



RJE INTERNATIONAL, INC.



**STI-350
SURFACE ACOUSTIC
RECEIVER
OPERATIONS MANUAL
REV 2.2**

November 28, 2017

Forward

This manual is comprised of figures and text intended to provide descriptions and instructions for the deployment, operation, and maintenance of the RJE International STI-350 Surface Acoustic Receiver. The information herein is arranged into chapters and sections as follows:

Chapter 1 – An overview of the STI-350. General notes, with brief descriptions of applications and physical characteristics of the STI-350 Surface Acoustic Receiver.

Chapter 2 – Specifications. Sections comprised of lists of both general and unique-to-the-unit specifications.

Chapter 3 – Operation and Deployment Notes. Sections detail the unpacking, battery charging and pre-deployment procedures.

Chapter 4 - Maintenance. Sections detail periodic maintenance.

Please forward comments, questions, suggestions, or problems with the text, figures, or equipment to RJE International.

PROPRIETARY MATERIAL

The descriptions, procedural information, photos, figures, drawings and illustrations in this manual are the property of RJE International, Inc. Materials may not be reproduced or disseminated without the prior written consent of RJE International.

RJE International reserves the right to make changes in design or specifications at any time without incurring any obligation to modify previously installed units.

This manual is provided for information and reference purposes only and is subject to change without notice.

LIMITED WARRANTY

RJE International, Inc. (RJE) guarantees its products to be free from defects in materials and workmanship for a period of one year from the date of shipment. In the event a product malfunctions during this period, RJE's obligation is limited to the repair or replacement, at RJE's option, of any product returned to the RJE factory. Products found defective should be returned to the factory freight prepaid and carefully packed, as the customer will be responsible for any damage during shipment.

Repair or replacement, parts, labor, and return shipment under this warranty will be at no cost to the customer. This warranty is void if, in RJE's opinion, the product has been damaged by accident or mishandled, altered, or repaired by the customer, where such treatment has affected its performance or reliability. In the event of such mishandling, all costs for repair and return freight will be charged to the customer. All products supplied by RJE that are designed for use under hydrostatic loading have been certified by actual pressure testing prior to shipment. Any damage that occurs as a direct result of flooding is NOT covered by this warranty.

If a product is returned for warranty repair and no defect is found, the customer will be charged a diagnostic fee plus all shipping costs. Incidental or consequential damages or costs incurred as a result of a product's malfunction are not the responsibility of RJE.

Equipment not manufactured by RJE is supported only to the extent of the original equipment manufacturers (OEM) original warranties. All OEM sensors that utilize electrodes (oxygen cartridges, pH, ORP, etc.) are warranted at the time of shipment, and shall perform upon initial installation within stated specifications. If the product proves to be defective within the OEM's warranty, RJE will replace the product or defective part with a similar model, product or part, but only to the extent that the OEM warrants.

All returned products must be accompanied by a Case Number issued by RJE. Shipments without a Case number will not be accepted.

LIABILITY

RJE shall not be liable for incidental or consequential damages, injuries, or losses as a result of the installation, testing, operation, or servicing of RJE products.

RETURN PROCEDURE

Before returning any equipment to RJE, you must contact RJE and obtain a Case number. The Case number assists RJE in identifying the origin, and tracking the location of, returned items.

When returning items to RJE from outside the United States, follow the checklist presented below to prevent any delays or additional costs.

- Include with all shipments two copies of your commercial invoice showing the value of the items and the reason you are returning them. Whenever possible, send copies of the original export shipping documents with the consignment.
- Route via courier (FedEx or UPS).
- If there is more than one item per consignment, include a packing list with the shipment. It is acceptable to combine the commercial invoice and packing list with the contents of each carton clearly numbered and identified on the commercial invoice.
- If it is necessary to ship via airfreight, contact RJE for specific freight forwarding instructions. You will be charged for customs clearance and inbound freight.
- Insure the items for their full value.
- Refer to the RJE issued Case number on all documents and correspondence.
- Prepay the freight.

