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Owner's Manual

Freedom 10 Inverter/Charger

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About This Manual

Purpose

The purpose of this Owner's Manual is to provide explanations and procedures for installing, operating, maintaining, and troubleshooting the Freedom 10 Inverter/Charger.

Scope

The Manual provides safety guidelines, detailed planning and setup information, procedures for installing the inverter, as well as information about operating and troubleshooting the unit. It does not provide details about particular brands of batteries. You need to consult individual battery manufacturers for this information.

Audience

The Manual is intended for anyone who needs to install and operate the Freedom 10 Inverter/Charger. Installers should be certified technicians or electricians.

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 that are important for you to know, but not as serious as a caution or warning.

Related Information

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

Important Safety Instructions

WARNING

This chapter contains important safety and operating instructions. Read and keep this Owner's Manual for future reference.

Important: General safety information for installation and operation is contained throughout this manual where they apply and are not included In this summary.

1. Before installing and using the Freedom 10 Inverter/Charger, read all instructions and cautionary markings on the Freedom 10 Inverter/Charger, the batteries, and all appropriate sections of this guide.
2. For continued protection against the possibility of fire, replace the fuse only with a fuse of the specified voltage, current, and type ratings.
3. To avoid damage, operate the equipment only within the specified AC (mains) and DC (battery) voltages.
4. Do not expose the Freedom 10 Inverter/Charger to rain, snow, spray, or bilge water. To reduce risk of fire hazard, do not cover or obstruct the ventilation openings. Do not install the Freedom 10 Inverter/Charger in a zero-clearance compartment. Overheating may result.
5. Use only attachments recommended or sold by the manufacturer. Doing otherwise may result in a risk of fire, electric shock, or injury to persons.
6. 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 Freedom 10 Inverter/Charger with damaged or substandard wiring.
7. Do not operate the Freedom 10 Inverter/Charger if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the Freedom 10 Inverter/Charger is damaged, see the Warranty section.
8. Do not disassemble the Freedom 10 Inverter/Charger. It contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the Freedom 10 Inverter/Charger yourself may result in a risk of electrical shock or fire. Internal capacitors remain charged after all power is disconnected.
9. To reduce the risk of electrical shock, disconnect both AC and DC power from the Freedom 10 Inverter/Charger before attempting any maintenance or cleaning or working on any circuits connected to the Freedom 10 Inverter/Charger. Turning off controls will not reduce this risk.
10. The Freedom 10 Inverter/Charger must be provided with an equipment-grounding conductor connected to the AC input ground.

Explosive gas precautions

WARNING: Explosion hazard

1. Working in the vicinity of lead-acid batteries is dangerous. Batteries generate explosive gases during normal operation. Therefore, you must read this guide and follow the instructions exactly before installing or using your Freedom 10 Inverter/Charger.
2. This equipment contains components that tend to produce arcs or sparks. To prevent fire or explosion, do not install the Freedom 10 Inverter/Charger in compartments containing batteries or flammable materials, or in locations that require ignition-protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, as well as joints, fittings, or other connections between components of the fuel system.
3. To reduce the risk of battery explosion, follow these instructions and those published by the battery manufacturer and the manufacturer of the equipment in which the battery is installed.

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 are off so you don't cause a spark.

Precautions for Using Rechargeable Appliances

CAUTION: Equipment damage

Most rechargeable battery-operated equipment uses a separate charger or transformer that is plugged into an AC receptacle and produces a low voltage charging output.

Some chargers for small rechargeable batteries can be damaged if connected to the Freedom 10 Inverter/Charger. Do not use the following with the Freedom 10 Inverter/Charger:

- Small battery-operated appliances like flashlights, razors, and night lights that can be plugged directly into an AC receptacle to recharge.
- Some chargers for battery packs used in power hand tools. These affected chargers display a warning label stating that dangerous voltages are present at the battery terminals.

Important: if you are unsure about using your rechargeable appliance with the Freedom 10 Inverter/Charger, contact the equipment manufacturer to find out if there are high voltages at the battery terminals or if the appliance incorporates the use of transformers.

Contents

3 Operation

4 Troubleshooting

A Specifications

B Glossary

1 Introduction

Chapter 1 describes the features and functions of the Freedom 10 Inverter/Charger.

Introduction

This Owner's Manual describes the Xantrex Freedom 10 Inverter/Charger. This unit performs four distinct functions:

1. DC to AC power inverting
2. Automatic transfer switching between inverter power and incoming AC power
3. Three-stage automatic battery charging plus manual battery equalizing
4. AC to DC power converter.

The inverter provides 1,000 watts of voltage and frequency-regulated AC power from a deep-cycle battery bank. The output is a modified sine wave and is compatible with virtually all consumer appliances. An idle circuit reduces battery power consumption when the inverter is unloaded. There is a low battery cutout circuit and considerable momentary surge power is available for starting electric motors. High efficiency ensures the longest possible battery life between recharges.

Figure 1-1 Freedom 10 Inverter/Charger

Transfer switch

The transfer switch allows the Freedom 10 to be connected to an external AC source. Some of the external AC power is used to operate the battery charger, the rest is switched through the unit to the output. Thus, the Freedom 10 operates as a self-contained backup power system just by adding batteries. The power sharing feature constantly senses the AC current being used by the battery charger and the appliances connected to the output, and automatically reduces battery charger power consumption if usage exceeds the input circuit breaker rating.

Battery charging

The Freedom 10 battery charger is electronically controlled and rated at 50 amps DC (25 amps DC for 24-volt systems). It is designed to rapidly and optimally recharge either wet or gel cell deep-cycle batteries. Battery charging is accomplished in three automatic stages: Bulk Charge, Acceptance, and Float Charge. In addition, using the remote control, a manually engaged equalizing charge cycle is possible.

DC power supply

With an external AC source connected, the Freedom 10 charger also serves the functions of an AC to DC converter to supply all of the DC loads that are connected to the battery.

Simple, automatic operation is made possible by the microprocessor that is the brain of the Freedom 10. In most cases, the unit is left on and no attention or maintenance is required.

Optional remote panel

Two optional remote control panels are available for the Freedom 10—one for 12 V models and one for 24 V models. These remote control panels provide a power switch, system status LEDs, DC volts and DC amps LED bar graphs. In addition, the remote control panel allows adjustment of the following settings:

- three-stage or equalize charging
- temperature
- battery type
- charger mode
- idle sensitivity
- power sharing.

Things You Should Know

WARNING: Unexpected operation

A transfer between inverter and charge modes of operation may temporarily take place when the product is subjected to electrostatic discharge.

Intended Use

The Freedom 10 Inverter/Charger is intended:

- as a DC to AC inverter/battery charger
- for use in recreational vehicles, recreational marine vehicles, and residential solar applications
- to be permanently installed, not portable
- to be used with a DC fuse as described in the installation section of this manual.

Circuit Breaker Protection

The 15 amp circuit breaker on the front of the unit protects against sustained inverter overloads. The breaker is reset by pressing the button. The 15 amp circuit breaker protects the incoming AC circuit which is transferred through to the loads, and feeds the battery charger.

Electronic Protection

Fast-acting electronic circuits protect the inverter from extreme overloads, low and high battery voltage and over-temperature. They can be reset by cycling the power switch off and on. The fault condition must be eliminated before reset will occur. For example, remove the overload, recharge the batteries, or allow the unit to cool. See “Troubleshooting” on page 4–1.

Inverter Idle Circuit

The inverter idle circuit is an automatic energy saving feature that reduces battery power consumption when no load is present. Response from idle is instant. In most cases, the operation of the idle circuit is not noticeable. Using the remote control panel allows the idle circuit sensitivity to be adjusted.

Power Sharing

The Freedom 10 can automatically reduce the battery charger output, and therefore the AC power consumption, if appliances are turned on that threaten to trip the incoming circuit breaker. This feature can be adjusted using the remote control panel. This feature is set to protect a 15-amp source by default.

2 Installation

Chapter 2 contains information and procedures to install the Freedom 10 Inverter/Charger.

Topics in this chapter include:

- “Installation Precautions”
- “Recreational Vehicle Installation”
- “Marine Installation”
- “Residential Solar Installation”

Installation Precautions

WARNING: Fire or explosion hazard

This equipment is not ignition protected and employs components that tend to produce arcs or sparks. To reduce the risk of fire or explosions, do not install in compartments containing batteries or flammable materials or areas in which ignition-protected equipment is required.

WARNING: Shock hazard and equipment failure

To reduce the risk of electric shock and prevent premature failure due to corrosion, do not mount where exposed to rain or spray.

WARNING: Fire hazard

To prevent fire, do not obstruct ventilation openings. Do not mount in a zero clearance compartment—overheating may result.

WARNING: Shock hazard

For continued protection against risk of electric shock use only the residual current circuit breaker (RCCB) type receptacles. Other types may fail to operate properly when connected to this inverter, resulting in a potential shock hazard.

WARNING: Shock hazard

Both AC and DC voltage sources are teminated inside this equipment.
Each circuit must be individually opened before servicing. When a solar array is exposed to light it supplies DC voltage to the battery and this equipment.

WARNING: Shock hazard

Do not remove cover—no user serviceable parts inside. Refer servicing to qualified service personnel.

Important: The output of this device is not sinusoidal. It has a maximum total harmonic distortion of 47% and a maximum single harmonic of 34%.

Application Information The Freedom 10 is provided with integral electronic protection against AC and DC overloads.

Appropriate Applications

The Freedom 10 is appropriate for installation in recreational vehicle (RV), residential solar installations, and marine applications. The installation instructions for each application will be discussed separately. Refer to the separate installation guide for typical installation examples.

Key Installation Points

- **Observe proper polarity when connecting batteries.** Reverse DC polarity will result in damage to the Freedom 10.
- **Do not backfeed the AC output of the inverter with incoming AC power.** Double check all aspects of your AC wiring for the possibility of backfeeding. A backfeed will cause significant damage to your unit.
- **Do not connect the AC input to the AC output.** In effect, this would be plugging the battery charger into the inverter. This could occur if the Freedom 10 is connected to the entire leg of a circuit breaker panel, then a circuit breaker on that leg is used to feed the battery charger. This will cause the unit to oscillate on and off when the unit is in inverter mode.
- **Always use properly sized wire and connectors**, keeping in mind that considerable amperage flows in the DC circuit. Fusing the positive DC cable is required.
- **Keep the Freedom 10 out of the elements and out of direct contact with water.** Remember that the unit is a piece of electronic equipment and treat it accordingly.
- **Mount the unit as close to the batteries as possible** but not in the presence of flammable fumes or in an enclosed battery compartment.
- **Do not bolt the unit down until the AC, remote, and ground wiring is completed.**

Recreational Vehicle Installation

Before installing the inverter in a recreational vehicle, you must consider factors such as:

- “Location” (see page 2–4)
- “Grounding” (see page 2–5)
- “Neutral Bonding” (see page 2–5)
- “AC Wiring” (see page 2–6)
- “Residual Current Circuit Breaker” (see page 2–7)
- “Remote Control Wiring” (see page 2–7)
- “DC Wiring” (see page 2–8)
- “Battery Cable Fusing” (see page 2–9).

