditioning mode has a 4 hour timing limit.

**To recondition your batteries (on the vehicle):**

1. Disconnect all loads from the battery by removing battery cables or by opening a disconnect switch.
2. Apply AC power to the Duracell® Charger, and turn the AC power ON/OFF switch to ON.
3. Connect the red positive (+) clip of the cables to the positive (+) terminal of the engine battery.
   The battery's positive terminal is usually larger in diameter than the negative terminal. In most vehicles, the battery's positive terminal has a red wire connected to it.

4. Connect the black negative (–) clip of the cables to the negative (–) battery terminal.
   If the red Incorrect Connection indicator light on the Battery Charger function illuminates, reverse polarity has been detected. Correct polarity must be established before proceeding.
5. Use a toothpick, paper clip, pen point or other small object to push the Battery Reconditioning button (pin-hole type).
6. The Battery Reconditioning and Charge Rate indicator lights illuminate and blink.
   The display shows ( _ _ _ ) then ( – – – ) then ( ¯ ¯ ¯ ).
7. Select the suitable battery reconditioning current for the battery size (see Table 2-2 on page 2-5) by pushing the Charge Rate push button.
   If the battery reconditioning current is not selected within 10 seconds, the unit will set to a default charging rate of 2 A.
8. Monitor the specific gravity of each cell of the battery during reconditioning with a battery hydrometer. Reconditioning is complete when the specific gravity of each cell of the battery remains constant. Most lead-acid batteries have a specific gravity of approximately 1.265 when fully charged.
   When the battery reaches the target specific gravity, press the Charge Rate button until all charge rate lights are off or remove the battery clips to terminate the reconditioning mode.
9. If the specific gravity is still rising when the reconditioning mode reaches the 4 hour timing limit, you can initiate further reconditioning by pressing the Battery Reconditioning button again.
   After approximately 4 hours, the Battery Reconditioning indicator light changes from blinking to solid and the digital display will show ( ≡ ≡ ≡ ).
   The battery reconditioning mode has been terminated.

10. Turn the AC power ON/OFF switch to OFF.
11. Remove the black negative (–) clip and the red positive (+) clip from the vehicle's battery terminals.
12. Check the battery electrolyte level. If necessary, refill with distilled water only.

# 3 Troubleshooting

Chapter 3 will help you identify and remedy the common problems than can occur with the Duracell® Charger.

Read this chapter before calling your dealer.

If you cannot solve the problem with the Duracell® Charger, record the information asked for on “Information About Your System” on page WA–6 and then call your dealer.

## Troubleshooting Reference

**WARNING: Electric shock hazard**

Do not disassemble the Duracell® Charger. The Duracell® Charger does not contain any internal user-serviceable parts and attempting to service the unit yourself could result in electrical shock or burn.

**Table 3-1** Troubleshooting reference

| Problem | Possible Cause | Solution |
|---|---|---|
| Digital Display or LED on unit does not turn on | No power at the AC receptacle | Ensure that power is available at the receptacle |
| | AC Power ON/OFF switch is OFF | Ensure AC Power ON/OFF switch is ON |

**Table 3-1** Troubleshooting reference

| Problem | Possible Cause | Solution |
|---|---|---|
| Digital Display shows voltage and charging current but not Charge % during charging | Unit is normal, as the charge % reading is disabled when unit is charging a battery | |
| Digital Display shows Charge % but not voltage and charging current | Unit is normal. With no AC connected to the unit, the digital display will only show battery capacity (in %) when it is connected | |
| Digital display always shows **0** when the battery is connected | The battery being charged is below 2.5 VDC | Battery cannot be charged |
| | Poor connection on battery terminals | Check battery connections |
| | The red Incorrect Connection indicator light is illuminated indicating that the positive and negative charging cable clips are reversed | Reconnect the charger cable clips to the correct polarity (see “To charge your 12 volt battery:” on page 2-3) |
| **Charging Error E01** Bad Battery Shutdown | Battery is not accepting charge | For flooded battery, try reconditioning the battery (see “To recondition your batteries (on the vehicle):” on page 2-6) |
| | Charging rate selected is too low for the battery being charged | Select a higher charge rate (see Table 2-2 or Table 2-2 on page 2-5) |