TITLE

Title shall pass to buyer on delivery to carrier at Irvine, CA. Risk of damage or loss following such delivery shall be to the buyer and RJE International shall in no way be responsible for safe arrival of the shipment. Title shall so pass to buyer regardless of any provision for payment of freight or insurance by RJE International or of the form of shipping documents. If shipment is consigned to RJE International, it shall be for the purpose of securing buyer's obligations under the contract.

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INTRODUCTION TO THE STI-350

1.1 Overall Description

The RJE International STI-350 is the next generation in acoustic receivers for relocating acoustic sound sources. Using the latest in underwater acoustic technology, the STI-350 allows the tracking and relocation of marked targets underwater with active and passive technology.

Designed for the offshore environment, the STI-350 Surface Acoustic Receiver can operate as an active transponder/interrogator or a passive pinger receiver to accurately navigate a surface vessel to a target or location that has been marked with an ATT-400 Underwater Transponder or acoustic pinger to within 1 meter (3ft).

In Active Mode the STI-350 sends a CW signal through the water up to 750 meters (2,461ft) away. Once an ATT-400 receives this signal, it responds to the STI-350 and, by receiving the signal on multiple elements, the STI-350 provides range and bearing to the operator.

In Passive Mode, the STI-350 passively listens for a pinger corresponding to the frequency between 8 kHz and 45 kHz. Once a ping is detected the STI-350, by receiving on multiple elements, provides relative signal strength and bearing to the operator.

The STI-350 is a multi-channel system which allows the operator to track up to eight different ATT-400s for up to 6 hours. Using sealed switches on the panel of the STI-350, the operator can select the corresponding frequency on the LCD display for the ATT-400 to be located.

STI-350 SYSTEM SPECIFICATIONS

2.1 STI-350 Specifications (Specifications are subject to change.)

ACTIVE MODE	
Transmit Frequency	26kHz
Acoustic Source Level	190 dB re 1 μ Pa @ 1 meter
Transmit Repetition Rate	Normal: 1.0 sec
Transmit Pulse Length	5.0 ms
Receive Frequency	Switch-selectable to 25, 27, 28, 29, 30, 31, 32, 33, 34 kHz
Acoustic Range	750m (2,461ft), Resolution 1m (3.28ft)
Acoustic Bearing	Range +/- 30 Deg., Resolution 5 Deg.
PASSIVE MODE	
Frequency	8kHz to 45kHz in 100Hz increments
Acoustic Bearing	Range +/- 30 Deg., Resolution 5 Deg.
ELECTRICAL	
Display	LCD
Controls	Piezoelectric Switches
Power Source	Rechargeable NiMH Battery
Charger	100-240VAC, 50/60Hz, 2.0A
Operating Life	6 hours
MECHANICAL	
Staff Assembly	Anodized Aluminum, four (4) 27" (0.7m) sections
Surface Box Housing	UK613 Case
Surface Box Dimensions	35.5cm (L) x 26.5cm (W) x 15cm (H) 14 in (L) x 10.5in (W) x 6.0in (H)
Weight	Deck box: 4.4kg (9.5 lbs.) Staff Assembly with Hydrophone: 6.6kg (14.5 lbs.)

OPERATION & INSTALLATION NOTES

3.1 Introduction

The STI-350 Surface Acoustic Receiver comes with battery charger and shipping case. The STI-350 employs a LCD display to provide navigation data to the user while sealed switches allow access to the control functions of the unit. Once an ATT-400 or acoustic source has been detected, the STI-350 provides accurate range and bearing to an underwater acoustic device in Active Mode, or signal strength and direction in Passive Mode. In addition, an internal electronic compass assists the operator in navigating to the marked location.

3.2 System Components

- STI-350 Surface Acoustic Receiver (Surface Box)
- Battery Charger Assembly
- Hydrophone Cable Assembly
- Hydrophone Section for Staff Assembly
- Compass/Handle Section for Staff Assembly
- Center Sections for the Staff Assembly
- Carrying Case



DECK BOX



BATTERY CHARGER



HYDROPHONE CABLE



HYDROPHONE SECTION



CENTER SECTIONS



COMPASS/HANDLE SECTION

3.3 Unpacking

When opening the shipping carton, carefully inspect each piece of equipment as it is unpacked, and report any damage to the freight carrier and to RJE International.