Location

The following factors should be considered when planning to install the Freedom 10.

1. **The chassis ground bonding lug is located on the bottom of the unit.** Be sure to make this connection before bolting the unit down.

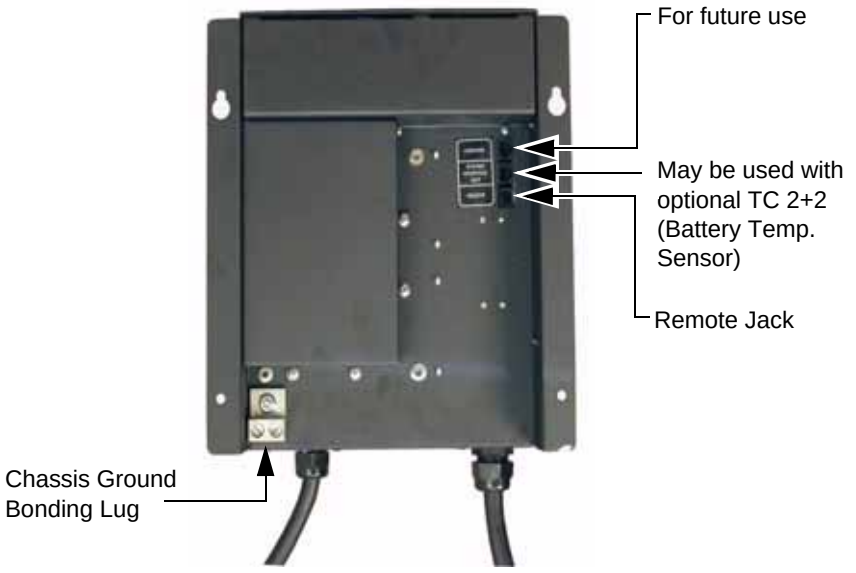

Figure 2-1 Ground, AC, and Remote Connection Locations

2. **Always mount the unit in a dry area**, out of direct contact with water or spray.
3. **You may mount the unit horizontally** (on a shelf) **or vertically** (on a wall or bulkhead). If mounted vertically, you must orient the unit so the switch and circuit breakers are facing up and the fan and battery cables are facing down.

4. **Allow 13 cm (minimum) of clearance** around the unit and allow for a supply of fresh air to the cooling fan. Do not block any of the vents or louvers. The fan pulls air from outside the unit. It blows the air across the internal components, particularly the transformer and heat sinks, then out the side vents.
5. **The mounting location should be as close to the batteries as possible.** The battery cables can be extended, however each cable must not be over 3.04 m in total length from the inverter to battery terminals. Do not use the RV chassis as a negative conductor.

WARNING: Fire hazard and equipment damage

Do not mount the unit in an enclosed battery compartment. Take precautions to keep road dirt and spray out of the unit.

Grounding

For safety purposes, **the chassis of the Freedom 10 must be connected to your AC ground system**. The chassis ground bonding lug is located on the bottom of the unit. This connector can accept two wires. The first is used to connect the unit to AC ground. The second can be used to connect other AC equipment to ground.

Use 5.0 mm^2 ES (Euro Standard) green insulated wire. Strip one end and use a screwdriver to secure it to the chassis ground bonding lug. This wire will connect to the ground in your AC electrical system, typically the vehicle chassis. Make sure the connection is clean and tight.

This procedure will connect the chassis of your Freedom 10 to AC ground. In addition, the AC input and AC output green/yellow wires are connected to chassis ground. It is important to connect these wires to the AC ground bus in the circuit breaker panel.

Please note that the battery cables are not connected to ground or the chassis of the Freedom 10.

Neutral Bonding

For safety purposes, the Freedom 10 internally bonds the blue AC output neutral wire to the green/yellow AC ground wire when the unit is OFF or in the inverter mode. When incoming AC power is applied and the transfer switch is engaged, the internal neutral-to-ground bond is automatically lifted.

This means that when the RV is in a campground, the grounding system is connected to the shore power ground, where neutral and earth ground are bonded together. This technique ensures safety in all conditions and conforms to the requirements of numerous electrical codes. Refer to other applicable electrical codes regarding connections between AC ground and DC ground.

AC Wiring

Use a screwdriver to remove the screws that secure the AC wiring compartment cover plate. See Figure 2-2.

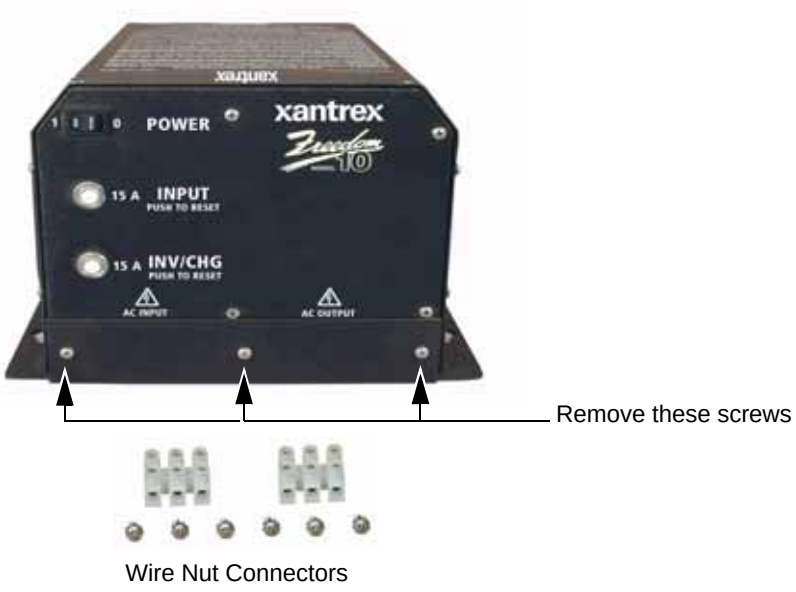

Figure 2-2 AC Compartment Cover Plate Screws

Inside you will see that the compartment is divided into two sections, one labeled AC INPUT, the other labeled AC OUTPUT. Each side contains three pigtails: blue, brown, green/yellow. Wire nut connectors are provided.

Wire Color	Description
Brown	Hot or Line
Blue	Neutral
Green/Yellow	Ground
Solid Green (AC output only)	Internal output neutral to ground bonding conductor

Important: At the AC output, the green/yellow and solid green wires are already connected together.

Two AC wiring knockouts are provided on the AC compartment cover plate. After removing the knockouts, you can add strain reliefs for additional stability or conduit fittings if the wiring will be routed through conduit. Flexible conduit is recommended.

You must use 2.5 mm^2 ES copper wire with insulation rated for 60 degrees centigrade or higher for both the AC input and AC output.

AC Input

Route the 3-conductor AC input wires through the cover plate knockouts and into the AC input compartment. You should have about 15 cm of individually insulated brown, blue and green/yellow wire. Strip about 1 cm of insulation off each conductor and connect to the Freedom 10 pigtails: brown to brown, blue to blue and green/yellow to green/yellow.

Use the wire nuts provided to make the wire connections.

AC Output

Route the 3-conductor AC output wire through the cover plate knockouts and connect in the same fashion.

In addition, if internal output neutral-to-ground bond is not required, remove the solid green wire from the green/yellow wires and cap with a wire nut.

CAUTION: Backfeed damage

Do not connect incoming AC from any source to the AC output of the inverter. This is known as backfeeding and will damage the unit and void the warranty.

Pull firmly on each connection to test it. These connections are the first thing to check if the unit seems to operate improperly. Carefully and neatly tuck the wires into the AC wiring compartment. Replace the cover plate.

Residual Current Circuit Breaker

In order to conform to the numerous electrical codes, certain branch circuits must be equipped with a residual current circuit breaker (RCCB). Please consult the code or a qualified electrician for details. Any such branch circuit must be protected by a circuit breaker consistent with the (RCCB) rating.

Remote Control Wiring

The remote control is supplied with a 7.62 m or 15.24 m RJ11 remote cable for connection to the unit. Simply plug one end of the cable into the remote connector on the bottom of the unit and the other end into the connector on the back of the remote control panel.

Routing the remote cable away from AC and DC wires will minimize the potential for interference which may affect the LED bar displays.

The remote control cable can be extended up to 15.24 m if required. Use standard 4-conductor remote RJ11 cable. Use a single length of cable with no connectors or in-line splices. If some remote RJ11 cable is left over, coil it up and store it in an area away from AC equipment to prevent electrical interference.

Once the above steps have been completed the unit can be bolted down.

DC Wiring

Two battery cables are provided with the unit. Both are black. The positive (+) cable has a piece of red heat shrink insulation on the end. Keep in mind that high current will pass through the DC wiring. All wires must be properly sized and all connections clean and tight.

It is recommended that the battery cables not be lengthened at all. However, it is possible to extend the cables if necessary. Extension cables must be 35.0 mm^2 ES, the same type of wire, and the total length for each battery cable must not exceed 3.04 m from the inverter to the battery terminal.

CAUTION: Reverse polarity hazard

The Freedom 10 is not DC reverse-polarity protected. Be very careful to connect the negative and positive cables correctly, otherwise damage will result and the warranty will be void.

Make sure the connections to the extension cables are tight and properly insulated. Do not attempt to open the case and replace the battery cables.

The negative (–) cable should be connected directly to the negative post of the battery bank or the ground side of a current shunt. Do not use the RV frame as the negative conductor. Tighten securely.

The positive (+) battery cable will commonly lead to a positive distribution point. This point typically connects to a battery switch rather than to the battery. The total length should not exceed 3 m and should be fused.

A spark may be generated when the final battery connection is made. This is normal and do not be alarmed. However, do not make the final connection in the presence of flammable fumes.

Figure 2-3 DC End

Battery Cable Fusing

A fuse is required for safety reasons to protect the battery and cables. The fuse must be installed in the positive battery cable, within 45.7 cm of the battery.