**Table 3-1** Troubleshooting reference

| Problem | Possible Cause | Solution |
|---|---|---|
| **Charging Error E02** Overcharge Shutdown | Battery model being charged is 18 V or above | Check battery being connected. This charger will recharge 12 V batteries only. Use appropriate charger for your battery |
| **Charging Error E03** High Current Shutdown | High current load is connected to the battery | Remove all loads from the battery being charged |
| **Charging Error E04** Overheat Shutdown | Unit has overheated due to poor ventilation or excessively warm environmental conditions | Clear blocked ventilation openings or remove objects covering the unit. Unit will automatically restart when it cools down<br><br>Move the Duracell® Charger to a cooler environment |
| **Charging Error E05** Charging Time Off | Battery charging time reaches 24 hours<br><br>Charging rate selected for battery charging is too low for the battery being charged<br><br>Battery has a damaged cell | Check load is connected to battery<br><br>Select a higher charging rate (see Table 2-2 on page 2-5)<br><br>Replace battery |

# Recycling

**If it's rechargeable, it's recyclable!**

Xantrex recognizes its responsibility as a global citizen and is continually striving to reduce the environmental impact of the work we do and the products we create. We have taken a step forward to limit our impact on the natural environment by initiating a battery recycling program. Xantrex is a licensee of the Rechargeable Battery Recycling Corporation ("RBRC"), a non-profile public service organization dedicated to recycling used rechargeable batteries. Through RBRC's national program and the availability of recycling depots for Pb batteries, Xantrex customers can recycle rechargeable batteries in a convenient and environmentally friendly way.

If one of your Xantrex battery-integrated products has reached the end of its useful life, we urge you to dispose of the product correctly and safely. Xantrex recommends taking the following steps to recycle your product depending on battery chemistry and size.

**Ni-MH, Li-ion or small Pb Batteries (up to 2 lbs. or 1 kg)**

If you are recycling a product that contains a Ni-MH, Li-ion or small Pb battery (up to 2 lbs. or 1 kg) then you can simply drop it off at the battery drop-box located at any one of the following major retailers.

**In Canada:** Battery Experts, Battery Plus, Bell World, FIDO, Future Shop, The Home Depot, Home Hardware, London Drugs, Makita Factory Service Centers, Personal Edge, Revy, Sears, The Sony Store, The Source by Circuit City, TELUS Mobility and Zellers

**In the USA:** Alltel, Batteries Plus, Black & Decker, Cingular Wireless, Circuit City, The Home Depot, Lowe's, Milwaukee Electric Tool, Office Depot, Orchard Supply, Porter Cable Service Centers, RadioShack, Remington Product Company, Sears, Staples, Target, US Cellular and Verizon Wireless

If you are not sure of the drop-box nearest you, simply call 1-877-2-RECYCLE to find the retail collection nearest you.

**Pb Batteries (larger than 2 lbs. or 1 kg)**

If you need to recycle a Pb battery that is larger than 2lbs. (1kg) then you may take one of the following three steps to recycle your battery:

- dispose of your battery product 'as is' at a battery disposal location or waste disposal location nearest you.
- send your battery product 'as is' back to Xantrex for proper recycling of the battery (see address below).

  Xantrex Technology Inc.
  Attn: Battery Recovery
  5917 195th Street NE
  Arlington, WA
  USA, 98223
- dispose of the battery inside your product, by first removing it (simple disassembly may be required) and then taking it to a Sears Automotive Facility in your area where it can be dropped off for proper recycling.

  * If you are not sure of a Sears Automotive Facility nearest you simply go to www.Sears.com and select store locator.

# A Specifications

Appendix A lists the specifications for the Duracell® Charger.

**Important:** Specifications are subject to change without notice.

## Physical Specifications

| | |
|---|---|
| Dimensions | 270 mm x 130 mm x 180 mm (10.63 in. x 5.12 in. x 7.09 in.) |
| Weight | 1.94 kg (4.28 lbs) |
| AC Input Connections | 6.5’ (2.0 m) AWG 18 |
| DC Output Connections | 6.0’ (1.8 m) AWG 14 |

# Electrical Specifications

Battery Charging System

| | |
|---|---|
| Number of Battery Bank Outputs | 1 |
| Nominal Battery Voltage | 12 VDC |
| Nominal Operating Output Range | 2.5 – 15.6 VDC |
| Rated DC Output Current | 2/8/15 ADC |
| Charge Modes | 3 stage |
| Absorption Voltage | 14.4 VDC |
| Float Voltage at no Load | 13.6 VDC |