As with any sophisticated electronic equipment, RJE International products should be handled with a reasonable amount of care during unpacking, transporting and storing. Pay particular attention to make sure that:

- There is no damage to the housing.
- The control switches are installed and working properly.
- The battery charger power cord and its plug-in connector are in good condition.

3.4 Assembling the STI-350

3.4.1 Staff Assembly

The staff assembly comes in four (4) 27" (0.7m) sections that connect using pins. The directional hydrophone section is the bottom and the compass handle is the top of the staff assembly. Two center sections fit in between. Select the number of sections necessary to have the hydrophone one meter below the water line. The completed staff assembly is 82" (2m) long with one center section and 109" (2.8m) long with 2 center sections.

Connect staff sections together by inserting pole end into the coupler end, aligning clevis pin holes, inserting clevis pin through holes, and securing with lock wire to couple them together.



CONNECTING STAFF ASSEMBLY SECTIONS TOGETHER

During assembly, make sure that the front of the hydrophone points away from the handle.

Connect hydrophone cable to connector on hydrophone assembly. Remove dummy connector from hydrophone by unscrewing the locking sleeve and pulling the connector out. Do not lose the dummy connector! Push cable end onto the exposed pins from hydrophone connector. Use the locking sleeve to secure the cable to the hydrophone assembly. Secure cable to staff assembly at each clevis pin with the attached "S" hook.



CONNECTING CABLE



CABLE CONNECTED



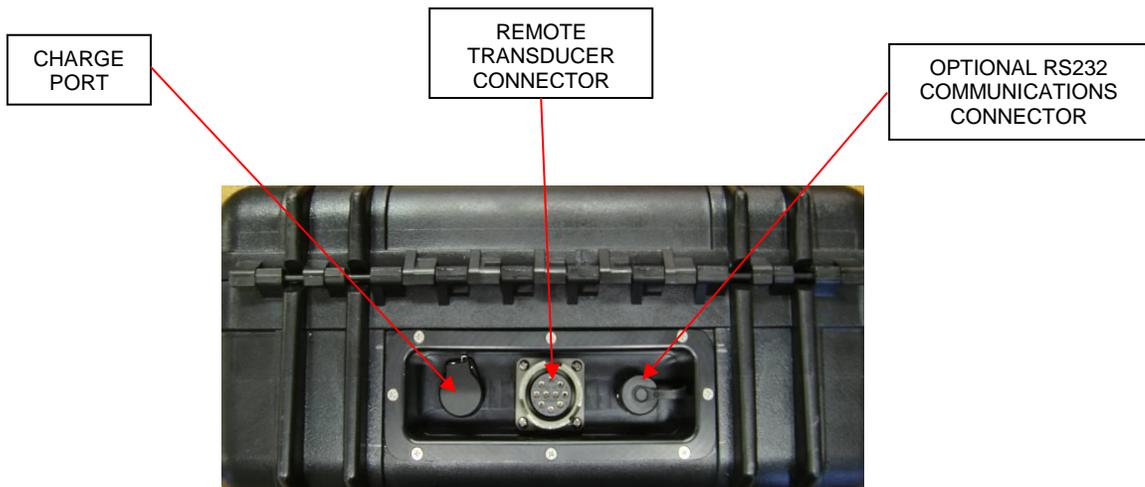
CABLE IN "S" HOOK



The finish assembly should look like this:

3.4.2 Connecting the Surface Box to Hydrophone

The STI-350 has external connectors to access the battery charging port, connect the directional hydrophone, and the optional RS-232 communications connector (contact the factory for further information on this non-standard option). The rear connector panel is shown below. Connect the other end of the transducer cable to the back of the STI-350 surface box.





DECK BOX CONNECTED TO STAFF ASSEMBLY

3.5 STI-350 Display and Control Functions

All functions of the STI-350 Surface Acoustic Receiver are accessed by viewing the LCD display and using the control switches mounted on the panel on the left and right sides of the display.