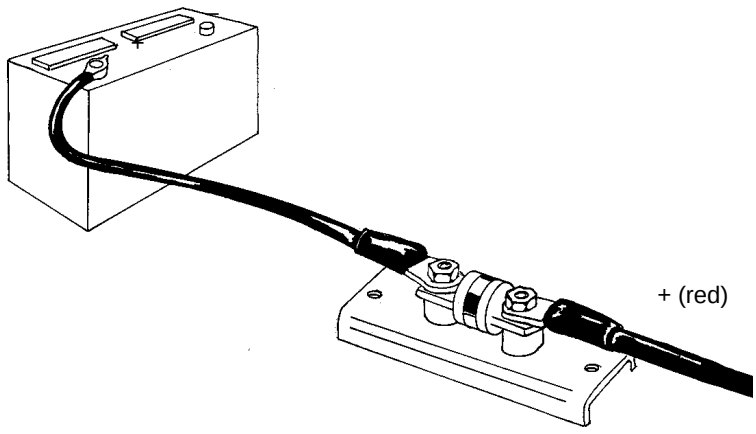

Figure 2-4 Fuse installation

Recommended fuse: Class T JLLN 200 amp

This fuse with fuse holder is available from your authorized dealer or directly from Xantrex:

- Fuse and holder: PN# TFB200
- Fuse only: PN# TF200

Marine Installation

Before installing the inverter in a marine application, you must consider factors such as:

- “Location” (see page 2–10)
- “Grounding” (see page 2–11)
- “Neutral Bonding” (see page 2–11)
- “AC Wiring” (see page 2–12)
- “Residual Current Circuit Breaker” (see page 2–13)
- “Remote Control Wiring” (see page 2–13)
- “DC Wiring” (see page 2–14)
- “Battery Cable Fusing” (see page 2–15).

Location

The following factors should be considered when planning to install the Freedom 10.

1. **The chassis ground bonding lug is located on the bottom of the unit.** Be sure to make this connection before bolting the unit down.
2. **Always mount the unit in a dry area**, out of direct contact with water or spray.
3. **You may mount the unit horizontally** (on a shelf) **or vertically** (on a wall or bulkhead). If mounted vertically, you must orient the unit so the switch and circuit breakers are facing up and the fan and battery cables are facing down.

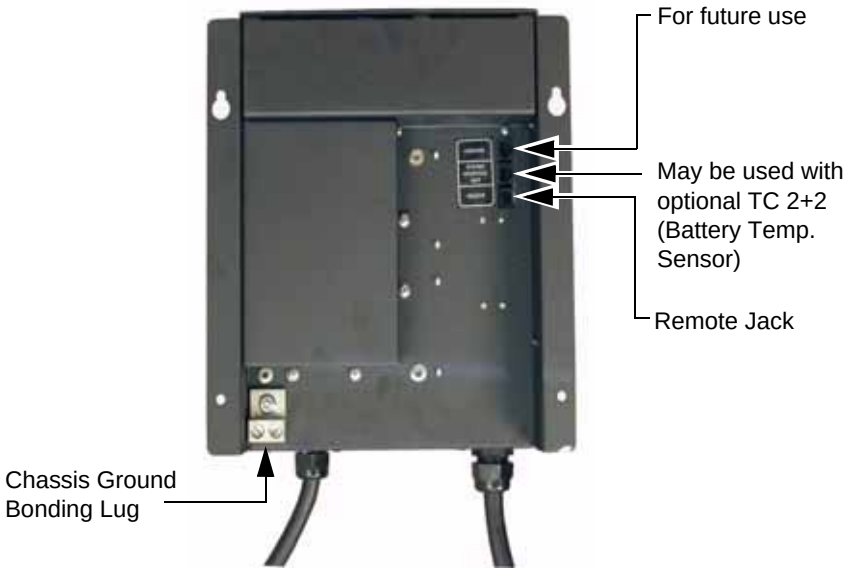

Figure 2-5 Ground, AC, and Remote Connection Locations

4. **Allow 13 cm (minimum) of clearance** around the unit and allow for a supply of fresh air to the cooling fan. Do not block any of the vents or louvers. The fan pulls air from outside the unit. It blows the air across the internal components, particularly the transformer and heat sinks, then out the side vents.
5. **The mounting location should be as close to the batteries as possible.** The battery cables can be extended, however each cable must not be over 3.04 m in total length from the inverter to the battery terminals.

Grounding

For safety purposes, **the chassis of the Freedom 10 must be connected to your AC ground system.** The chassis ground bonding lug is located on the bottom of the unit. This connector can accept two wires. The first is used to connect the unit to AC ground, the second can be used to connect other AC equipment to ground.

WARNING: Fire hazard

Do not mount the unit in a gasoline powered engine compartment or in an enclosed battery compartment. **Diesel engine compartments are acceptable locations**, but take precautions to keep dirt and spray off the unit.

Use 5.0 mm^2 ES (Euro Standard) green insulated wire. Strip one end and use a screwdriver to secure it to the chassis ground bonding lug. This wire will connect to the ground in your AC electrical system. Make sure the connection is clean and tight.

This procedure will connect the chassis of your Freedom 10 to AC ground. In addition, the AC input and AC output green/yellow wires are connected to chassis ground. It is important to connect these wires to the AC ground bus in the circuit breaker panel.

Please note that the battery cables are not connected to ground or the chassis of the Freedom 10.

Neutral Bonding

For safety purposes, the Freedom 10 internally bonds the blue AC output neutral wire to the green/yellow AC ground wire when the unit is OFF or in the inverter mode. When incoming AC power is applied and the transfer switch is engaged, the internal neutral-to-ground bond is automatically lifted.

This means that when the boat is in a marina, the grounding system is connected to the shore power ground, where neutral and earth ground are bonded together. This technique ensures safety and conforms to the requirements of numerous electrical codes.

Refer to other applicable electrical codes regarding connections between AC ground and DC ground for marine applications.

AC Wiring

Use a screwdriver to remove the screws which secure the AC wiring compartment cover plate.

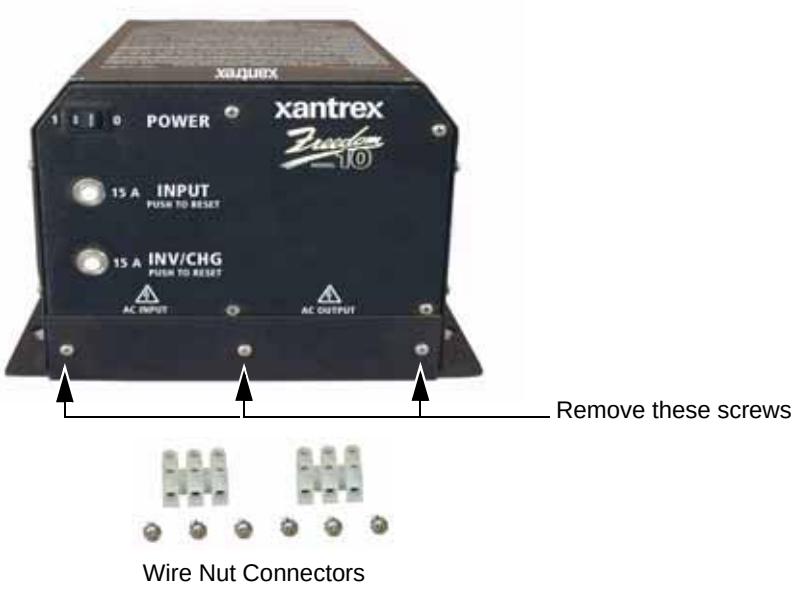

Figure 2-6 AC Compartment Cover Plate Screws

Inside you will see the compartment is divided into two sections, one labeled AC INPUT, the other labeled AC OUTPUT. Each side contains three pigtails: brown, blue and green/yellow. Wire nut connectors are provided.

Wire Color	Description
Brown	Hot or Line
Blue	Neutral
Green/Yellow	Ground
Solid Green (AC output only)	Internal output neutral to ground bonding conductor

Important: At the AC output, the green/yellow and solid green wires are already connected together.

Two AC wiring knockouts are provided on the AC compartment cover plate. After removing the knockouts, you can add strain reliefs for additional stability or conduit fittings if the wiring will be routed through conduit. Flexible conduit is recommended.

You must use 2.5 mm^2 ES copper wire with insulation rated for 60 degrees centigrade or higher for both the AC input and AC output.

AC Input

Route the 3-conductor AC input wires through the cover plate knockouts and into the AC input compartment. You should have about 15 cm of individually insulated brown, blue and green/yellow wire. Strip about 1 cm of insulation off each conductor and connect to the Freedom 10 pigtails: brown to brown, blue to blue and green/yellow to green/yellow.

To meet marine electrical codes, you may want to use butt splices instead of the wire nuts provided to make the wire connections.

AC Output

Route the 3-conductor AC output wire through the cover plate knockouts and connect in the same fashion.

In addition, if internal output neutral-to-ground bond is not required, remove the solid green wire from the green/yellow wires and cap with a wire nut.

CAUTION: Backfeed damage

Do not connect incoming AC from any source to the AC output of the inverter. This is known as backfeeding and will damage the unit and void the warranty.

Pull firmly on each connection to test it. These connections are the first thing to check if the unit seems to operate improperly. Carefully and neatly tuck the wires into the AC wiring compartment. Replace the cover plate.

Residual Current Circuit Breaker

In order to conform to the numerous electrical codes, certain branch circuits must be equipped with a residual current circuit breaker (RCCB). Please consult the code or a qualified electrician for details. Any such branch circuit must be protected by a circuit breaker consistent with the (RCCB) rating.

Remote Control Wiring

The remote control is supplied with 7.62 m or 15.24 m RJ11 remote cable for connection to the unit. Simply plug one end of the cable into the remote connector on the bottom of the unit and the other end into the connector on the back of the remote control panel.

Routing the remote cable away from AC and DC wires will minimize the potential for interference that may affect the LED bar displays. The remote control cable can be extended up to 15.24 m if required. Use standard 4-conductor remote RJ11 cable. Use a single length of cable with no connectors or in-line splices. If some remote RJ11 cable is left over, coil it up and store it in an area away from AC equipment to prevent electrical interference.

Once the above steps have been completed the unit can be bolted down.

DC Wiring

Two battery cables are provided with the unit. Both are black. The positive (+) cable has a piece of red heat shrink insulation on the end. Keep in mind that high current will pass through the DC wiring. All wires must be properly sized and all connections clean and tight.

It is recommended that the battery cables not be lengthened at all. However, it is possible to extend the cables if necessary. Extension cables must be 35.0 mm^2 ES, the same type of wire, and the total length for each battery cable must not exceed 3.04 m from the inverter to the battery terminal.