Battery Reconditioning Mode

| | |
|---|---|
| Maximum Output Voltage | 16.5 VDC |
| Battery Reconditioning Mode Current | 0.25 A with 2 A setting<br>1.0 A with 8 A setting<br>2.0 A with 15 A setting |

# AC Input Specifications

| | |
|---|---|
| AC Input Voltage Range | 104 – 127 VAC, 50/60 Hz |
| Typical AC Input Current at 120 VAC | 3.5 A RMS |
| No-load AC Power Draw | Less than 5 watts |
| Power Factor Rated Load | 0.66 |
| Efficiency – peak | 83% |

# Protection Features

| | |
|---|---|
| Battery Reverse Polarity | Reverse Polarity indicator light on charger section of front panel illuminates |
| Output Current Limit | 2 A — 2.1 A<br>8 A — 8.4 A<br>15 A — 15.8 A |
| Error Code with Light ON | E01 — E05 |

# Approvals

| | |
|---|---|
| Product Safety | ETL approved to CSA107.2 and UL1236 standards |
| Electromagnetic Compatibility (EMC) | Complies with FCC part 15B, Class B |

# B Battery Charging

Appendix B describes battery charging in more detail.

Duracell® Charger charges batteries in a sequence known as a three-stage charge. The charging voltage delivered to the battery depends on the battery

The three automatic stages are:

- bulk
- absorption
- float

There is a fourth stage, battery recondition (equalization), that is initialized manually since it is only performed occasionally and only on a flooded battery.

## Bulk Charge

In the first stage, known as the bulk charge, Duracell® Charger delivers its full- rated output current.This constant current is delivered to the batteries until the battery voltage approaches its absorption voltage—typically around 14.5 volts. The bulk charge stage restores about 75% of the battery's charge.

## Absorption Charge

During the absorption charge, the charging voltage is held constant near the gassing voltage, and the battery gradually reduces the charging current it demands as it attains full charge. Once the current drops to around 1/6 of the charging current in bulk charge mode, the charger exits to Float charge mode.

# Float Charge

The float charge is a maintenance mode in which the output voltage of the charger is reduced to a lower level, typically about 13.5 volts to maintain the battery's charge without losing electrolyte through gassing. In the float mode, the charger will initiate a new charge cycle under any of these conditions:

- AC power is disconnected and reconnected
- current demand on charger exceeds the battery recharge current setting

The chart in Figure B-1 shows the three-stage charging profile.

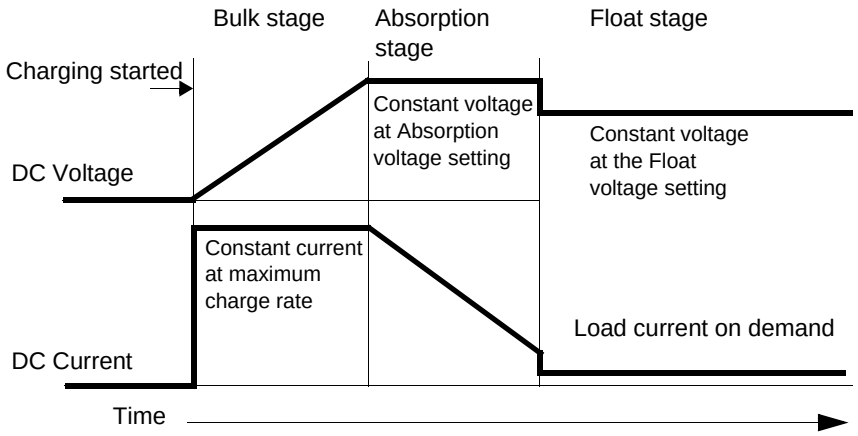



**Figure B-1** Three-stage charging profile

# Calculating External Battery Charging Time

Formula

Charging time will depend on the capacity of your battery and on how deeply it is discharged.The following equation calculates an approximate charging time:

$$\text{Charging time} = \frac{\text{CAP} \times \text{DOD}}{\text{CC} \times 80\%}$$

where:

| | |
|---|---|
| Charging Time: | Battery recharge time in hours |
| CAP: | Battery capacity in amp-hours |
| DOD: | Battery depth of discharge in per cent. A fully discharged battery has 100% DOD |
| CC: | Charge current, the rated current output of the charger in amperes |
| 80%: | Typical charging efficiency for lead-acid batteries |