Controls in Active Mode

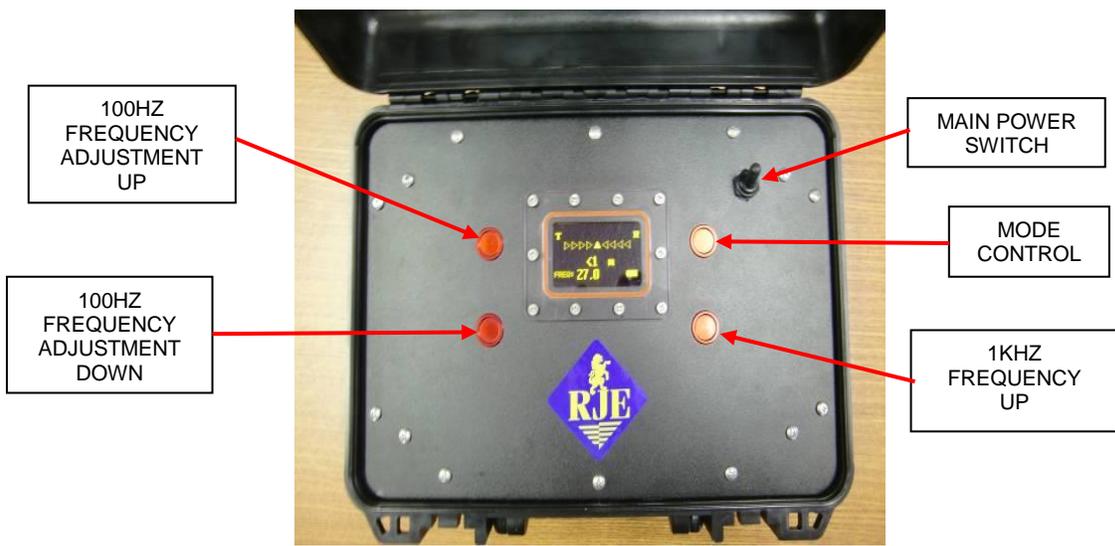


Display in Active Mode

STI-350 Active Mode Display and Controls

DISPLAY ICON	DESCRIPTION
T	Marker flashes each time the Diver Transponder Interrogator sends an interrogation signal.
R	Indicator illuminates each time the Diver Transponder Interrogator receives an acoustic signal at the selected frequency.
▶▶▶▶▶▲◀◀◀◀◀	<p>Bearing Indicator</p> <ul style="list-style-type: none"> • Nine Arrows show the direction adjustment required to determine bearing to the target: • When the unit is pointed directly at the target, only the center arrow is illuminated. • As the direction moves off center to the left, arrows to the left of the center arrow will be illuminated. Likewise, when the direction moves off center to the right, arrows to the right of the center arrow will be illuminated. • The number of arrows displayed shows the movement required to correct the aim to the target: One arrow indicates the direction is off about 5 degrees. Two arrows indicate the direction is off as much as 10 degrees. Three arrows indicate the direction is off by as much as 20 degrees. Four arrows indicate the direction is off by as much as 30 degrees.
00.0m	Displays the Range in meters to the ATT-400 set to the selected Frequency
FREQ:	Frequency currently selected from the Frequency Up/Down controls 25kHz, 27kHz, 28kHz, 29kHz, 30kHz, 31kHz, 32kHz, 33kHz, 34kHz
■	Battery Level Indicator

CONTROL	FUNCTION
FREQUENCY UP	Increases Frequency
FREQUENCY DOWN	Decreases Frequency
MODE CONTROL	The Mode control allows the user to turn the unit ON and OFF as well as change mode from passive to active or back. It also accesses the Compass Calibration.
FAST INTERROGATE	Switch between normal and fast interrogate. Fast will interrogate transponder at 0.5Sec rate

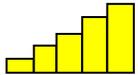


Controls in Passive Mode



Display in Passive Mode

STI-350 Passive Mode Display and Controls

DISPLAY ICON	DESCRIPTION
P	Indicates STI-350 is in Passive Mode
R	Indicator illuminates each time the Diver Surface Acoustic Receiver receives an acoustic signal at the selected frequency.
	<p>Bearing Indicator</p> <ul style="list-style-type: none"> • Nine Arrows show the direction adjustment required to determine bearing to the target: • When the unit is pointed directly at the target, only the center arrow is illuminated. • As the direction moves off center to the left, arrows to the left of the center arrow will be illuminated. Likewise, when the direction moves off center to the right, arrows to the right of the center arrow will be illuminated. • The number of arrows displayed shows the movement required to correct the aim to the target: One arrow indicates the direction is off about 5 degrees. Two arrows indicate the direction is off as much as 10 degrees. Three arrows indicate the direction is off by as much as 20 degrees. Four arrows indicate the direction is off by as much as 30 degrees.
	Displays signal strength of detected pinger transmission.
FREQ:	Frequency currently selected from the frequency select controls.
	Battery Level Indicator