CAUTION: Reverse polarity hazard

The Freedom 10 is not DC reverse-polarity protected. Be very careful to connect the negative and positive cables correctly, otherwise damage will result and the warranty will be void.

Make sure the connections to the extension cables are tight and properly insulated. Do not attempt to open the case and replace the battery cables.

The negative (–) cable should be connected directly to the negative post of the battery bank or the ground side of a current shunt. Do not use a negative bus or bonding system as the negative conductor. Tighten securely.

The positive (+) battery cable will commonly lead to a positive distribution point. This point typically connects to a battery switch rather than to the battery. The total length should not exceed 3 m and should be fused.

A spark may be generated when the final battery connection is made. This is normal and do not be alarmed. However, do not make the final connection in the presence of flammable fumes.

Figure 2-7 DC End

Battery Cable Fusing

A fuse is required for safety reasons to protect the battery and cables. The fuse must be installed in the positive battery cable, within 45.7 cm of the battery.

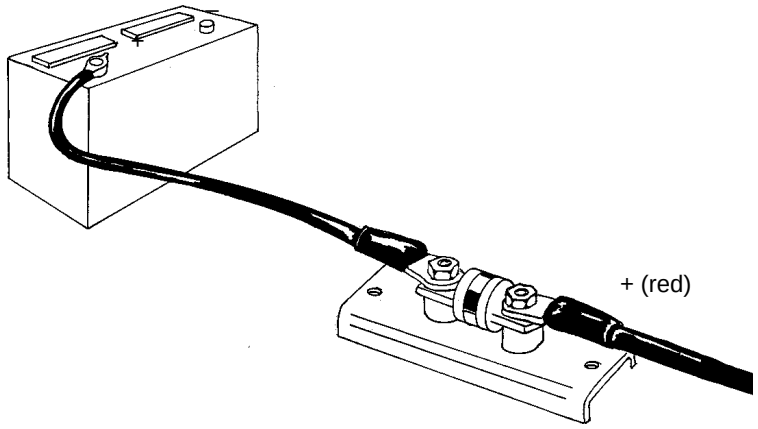

Figure 2-8 Fuse installation

Recommended fuse: Class T JLLN 200 amp

This fuse with fuse holder is available from your authorized dealer or directly from Xantrex:

- Fuse and holder: PN# TFB200
- Fuse only: PN# TF200

Residential Solar Installation

Before installing the inverter in a residential solar application, you must consider factors such as:

- “Location” (see page 2–16)
- “Grounding” (see page 2–17)
- “Neutral Bonding” (see page 2–17)
- “AC Wiring” (see page 2–18)
- “Residual Current Circuit Breaker” (see page 2–19)
- “Remote Control Wiring” (see page 2–19)
- “DC Wiring” (see page 2–20)
- “Battery Cable Fusing” (see page 2–21).

Location

The following factors should be considered when planning to install the Freedom 10.

1. **The chassis ground bonding lug is located on the bottom of the unit.** Be sure to make this connection before bolting the unit down.

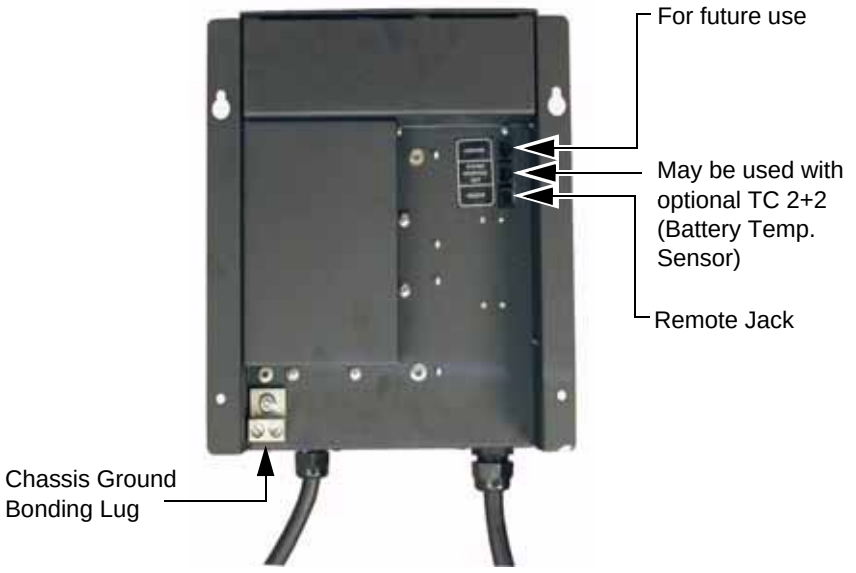

Figure 2-9 Ground, AC, and Remote Connection Locations

2. **Always mount the unit in a dry area**, out of direct contact with water or spray.
3. **You may mount the unit horizontally** (on a shelf) **or vertically** (on a wall). If mounted vertically, you must orient the unit so the switch and circuit breakers are facing up and the fan and battery cables are facing down.

4. **Allow 13 cm (minimum) of clearance** around the unit and allow for a supply of fresh air to the cooling fan. Do not block any of the vents or louvers.
5. **The mounting location should be as close to the batteries as possible.** The battery cables can be extended, however each cable must not be over 3.04 m in total length from the inverter to battery terminals.

WARNING: Fire hazard and equipment damage

Do not mount the unit in an area exposed to flammable fumes or in an enclosed battery compartment.

Grounding

For safety purposes, **the chassis of the Freedom 10 must be connected to your AC ground system.** The chassis grounding terminal is located on the bottom of the unit. This connector can accept two wires. The first is used to connect the unit to the earth grounding system, the second can be used to connect other equipment to the grounding system, through the unit.

Use 5.0 mm^2 ES (Euro Standard) green insulated or bare copper wire if no other equipment is grounded through the unit. If additional equipment is connected to the chassis grounding terminal, larger wire may be required. Consult local electrical codes for details.

Strip one end of the wire and use a screwdriver to secure it to the chassis grounding terminal. This wire will connect to the equipment ground system either at the earth ground electrode or at an electrical equipment enclosure ground bonding terminal. In either case, you must ensure that the ground bonding wire does not become smaller between the Freedom 10 and earth ground point. Make sure each connection is clean and tight.

This procedure will connect the chassis of your Freedom 10 to ground. In addition, the AC input and AC output green wires are connected to chassis ground. It is important to connect these wires to the AC ground bus in the circuit breaker panel.

Please note that neither of the battery cables is connected to ground or the chassis of the Freedom 10.

Neutral Bonding

For safety purposes, the Freedom 10 internally bonds the blue AC output neutral wire to the green/yellow AC ground wire when the unit is OFF or in the inverter mode. When incoming AC power is applied and the transfer switch is engaged, the internal neutral to ground bond is automatically lifted.

This technique meets safety requirements of numerous electrical codes. Refer to other applicable electrical codes regarding connections between AC ground and DC ground.

AC Wiring

Use a screwdriver to remove the screws that secure the AC wiring compartment cover plate.

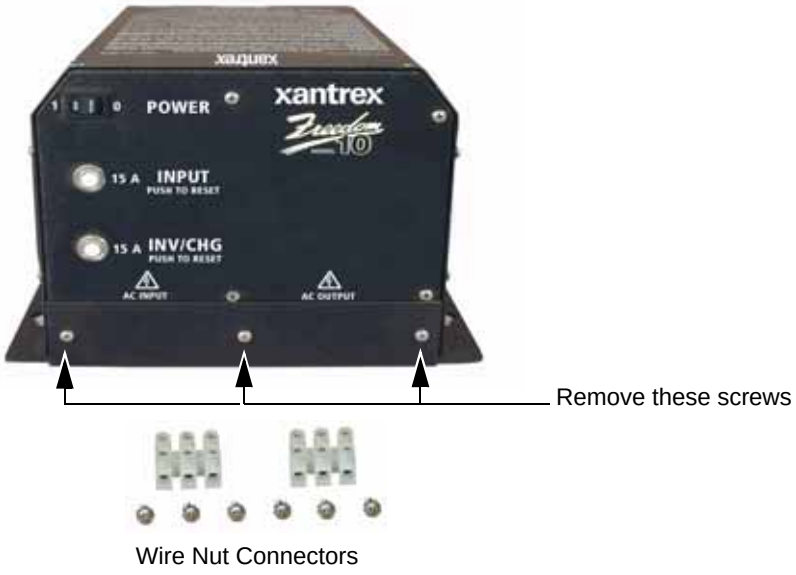

Figure 2-10 AC Compartment Cover Plate Screws

Inside you will see that the compartment is divided into two sections, one labeled AC INPUT, the other labeled AC OUTPUT. Each side contains three pigtails: brown, blue, green/yellow. Wire nut connectors are provided.

Wire Color	Description
Brown	Hot or Line
Blue	Neutral
Green/Yellow	Ground
Solid Green (AC output only)	Internal output neutral to ground bonding conductor

Important: At the AC output, the green/yellow and solid green wires are already connected together.

Two AC wiring knockouts are provided on the AC compartment cover plate. After removing the knockouts, you can add strain reliefs for additional stability or conduit fittings if the wiring will be routed through conduit. Flexible conduit is recommended.

You must use 2.5 mm^2 ES copper wire with insulation rated for 60 degrees centigrade or higher for both the AC input and AC output.

AC Input

Route the 3-conductor AC input wires through the cover plate knockouts and into the AC input compartment. You should have about 15 cm of individually insulated brown, blue and green/yellow wire. Strip about 1 cm of insulation off each conductor and connect to the Freedom 10 pigtails: brown to brown, blue to blue and green/yellow to green/yellow.

Use the wire nuts provided to make the wire connections.

AC Output

Route the 3-conductor AC output wire through the cover plate knockouts and connect in the same fashion.

In addition, if internal output neutral-to-ground bond is not required, remove the solid green wire from the green/yellow wires and cap with a wire nut.

CAUTION: Backfeed damage

Do not connect incoming AC from any source to the AC output of the inverter. This is known as backfeeding and will damage the unit and void the warranty.

Pull firmly on each connection to test it. These connections are the first thing to check if the unit seems to operate improperly. Carefully and neatly tuck the wires into the AC wiring compartment. Replace the cover plate.

Residual Current Circuit Breaker

In order to conform to the numerous electrical codes, certain branch circuits must be equipped with a residual current circuit breaker (RCCB). Please consult the code or a qualified electrician for details. Any such branch circuit must be protected by a circuit breaker consistent with the (RCCB) rating.

Remote Control Wiring

The remote control is supplied with a 7.62 m or 15.24 m RJ11 remote cable for connection to the unit. Simply plug one end of the cable into the remote connector on the bottom of the unit and the other end into the connector on the back of the remote control panel.