Example

A Group 27 size battery rated at 82 amp-hours is 40% discharged, that is, it has a DOD = 40. Charging time with a Duracell® Charger unit is calculated as follows:

$$\text{Charging time} = \frac{82\ \text{Ah} \times 40\%}{20\ \text{A} \times 80\%} = 2\ \text{hours}$$

# Battery Reconditioning Mode

A battery reconditioning charge should be performed *only* on vented, flooded (non-sealed or “wet”) batteries. It should be performed only if recommended by the battery manufacturer and only as often as specified. Battery reconditioning is a deliberate overcharge designed to return each cell to optimum condition by reducing sulfation and stratification in the battery. The overcharge helps the battery to reach and maintain peak capacity by equalizing the chemistry in the individual battery cells.

## CAUTION: Risk of battery damage

Duracell® Charger *cannot* automatically determine when to stop the reconditioning of a battery. You must monitor the battery specific gravity throughout reconditioning to determine the end of the reconditioning cycle. The 4 hour time-out is intended as a safety feature but may not be sufficiently short to prevent battery damage.

## WARNING

Do not recondition gel cell batteries.

## WARNING

Always monitor the reconditioning charge cycle. Provide proper ventilation for battery fumes. Do not allow any sparks during reconditioning. If one or more cells begin to overflow, terminate the recondition cycle.

## WARNING

Check the battery electrolyte both before and after the reconditioning charge. Do not expose the battery plates to air. Leave the battery caps on while reconditioning. Top off after reconditioning.

## WARNING

Remove all loads from the DC system before reconditioning. Some DC loads may not tolerate the high charge voltage.

## About Reconditioning

**Frequency**

Approximately once a month, you may wish to recondition your flooded batteries by using the battery reconditioning mode.

**Important**

Reconditioning can damage your batteries if it is not performed properly. Never recondition a battery more than twice a month. Always check battery fluid level before *and* after reconditioning. Fill batteries only with *distilled* water.

Battery manufacturers' recommendations on reconditioning vary. Always follow the battery manufacturer's instructions so batteries are properly reconditioned. As a guide, a heavily used battery may require reconditioning once a month while a battery in light duty service, only needs reconditioning every two to four months. Duracell® Charger provides a high-quality charge so batteries will not need to be reconditioned as often as with a lower quality charger.

**Battery type**

Duracell® Charger reconditions only flooded lead-acid batteries. It does not recondition sealed lead-acid batteries since they can be damaged by this process.

**Duration**

Reconditioning is manually terminated when the specific gravity in each cell is about 1.265 and remains constant at that level. Duracell® Charger automatically exits the reconditioning mode after six hours.

**Battery charge state**

Reconditioning is only performed on fully-charged batteries. If they are not charged, the first part of the process is similar to the absorption charge and ensures the battery is fully charged.

**Recommended**

The manufacturer recommends that you run a normal charge cycle on the batteries before you recondition them.

# 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 Duracell® 15 AMP Battery Charger. This warranty period lasts for 12 months 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.

**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 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 dealer.**

If you are unable to contact your dealer, or the dealer is unable to provide service, contact Xantrex directly at:

| | |
|---|---|
| Telephone: | 1 408 987 6359 |
| Web: | www.xantrex.com/support |

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, 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 DURACELL® 15 AMP BATTERY CHARGER 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 DURACELL® 15 AMP BATTERY CHARGER IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES.

# 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 “Information About Your System” on page WA-6.

# 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 Duracell® 15 AMP Battery Charger 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 Duracell® 15 AMP Battery Charger 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-4.

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 Duracell® 15 AMP Battery Charger package, record the following information and be sure to keep your proof of purchase.

- ❒ Serial Number (on DC end) _____
- ❒ 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.

- ❒ Battery/battery bank size _____
- ❒ DC wiring size and length _____
- ❒ Warning, Error or Panel Fault Message _____
- ❒ Appliances operating when problem occurred _____
- ❒ Description of problem _____

_____

_____