CONTROL	FUNCTION
100Hz UP	Increases frequency by 100Hz
100Hz DOWN	Decreases frequency by 100Hz
MODE CONTROL	The Mode control allows the user to turn the unit ON and OFF as well as change mode from passive to active or back. It also accesses the Compass Calibration.
1kHz FREQUENCY UP	Increases frequency by 1kHz from 8kHz to 45kHz.

3.6 Powering up and shutting down the STI-350

Power is supplied to the electronics of the STI-350 through a mechanical switch on the front panel. Turning the switch to the “ON” position applies power to the electronics and the LCD will light up. To continue the “power up” process, press any button on the front panel within 10-seconds. Failure to do so will cause the LCD display to shut down. To power down the unit completely, turn the mechanical switch to the off position.

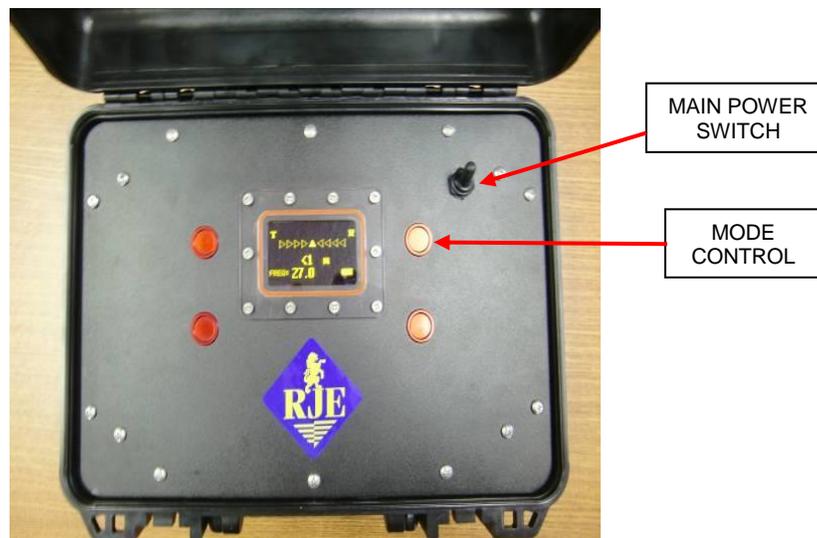
3.7 Selection of Operation and the “Mode Screen”

Once the STI-350 has been powered up and the LCD is active, pressing the top right switch will lead you to the “Mode Screen”. Once you have chosen mode, you have 10 seconds to make a selection or the unit will shut down to conserve power. In the mode screen, you have two options:

>Change Mode of operation (Active or Passive)

Note: Once you have made a selection you have 10 seconds to confirm by pressing the top right button to move into that mode.

>Exit (shut unit down)



STI-350 Main Power Switch and Mode Control

3.8 STI-350 Pre-deployment Setup and Check-out

Perform an in-air check of the STI-350 using the following sequence:

- >Turn the receiver on by using the main power switch and press any control switch before 10 seconds to confirm activation.
- >Confirm what mode you want to operate in, Active (transponder) or Passive (acoustic pinger). If the STI-350 is in the wrong mode for the chosen in-air check, use section 3.7 to change the mode.

ACTIVE MODE (transponder mode using an ATT-400)

- On STI-350 press UP or DOWN buttons and set **FREQ:** to 30 kHz.
- On ATT-400 transponder set rotary switch to position 3 (30 kHz). Activate the transponder by placing it into a glass of water and place the two devices within half a meter of each other.
- Aim the STI-350's transducer at the transponder. Observe the STI-350 **T** (transmit) flash and verify the STI-350 **R** (receive) flashes alternately. The unit will display a range and bearing to the transponder under test.