Routing the remote cable away from AC and DC wires will minimize the potential for interference that may affect the LED bar graphs.

The remote control cable can be extended up to 15.24 m if required. Use standard 4-conductor remote RJ11 cable. Use a single length of cable with no connectors or in-line splices. If some remote RJ11 cable is left over, coil it up and store it in an area away from AC equipment to prevent electrical interference.

Once the above steps have been completed, the unit can be bolted down.

DC Wiring

Two battery cables are provided with the unit. Both are black. The positive (+) cable has a piece of red heat shrink insulation on the end. Keep in mind that high current will pass through the DC wiring. All wires must be properly sized and all connections clean and tight.

It is recommended that the battery cables not be lengthened at all. However, it is possible to extend the cables if necessary. Extension cables must be 35.0 mm^2 ES, the same type of wire, and the total length for each battery cable must not exceed 3.04 m from the inverter to the battery terminal.

CAUTION: Reverse polarity hazard

The Freedom 10 is not DC reverse polarity protected. Be very careful to connect the negative and positive cables correctly, otherwise damage will result and the warranty will be void.

Make sure the connections to the extension cables are tight and properly insulated. Do not attempt to open the case and replace the battery cables.

The negative (–) cable should be connected directly to the negative post of the battery bank or the ground side of a current shunt. Tighten securely.

The positive (+) battery cable will commonly lead to a positive distribution point. This point typically connects to a battery switch rather than to the battery. The total length should not exceed 3 m and should be fused.

A spark may be generated when the final battery connection is made. This is normal and do not be alarmed. However, do not make the final connection in the presence of flammable fumes.

Figure 2-11 DC End

Battery Cable Fusing

A fuse is required for safety reasons to protect the battery and cables. The fuse must be installed in the positive battery cable, within 45.7 cm of the battery.

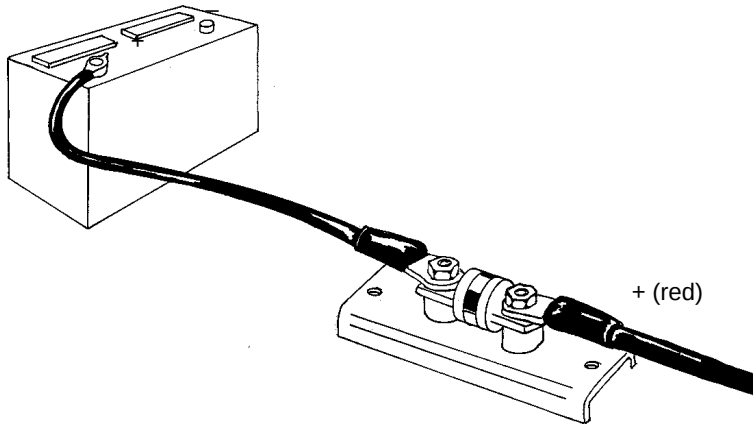

Figure 2-12 Fuse installation

Recommended fuse: Class T JLLN 200 amp

This fuse with fuse holder is available from your authorized dealer or directly from Xantrex:

- Fuse and holder: PN# TFB200
- Fuse only: PN# TF200

3 Operation

Chapter 3 describes the operation of the Freedom 10 Inverter/ Charger.

Topics in this chapter include:

- “Freedom 10 Power Switch”
- “Remote Control Panel”
- “Batteries” and “Battery Charging”

Freedom 10 Power Switch

The power switch is located on the front panel of the Freedom 10. This switch controls ON/OFF and RESET for the inverter. Expect a 3-second delay when the power switch is turned ON before the unit is activated.

If installed with the remote control panel, the power switch on the unit itself should be left in the OFF position.

If the unit is connected to external AC power, the power switch may be turned off, but the battery charger will continue to function. The internal transfer switch will continue to be engaged with the switch off and AC power will be available at the output of the unit. If AC power is removed, the unit will not come on as an inverter.

Figure 3-1 Freedom 10 Power Switch

Important: The power switch controls the inverter function. Placing the switch in the OFF position disables the inverter and connects mains to the output.

Remote Control Panel

12 V Models

The remote control panel provides LED bar graphs that show system status, battery voltage, and current in both inverter and charge modes. For more information about this remote, refer to its owner's manual.

Figure 3-2 Remote Control Panel For 12 V Models

24 V Models

This section contains information about the remote control panel for 24 V models. The remote control panel provides LED bar graphs that show system status, battery voltage, and current in both inverter and charge modes. These bar graphs can also display DIP switch positions and shutdown conditions.

Figure 3-3 Remote Control Panel for 24 V Models

Power Switch

The switch on the remote is used to control the inverter and can be used to control the battery charger function also. When a remote control is used, the power switch on the unit itself should be left in the OFF position.

System Status LEDs

These four LEDs monitor the system as described in Table 3-1.

Table 3-1 System Status LED summary

Status LED	Appearance	Purpose
BATTERY	On Steady	This is a warning condition. Inverter mode: Battery > 30.5 or < 21 volts Charger mode: Battery > 30.5 or < 20 volts.
BATTERY	Blinking	Indicates either a shutdown or equalizing. Battery > 31 volts will automatically reset at 30.5. Inverter mode: Battery < 20 volts, will automatically reset at charger float voltage or upon AC input. Charger mode: Battery < 16 volts for 1 minute, remove all DC loads and manually reset by cycling the power switch.
OVERLOAD	On Steady	Indicates an over-temperature condition, the unit is shut down.

Table 3-1 System Status LED summary

Status LED	Appearance	Purpose
OVERLOAD	Blinking	Inverter mode: shutdown. Diagnose problem with DC amps bar graph. Charger mode: thermal shutdown. After cooling, reset by cycling power switch.
AC INPUT	On Steady	Illuminates when incoming AC power has been applied and the transfer relays have been engaged. There is a 7- to 12-second delay from the time the AC is applied and this LED illuminates.
INV/CHRG	On Steady	Power On light. It will be illuminated whenever the power switch is on (inverter on) or whenever there is incoming AC power and the charger comes on.

DC Volts Bar Graph

These LEDs indicate battery voltage as measured inside the Freedom 10. Each LED segment indicates 1 volt. The DC volts bar graph will stop indicating battery voltage and display the DIP switch settings if the unit shuts down due to an overload. It will return to indicating battery voltage only after the unit has been reset.

DC Amps Bar Graph

These LEDs approximate DC input current in inverter mode and DC output current in battery charger mode. Two ranges are used.

1. Below 25 amps each segment represents a 5 amp increment.
2. Above 25 amps each segment represents a 10 amp increment.

Above 65 amps a flashing LED segment indicates the value displayed plus 50 amps (for example, a flashing 25 LED is equal to 25 + 50 or 75 amps DC). If the inverter is in its idle mode, the bottom LED segment will be out. As soon as the unit is pulled out of idle, the bottom segment will illuminate. This indicator is useful when adjusting the idle sensitivity using the DIP switches.

The DC amps bar graph will stop indicating DC amps and will indicate the type of problem if a shutdown occurs. Each LED segment indicates a different problem as described in “Using the Remote Control DC Amps LED Bar Graph” on page 4–2.

DIP Switches

On the back of the Freedom remote control panel is a series of eight DIP switches that are used to make several adjustments. If you look closely at the switch block you will see that each switch is labeled, 1 through 8, and the ON position is indicated (see Figure 3-4). The switch settings can be changed at any time, even while the unit is operating. Following is a discussion of each adjustment. Refer to “DIP Switch Programming” on page 3–6 for a summary.

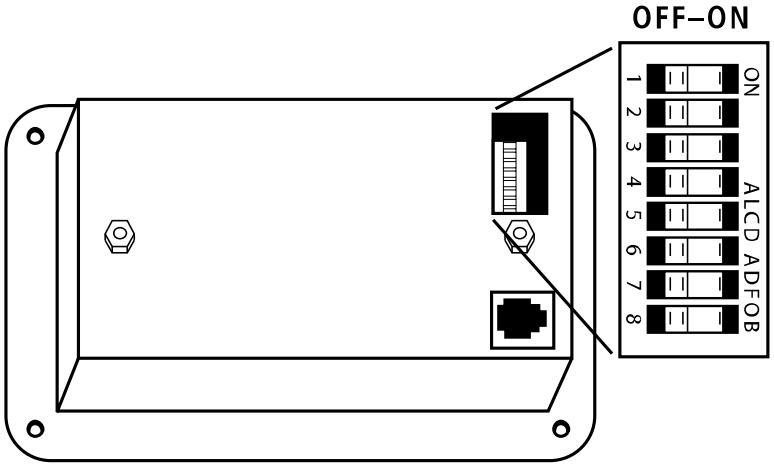

Figure 3-4 Freedom Remote Control Dip Switches

Equalize or Three-Stage Charging (Switch #1) Cycling this switch ON for 1 second, then OFF, will initiate an equalizing charge cycle. The battery charger must be engaged before cycling the switch. The switch must always be left in the OFF position. If it is left ON, an equalizing charge cycle will initiate every time the charger is engaged - this could cause battery damage. The equalizing cycle is timed to last 8 hours from the time the switch is cycled, at which point the charger resumes normal charging in the float stage. The BATTERY LED blinks when equalizing. Refer to page 3–14 for a discussion of the theory and procedure for battery equalizing.

Battery Type (Switch #2 and 3) Gel cell and wet cell batteries have slightly different charge voltage requirements and optimum battery charging is temperature dependent. For these reasons, the DIP switches allow four different battery charger voltage set points, depending on battery type and ambient temperature:

Battery Type and Temperature	Switch Position	
	Switch 2	Switch 3
Cool Wet Cell (< 27 °C)	Off	Off
Warm Wet Cell (> 27 °C)	On	Off
Cool Gel Cell (< 27 °C)	Off	On
Warm Gel Cell (> 27 °C)	On	On

See page 3–16 for the specific voltages for each setting.

Auto Charge (Switch #4) With the switch in the OFF position, the remote panel ON/OFF switch only controls the inverter operation. With the switch turned ON, this switch allows the power ON/OFF switch on the front of the remote to control the battery charger as well as the inverter.

Idle Sensitivity (Switch #5 and 6) Most installations will be connected to the electrical system. With no appliances turned on, this represents a small load. This is due to the capacitance of the wires. Using a trial and error process, the idle circuit can be adjusted until the unit will detect small loads but still drop into idle mode when all loads are shut off.

Some small loads may not pull the unit out of idle mode. In this case, you may disable the idle circuit or use an additional load, such as a small incandescent light, to first activate the idle circuitry. You can confirm if the unit is in idle mode by checking the DC Amps bar graph, the lowest LED goes out only when the unit is in idle mode.

A volt meter can also be used to confirm the idle condition. Idle mode output voltage will typically measure between 10 and 55 volts with an averaging AC volt meter. Refer to the Troubleshooting section for a discussion of measuring inverter output voltage with a meter.

Power Sharing (Switch #7 and 8) These switches should be set to match the value of the circuit breaker which protects the incoming AC power. For instance, in most RV parks or marinas a 15-amp circuit is available. Use the 2-amp setting for small generators, or for charging deeply discharged batteries. See page 3–15.

DIP Switch Status

You can check the position of the DIP switches by quickly cycling the power switch off and on twice. The DC Volts bar graph will cease to display battery voltage and will indicate the setting of each DIP switch. In this mode the bottom LED will illuminate if switch 1 is on, etc. DIP switch settings are indicated for 10 seconds after which time the display returns to indicating battery voltage.

DIP Switch Programming

Table 3-2 DIP switch function and position summary

Feature	Switch Number		Set Point
Equalize or 3-Stage Charging	**1**		
	Toggle On/Off		Equalize (Do not leave on.)
	Off		3-Stage Charging*
**Battery Type	**2**	**3**	
	On	On	Warm Gel Cell (>27 °C)
	Off	On	Cool Gel Cell (<27 °C)
	On	Off	Warm Wet Cell (>27 °C)
	Off	Off	Cool Wet Cell (<27 °C)*
Auto Charge	**4**		
	On		Disable: Charger responds to On/Off switch.

Table 3-2 DIP switch function and position summary

Feature	Switch Number		Set Point
	Off		Enable: Charger on when AC connected.*
Idle Sensitivity	**5**	**6**	
	On	On	Idle disabled
	Off	On	15 watts
	On	Off	6 watts
	Off	Off	4 watts*
Power Sharing	**7**	**8**	
	On	On	2 amps
	Off	On	5 amps
	On	Off	10 amps
	Off	Off	15 amps*

* Default setting.

** Refer to voltages under “Battery Charger Voltage Settings”.

Remote Control Wiring

The remote control panel is supplied with 7.62 m or 15.24 m of RJ11 remote cable. The cable supplied may have 6 conductors; however, only 4 conductors are required. You may buy standard 4-conductor telephone cable and run up to 15.24 m if desired. Use only a single length of telephone wire—do not splice.

Remote Power Consumption

Table 3-3 System current consumption versus idle mode

Idle Mode	With Remote	Without Remote
Normal Idle	181 mA	120 mA
Idle Circuit Disabled	496 mA	n/a
Unit Shut Off	16 mA	7 mA

Link 2000 Remote Control Panel

The Link 2000 and 2000R offer increased monitoring and control options. In addition to providing inverter/charger control, the Link 2000 enables precision monitoring of DC voltage, current, and amp hours for two battery banks.

The Link 2000R adds the ability to control an engine driven alternator. This precision regulator transforms an alternator into a 3 stage battery charging system like the charger in the Freedom 10.

If a Link 2000 or 2000R remote is being used to control the inverter/charger, refer to the Link manual for setup and control information.

Batteries

This section discusses how battery types, connection, and battery bank size affect the operation of your inverter/charger.

Battery Types

Use only deep-cycle batteries with your Freedom 10. These fall into two broad categories: wet cell and gel cell.

Wet Cell Batteries

True deep-cycle wet cell batteries are characterized by relatively thick plates that are alloyed with antimony.

Common Marine/RV deep-cycle batteries are the least expensive and lowest quality battery that is acceptable. **Golf cart batteries** are much better in terms of performance and life. These are 6-volt batteries that must be used in series pairs. **High quality marine deep-cycle batteries** offer good performance and are available in a wide variety of sizes. Floor sweeper, fork lift or large 2-volt cells can also offer excellent performance if their large size can be accommodated.

It should be noted that high antimony deep-cycle batteries will give off gasses as a natural result of charging and will experience some water loss. **It is very important that the electrolyte level be checked frequently** and topped off with distilled water when necessary. Never allow the tops of the plates to be exposed to air, as contamination of the cell will result. Keeping the tops of the batteries clean will reduce self-discharging. Always provide ventilation for the battery storage compartment.

Do not use car batteries or engine starting batteries of any kind with your inverter/charger. In general, most wet cell batteries that are described as hybrid batteries, suitable for either engine starting or deep-cycle applications are a compromise and will give limited life if deeply discharged. **Beware of 8-D batteries** which are commonly used for starting diesel engines. These batteries are often not deep-cycle.

Beware of batteries described as "maintenance-free." These batteries have calcium alloyed with the lead and hold the liquid electrolyte in a sponge-like material. They are sealed and water cannot be added. Do not confuse them with true gel cell batteries; they will not hold up to deep discharging. These batteries typically have thin plates and are best suited as engine starting batteries.

Gel-Cell Batteries

These are lead-acid batteries similar in many ways to the common wet cell battery, but differences in the chemistry and construction provide some unique features.

No Maintenance	There is no need to add water and the tops of the batteries stay clean. Also the batteries can be used in any position and are Coast Guard approved for use without a battery box.
Low Self-Discharge Rate	Unlike wet cell batteries, the gel cell will hold its charge for months if left sitting with no load and no float charge. They can be stored in the off-season without a constant float charge and without fear of freezing.
Low Internal Resistance	The result of this is a higher battery voltage under load, which will result in better inverter performance on demanding high power loads. In addition this allows the gel cell to accept a high rate of charge, a plus for rapid recharging.
No Sulfation	The combination of acids in the gel cell prevents sulfation and eliminates the need for battery equalization.
	The result of these features is a battery that solves many common problems. Cycle life is high, even under constant deep discharging. For all these reasons **the gel cell is highly recommended**.

Battery Interconnection

In most cases, you will be using a bank of two or more batteries with your inverter/charger. You may connect batteries together in two configurations: series and parallel.

Series

Connecting two batteries in series will double the voltage of the battery bank. For instance, two 6-volt batteries connected in series will produce 12 volts; four in series will produce 24-volts. The amp hour capacity of the battery bank will be the same as each individual battery. As an example, two 6-volt, 220 amp-hour batteries in series will produce one 12-volt, 220 amp-hour battery bank.

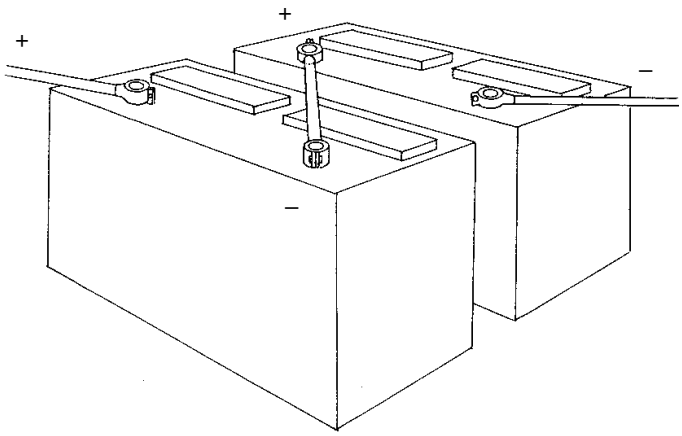

Figure 3-5 Series Battery Connection

Parallel

Connecting two batteries in parallel will double the amp hour rating of the battery bank, while the voltage will be the same as each individual battery. For example, two 12 volt 105 amp-hour batteries in parallel will produce one 12-volt, 210 amp-hour battery bank.

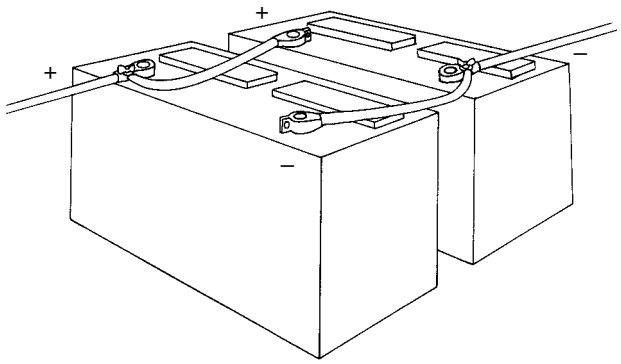

Figure 3-6 Parallel Battery Connection

Only similar batteries should be connected together in one bank. Do not connect old and new batteries or wet and gel cell batteries together. In the above drawing, note that the load is connected to the positive terminal of the first battery and the negative terminal of the last battery. This practice helps to balance the battery bank.

Important: Always use proper terminals for your interconnecting battery cables and cable which is 2 AWG or larger.

Battery Bank Ratings and Sizing

Deep-cycle batteries are usually rated in **amp hours**. The amp-hour rating is based on a 20-hour discharge cycle; therefore, a 100 amp-hour battery can deliver 5 amps for 20 hours. If the discharge rate is greater than 5 amps, the available amp hours are decreased. If the load is increased to 100 amps, only about 45 amp hours will be available.

Another common rating is **reserve capacity** expressed in minutes. This is derived by placing a 25 amp load on the battery and measuring the time until the battery voltage reaches 10.5 volts.

Deep-cycle batteries can be discharged about 80% before permanent damage occurs, though shallower cycling will result in much longer battery life. Fifty per cent cycling is generally considered to be a good compromise between long battery life and a reasonably sized battery bank.

To achieve 50% cycling, you should calculate your amp-hour consumption between charging cycles and use a battery bank with twice that capacity.**

To calculate amp-hour consumption, first look at the rating plate on your AC appliances. Each appliance will be rated in either AC amps or AC watts or AC VA (volt-amps) apparent power. Use one of the following formulas to calculate the DC amp-hour draw for a 12-volt system:

(AC amps × 10) × 1.1 × hours of operation = DC amp hours *

(AC watts ÷ 12) × 1.1 × hours of operation = DC amp hours *

(AC VA ÷ 12) × 1.1 × hours of operation = DC amp hours *

In all formulas, 1.1 is the factor for inverter efficiency.

* Divide amp hours by 2 for 24-volt systems.

** Batteries are frequently charged to 85% of full charge when charging with alternators without 3-stage regulators.

Calculate the above for every AC appliance you intend to use on your inverter. This will give you the total number of amp hours used between recharges. Size your battery bank using this number as a guideline. A good rule to follow is to size the battery bank about two times larger than your total amp hour load requirement. Plan on recharging when 50% discharged.

Table 3-4 Typical Power Consumption

Appliance	Typical Wattage	Appliance Run Times/Amp Hours*							
		5 min	15 min	30 min	1 hr.	2 hr.	3 hr.	8 hr.	24 hr.
13" color TV	50	0.33	1	2	4	8	12	32	96
19" color TV	100	0.66	2	4	8	16	24	64	192
VCR	50	0.33	1	2	4	8	12	32	96
Lamp	100	0.66	2	4	8	16	24	64	192
Blender	300	2	6	12					
Curling iron	50	0.33	1	2					
3/8" power drill	500	3.3	10	20					
Icemaker*	200			2.6	5.2	10.4	15.6	41.6	83.2
Coffee maker	1000	6.6	20	40	80	160			
3 cu. foot refrigerator*	150			2	4	8	12	32	96
20 cu. foot refrigerator*	750			21	42	84	126	336	672
Compact microwave	750	5	15	30	60	120	180		
Full-size microwave	1500	10	30	60	120	240	360		
Vacuum	1100	7.3	22	44	88	176	264		

The number in each box represents the amp hours used (at 12 volts DC) based on various continuous run times.

* Note: refrigeration is typically calculated using a 1/3 duty cycle.

Battery Charging

Completely recharging wet cell deep-cycle batteries requires that the battery voltage be raised beyond what is known as the gassing point. This is the voltage at which the battery begins to bubble and gas is given off. If charging stops short of this point, sulfate is left on the plates and deterioration of the battery begins. The gassing point will vary with battery temperature. At 25 degrees C, the gassing point of a 12-volt battery is about 14.0 volts. Battery charging without excessive gassing of the batteries is accomplished with three-stage chargers. This technique is used in the Freedom 10.

Gel cell batteries must not be charged to their gassing point. In fact high voltage charging that gasses these batteries is harmful to them. These batteries do not give off water vapor. The float voltage can be higher than that of wet cell batteries.

Conventional Battery Chargers

Most conventional battery chargers are single stage constant voltage chargers. As such they must stop short of the gassing point or they will overcharge the battery bank. Therefore, most 12-volt battery chargers bring the battery voltage up to about 13.8 volts.

There are two problems with this. First, since the battery voltage does not reach the gassing point, sulfate is left on the plates. Second, 13.8 volts is close enough to the gassing point that some gas will escape, and the battery will need to be frequently topped up with distilled water.

Conventional battery chargers also suffer from another inherent characteristic of their design, which is a tapering output. While they will deliver their rated current into a deeply discharged battery, as the battery becomes charged and the voltage rises, the output current of the charger tapers down. This taper continues as the battery is charged, taking a very long time to reach an acceptable recharge.

The Freedom Battery Charger

The Freedom battery chargers are designed to overcome the limitations of conventional chargers by utilizing three distinct stages, each designed for optimal recharging of both wet cell and gel cell deep-cycle batteries.

Important: The Freedom 10 Battery Charger is on whenever there is AC power connected to the charger input, regardless of the condition of the ON/OFF switch.

Each time the battery charger is engaged, the three stages proceed automatically, resulting in an efficient, complete recharge and safe battery maintenance. In addition, use of the remote control provides the ability to periodically apply an 8-hour timed equalizing charge.

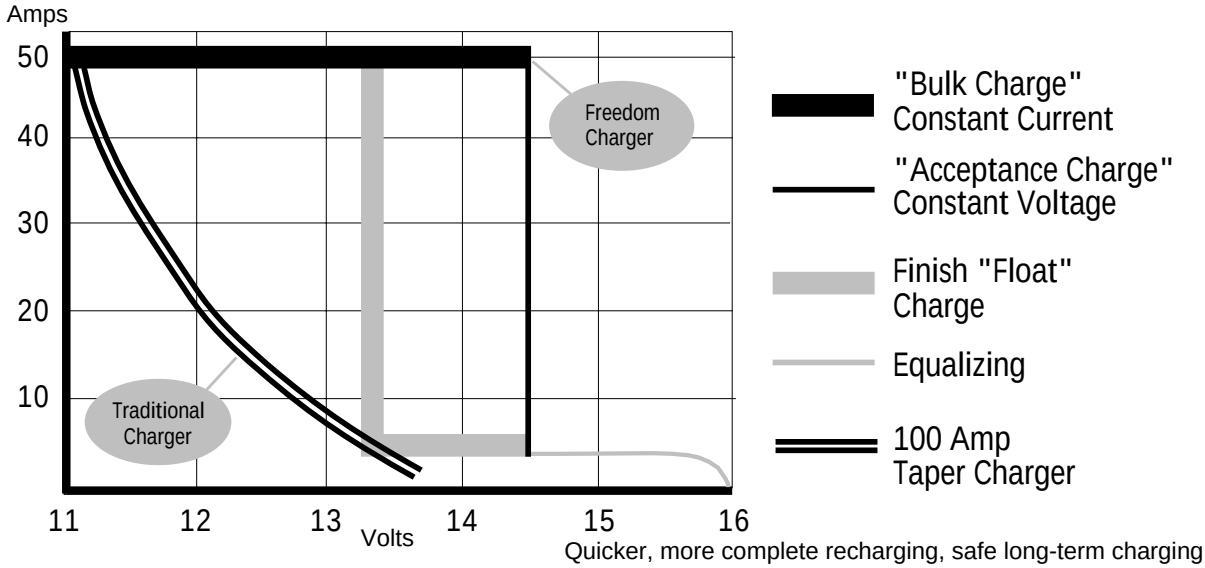

Figure 3-7 Benefits of the Freedom Charger vs. the Traditional Taper Charger

The battery charger stages are:

- Stage 1—Bulk Charge. During the bulk charge stage most of the charge current is delivered to the battery bank. This phase is engaged as soon as the battery charger is activated. Full rated charger current is delivered to the battery bank until the bulk charge voltage limit is reached. This results in a relatively rapid recharge.

  It is generally agreed that a wet cell battery bank should not be charged up to the gassing point at a rate that exceeds 25% of its capacity. In other words, a 12-volt battery bank of 520 amp hours should not be charged at over 130 amps.

  Gel cell batteries can accept a higher rate of charge. Consult the manufacturer for details.

- Stage 2—Acceptance Charge. The acceptance stage immediately follows the bulk charge stage. During this stage, the battery voltage is held constant at the bulk charge voltage limit and the current gradually ramps down. During this stage the battery is accepting its final amount of charge current and the last of the sulfate on the plates is removed.

  The acceptance stage lasts until the charge current reaches about 6 to 7 amps (3 to 4 amps for a 24-volt system). A timer will terminate the acceptance stage if this current level is not reached. This timer is set automatically when the DIP switches for battery type are set. Maximum acceptance time is 1 hour for wet cells and 3 hours for gel cells. Gel cell acceptance time can be increased because the battery is not gassing. Expect wet cell batteries to gas somewhat during acceptance. This is a necessary part of the charging process.

- Stage 3—Float Charge. When the acceptance stage is terminated, either because the charge current ramped down to 6 to 7 amps (3 to 4 amps for a 24-volt system) or the timer engaged, battery charger current will shut off and the unit monitors the battery voltage while it drifts down from the bulk charge voltage limit. When it reaches the float voltage set point, the float charge stage is engaged.

  The float charge stage holds the battery voltage at a lower level, where it is safe for long-term battery maintenance. During the float charge stage the full output current of the battery charger is available to operate any DC appliances that may be on the system, while constantly maintaining the float charge voltage.

  The battery charger remains in the float charge stage indefinitely until the charger is disconnected from incoming AC power.
- Stage 4—Equalizing Charge. This is the only battery charger stage which is not engaged automatically. It must be manually initiated each time using a DIP switch on the rear of the remote control. Applying an equalizing charge is not possible without the use of a remote.

Equalizing Batteries

Periodic equalizing is recommended by most wet cell deep-cycle battery manufacturers. There are no firm rules for how often an equalizing charge should be applied, but once a month is a good rule of thumb for batteries that are regularly cycled, less often for systems in only occasional use.

The equalizing charge is a timed 8-hour cycle. If desired, it can be ended by interrupting the AC power to the charger at any time during the cycle. Equalizing should be engaged after the batteries have been fully charged by a normal battery charging cycle. The battery voltage will increase to 16.3 (32.6 for a 24-volt battery) using the cool temperature wet cell setting. This will cause the battery bank to gas profusely and will accomplish the following:

- **Removal of residual sulfate**—Each time a battery is cycled (discharged and recharged), a small amount of sulfate is left on the plates. Over time, this gradual buildup of sulfate will compromise the performance of the battery. By applying an equalizing charge, this sulfate is returned back to the electrolyte, raising the specific gravity and fully exposing the active material of the plates.
- **Bring all cells to the same potential**—All lead-acid batteries are made up of individual 2-volt cells. As the battery bank is cycled, slight differences in the cells results in different cell voltages, affecting the overall charge effectiveness. Equalizing will serve to bring all cells up to the same voltage and the electrolyte in each cell to the same specific gravity.
- **Mixing up of the electrolyte**—There is a tendency in the cell of a battery for the electrolyte to separate into layers of acid and water. The vigorous boiling action of the battery during equalizing serves to physically mix the electrolyte.

Equalizing is not required on gel cell batteries. You will note that if the DIP switches are set in one of the two gel cell positions, the equalizing charge voltage is the same as the bulk charge voltage, therefore equalizing is equivalent to an 8-hour acceptance stage and is not harmful.

Equalize charging is current limited to 16 A DC. Remove all DC loads from the output of the inverter/charger.

CAUTION: Damage to batteries

- **Do not equalize gel cell batteries with the remote programmed for wet cells**.
- **Always monitor the equalize charge.** Provide proper ventilation for battery fumes. Do not allow any sparks during equalizing. If one or more cells begin to overflow, terminate the equalize cycle.
- **Check and top up the battery electrolyte both before and after the equalizing charge.** Do not expose the battery plates to air. Leave the battery caps on while equalizing.
- **Remove all loads from the DC system before equalizing.** Some DC loads may not tolerate the high charge voltage.
- **Do not leave the equalize DIP switch in the ON position.** It must be cycled OFF and left in the OFF position. If left ON, the unit will engage the equalizing cycle every time the battery charger is engaged.

Charging Over-Discharged Batteries

Charging into a battery bank with a terminal voltage of less than 8 volts (16 in a 24-volt system) presents a special problem for the Freedom 10.

If this situation arises, the unit will attempt to charge for 1 minute. If the inverter senses excessive ripple voltage, it will shut down to protect itself.

To successfully charger an over-discharged battery, you must remove as much DC load as possible. Then, set DIP switches 7 and 8 to the ON position to limit the amount of charge current and the resulting ripple voltage. After the battery voltage has reached 10 volts (20 volts in a 24-volt system), these switches can be set to their previous positions.

Please note that if a continuous DC load in excess of 100 amps (50 amps in a 24-volt system) is placed on the battery bank, eventually the battery voltage will drop below 8 volts (16 volts in a 24-volt system) and the battery charger will shut off. This load must be significantly reduced and the power to the charger cycled to resume charging.

Blinking of the BATTERY LED on the remote control while charging is a warning that an over-discharge is imminent and that the DC load should be reduced.

Battery Charger Voltage Settings

Table 3-5 Battery Charger Voltage Settings

Battery Type and Temperature	Acceptance Voltage/ Max Time	Float Voltage	Equalize Voltage
12-volt wet cell warm temperature	14.0 / 1 hour	13.1	15.8
12-volt wet cell cool temperature	14.4 / 1 hour	13.5	16.3
12-volt gel cell warm temperature	13.8 / 3 hours	13.3	14.1**
12-volt gel cell cool temperature	14.1 / 3 hours	13.6	14.1**
24-volt wet cell warm temperature	28.0 / 1 hour	26.2	31.6
24-volt wet cell cool temperature	28.8 / 1 hour	27.0	32.6
24-volt gel cell warm temperature	27.6 / 3 hours	26.6	27.6
24-volt gel cell cool temperature	28.2 / 3 hours	27.2	28.2

** When set for gel cells, the equalize mode is disabled.

4 Troubleshooting

Chapter 4 contains information and procedures to troubleshoot the Freedom 10. This chapter also describes how to use the DC Amps LED bar graph on the remote control to troubleshoot the unit.

Using the Remote Control DC Amps LED Bar Graph

The remote control LEDs are numbered by counting up from the bottom.

LED Number	Indication
1	Illuminates if the unit shuts down for any reason.
2	Over-temperature. Allow to cool.
3	The unit detected a failure. Call Xantrex technical support.
4	Inverter overload caused by too large a load or short circuit. Reset by cycling power switch or plugging in incoming AC power.
5	Battery overload caused by excessively discharged batteries. See page 3–15.
6	Incoming AC backfeed. Potentially damaging to the unit. Disconnect incoming AC power and correct the condition.
7	Triac thermal run away. Turn off and allow to cool down.
8	High battery voltage shutdown during charge mode. Check all charging sources for proper voltage. Reset by cycling the power switch.
9 and 10	Not used for troubleshooting.

Troubleshooting Guide

Problem	Things to Check
No inverter output	• Battery voltage under load. • Battery connections and DC fuse. • Circuit breaker on front panel. • Thermal condition, high power loads or inadequate ventilation may cause overheating. • Overloads or short circuit, check for excessive loads or bad wiring connections.
Low inverter output voltage	Confirm that your volt meter is a true RMS meter. Standard volt meters will not accurately read the waveform of the inverter and may read anywhere from 180 VAC to 240 VAC. If a true RMS meter is not available, check the brightness of an incandescent light bulb. If it appears normal, the output voltage is properly regulated.
Little or no output from battery charger	• Wiring connections—check both the AC and DC connections. • AC input voltage—low voltage input will result in low DC output current. Expect reduced charger output from generators under 6500 watts. • AC reverse polarity—check for voltage between the incoming blue and green wires. If 240 volts AC is measured, this is reverse polarity.
Microwave oven cooking slowly	• Microwave ovens will normally cook slowly on inverters due to a slightly low peak AC voltage. • Cooking speed will be determined by battery voltage. Low voltage results in increased cooking time. Support the battery bank with an alternator or other charging source for quicker cooking.

A Specifications

Appendix A contains the electrical and physical specifications for the Freedom 10 Inverter/Charger.

All specifications are subject to change without notice.

Specifications

	Nominal Battery Voltage	
	12 VDC	**24 VDC**
Battery Voltage Range	10.0 to 15.5 VDC	20 to 31 VDC
Low Battery Cutout	10 VDC	20 VDC
AC Input Voltage Range	180 to 260 VAC	
Frequency Regulation	0.005% @ 50 Hz	
Inverter Output Power	1000 VA	
Inverter RMS Voltage Regulation	230 VAC ± 5% True RMS	
Wave Shape	Modified Sine Wave	
Surge Power (15 seconds)	3000 VA	
Power Factors Allowed	All	
Full Load Efficiency	85%	
Peak Efficiency	92%	
No Load Power Current Drain	0.12 A	0.06 A
Remote Current Drain	0.03 A	0.015 A
Protection	Circuit breaker, electronic, thermal, high battery, low battery	
Charging Rate	50 A	25 A
Bulk Charge Voltage	14.3 VDC*	28.6 VDC*
Float Charge Voltage	13.4 VDC*	26.8 VDC*
Equalizing Charge Voltage	16.3 VDC*	32.6 VDC*
Regulatory Approvals	CE Marked for the Low Voltage Directive and EMC Directive	
Weight	14.1 kg	
Dimensions	30.5 × 24.8 × 17.8 cm	

* voltages will vary depending on temperature and the selected battery type.

B Glossary

Appendix B contains a glossary of terms used in this manual. This appendix also defines some common electrical terms and concepts.

Glossary of Terms

Alternating Current (AC)	An electric current that reverses direction at regular intervals. Sources of alternating current are shore power, utility power, inverter output power, generator power or household current.
Ampere (Amp, A)	The unit of measure of electron flow rate of current through a circuit.
Ampere-hour (Amp-hr. AH)	A unit of measure for a battery's electrical storage capacity, obtained by multiplying the current in amperes by the time in hours of discharge (Example: a battery which delivers 5 amperes for 20 hours delivers 5 amperes times 20 hours, or 100 Amp-Hr. of capacity.)
AWG	American Wire Gauge, a standard used to measure the size of wire.
AH Capacity	The ability of a fully charged battery to deliver a specified quantity of electricity (Amp-Hr, AH) at a given rate (amp, A) over a definite period of time (Hr).
Circuit	An electric circuit is the path of an electric current. A closed circuit has a complete path. An open circuit has a broken or disconnected path.
Circuit (Series)	A circuit which has only one path for the current to flow. Batteries arranged in series are connected with the negative of the first to the positive of the second, negative of the second to the positive of the third, etc. If two 12 volt batteries of 50 ampere-hours capacity are connected in series, the circuit voltage is equal to the sum of the two battery voltages, or 24 volts, and the ampere-hour capacity of the combination is 50 ampere-hours.
Circuit (Parallel)	A circuit which provides more than one path for current flow. A parallel arrangement of batteries (of like voltage and capacity) would have all positive terminals connected to a conductor and all negative terminals connected to another conductor. If two 12 volt batteries of 50 ampere-hour capacity each are connected in parallel, the circuit voltage is 12 volts, and the ampere-hour capacity of the combinations is 100 ampere-hours.
Current	The rate of flow of electricity or the movement rate of electrons along a conductor. It is comparable to the flow of a stream of water. The unit of measure for current is the ampere.
Cycle	In a battery, one discharge plus one recharge equals one cycle.
Dip Switch	A series of small switches used for special programming of the Freedom inverter/charger. These switches are located on the rear of the Freedom remote panel.
Direct Current (DC)	Current that flows continuously in one direction such as that from batteries, photovoltaics, alternators, chargers and DC generators.
Discharging (Discharge)	When a battery is delivering current it is said to be discharging.

Equalize Charge	A controlled overcharge of the batteries which brings all cells up to the same voltage potential, extends the battery life, restores capacity and mixes the electrolyte.
Gel Cell Battery	A type of battery that uses a gelled electrolyte solution. These batteries are sealed and are virtually maintenance free. Not all sealed batteries are the gel cell type.
Ground	The reference potential of a circuit. In automotive use, the result of attaching one battery cable to the body or frame which is used as a path for completing a circuit in lieu of a direct wire from a component. This method is not suitable for connecting the negative cable of the inverter to ground. Instead, route the cable directly to the negative terminal of the battery.
LED	Light Emitting Diode, used as an indicator light.
Negative	Designating or pertaining to electrical potential. The negative terminal is the point from which electrons flow during discharge.
Ohm	A unit for measuring electrical resistance. Ohm's Law Express the relationship between volt (V), amperes (A) in an electrical circuit with resistance (R). It can be expressed as follows: V = AR If any two of the three values are known, the third value can be calculated by using the above formula.
Ohm’s Law	Express the relationship between volt (V), amperes (A) in an electrical circuit with resistance (R). It can be expressed as follows: V = AR. If any two of the three values are known, the third value can be calculated by using the above formula.
Positive	Designating or pertaining to electrical potential; opposite of negative. The positive battery terminal is the point where electrons return to the battery during discharge.
Power sharing	The ability of the charger to reduce its output when the AC power being consumed by the charger and external AC loads connected to the output of the inverter are in excess of the input breaker rating.
RCCB	Residual Current Circuit Breaker. A protective device that deenergizes a circuit rapidly when current to ground exceeds a predetermined value.
Volt	The unit of measure for electric potential.
Volt Amps (VA)	See Watt.
Watt	The unit for measuring electrical power, i.e. the rate of doing work, in moving electrons by, or against, an electric potential.
Watt-Hour (WATT-HR, WH)	The unit for measuring electrical energy which equals Watts × Hours.
Wet Cell Battery	A type of battery that uses liquid as an electrolyte. This type of battery requires periodic maintenance such as cleaning the connections and checking the electrolyte level.

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 Freedom 10 Inverter/Charger. This warranty period lasts for 24 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.

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

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

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

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

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

Telephone:	34 93 470 5330
Fax:	34 93 473 6093
Email:	support.europe@xantrex.com

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

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

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

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

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

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

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

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

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

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

Disclaimer

Product

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

IN NO EVENT WILL XANTREX BE LIABLE FOR ANY SPECIAL, 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 FREEDOM 10 INVERTER/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 FREEDOM 10 INVERTER/CHARGER IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES.

Please note that the Freedom 10 Inverter/Charger is not intended for use as an uninterruptible power supply and Xantrex makes no warranty or representation in connection with any use of the product for such purposes.

Return Material Authorization Policy

Before returning a product directly to Xantrex you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. Products must also be shipped prepaid. Product shipments will be refused and returned at your expense if they are unauthorized, returned without an RMA number clearly marked on the outside of the shipping box, if they are shipped collect, or if they are shipped to the wrong location.

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

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

Record these details on page WA–4.

Return Procedure

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

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

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

Out of Warranty Service

If the warranty period for your Freedom 10 Inverter/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 unit may be serviced or replaced for a flat fee.

To return your Freedom 10 Inverter/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–3.

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

Information About Your System

As soon as you open your Freedom 10 Inverter/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.

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

_____

_____

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