PASSIVE MODE (acoustic pinger mode operating between 8 kHz and 45 kHz)

- On STI-350 set **FREQ:** to correspond with the acoustic pinger under test. Use the lower right control for 1 kHz up, and use the left control switches to fine tune the frequency (by 100 Hz).
- Place the acoustic pinger into a glass of water and place the two devices within half a meter of each other.
- Aim the STI-350's transducer at the pinger and verify that it is receiving a signal from the pinger, by observing the flashing **R** indicator, and the unit will display a signal strength and bearing to the pinger under test.

Note: The range and bearing acquired during in-air testing will not be accurate as air is a slower and more difficult sound medium than water. If the in-air testing is not satisfactory, submerge the units in water and repeat the test.

3.9 STI-350 Operating Procedures

The procedures for operating the Surface Acoustic Receiver are quite simple. The unit's display and indicators are designed to be clear and easy to understand while operating the system. However, optimum performance of the instrument will result from repeated and patient practice of operating techniques.

Active (Transponder) Mode Operation

- Use the UP and DOWN buttons to select the appropriate receive frequency for the ATT-400 transponder that is being relocated.
- Lower the hydrophone/staff assembly into the water.
- Begin a slow 360-degree turn of the staff assembly while observing the STI-350 Deck Box LCD for an indication of a received signal and a bearing to the transponder. Once the ATT-400 has responded the **R** indicator will flash, and the unit will display a range and bearing to the transponder.

Note: If the expected range from the STI-350 to the ATT-400 is beyond 500 meters, it is recommend that the STI-350 be put into "**Fast Interrogate**" by pressing the lower right control switch. This will allow for easier acquisition of the ATT-400. During this mode the range will not be accurate. Once the ATT-400 has responded (**R** indicator will flash and the unit will display bearing) turn off the "**Fast Interrogate**" function.

- When receiving transponder signals, use the bearing indicator to aim the directional hydrophone at the target. Use the compass mounted on top of the staff assembly to correctly determine a bearing to the target.

Note: The STI-350 directional hydrophone will be pointed directly at the target when only the center bearing arrow is displayed. When arrows are illuminated to the right of center, adjust the direction to the left. When arrows are illuminated to the left of center, adjust the direction to the right.

- Use the compass and the bearing indicator for navigation toward the target.
- View the range indicator on the display to acquire an accurate range to the target.
- When moving to the target, monitor the range and bearing on the LCD display until transponder is located.

Note: If the range suddenly begins to increase, it is possible you have passed over or under the transponder. Check behind for the transponder.

Passive (Pinger) Mode Operation

- Verify the **FREQ:** display on the LCD corresponds with the acoustic pinger that is being located. Use the lower right control for 1 kHz up, and use the left control switches to fine tune the frequency (by 100 Hz).
- Lower the hydrophone/staff assembly into the water.
- Begin a slow 360-degree turn of the staff assembly while observing the STI-350 Deck Box LCD for an indication of a received signal. Once the pinger has responded the **R** indicator will flash, and the unit will display bearing to the pinger.
- When receiving pinger signals, use the bearing indicator to aim the directional hydrophone at the target.
- View the signal strength indicator on the display to acquire an idea of the range to the target. Use the left control switches to fine tune the frequency (by 100Hz) for the strongest signal as displayed on the LCD.
- Use the compass and the bearing indicator for navigation and begin moving toward the target while monitoring the signal strength indicator until pinger is located.

Note: If the signal strength suddenly weakens significantly, it is possible you have passed over the acoustic pinger. Check behind for the pinger.

STI-350 SYSTEM MAINTENANCE

4.1 Maintenance

Upon completion of each dive mission, take these steps to assure continued reliable performance from the STI-350.

- Turn the equipment OFF with the power switch.
- Wash the exterior of the equipment with fresh water and mild detergent. Pay particular attention to cleaning film build-up from the transducer face.
- Make sure the equipment has been thoroughly dried before storage.
- Inspect all system components for damage and wear. Order needed replacement parts if required.
- Charge the STI-350 battery. Contact your authorized representative to replace the STI-350 battery if the unit fails to hold a charge.
- Plan sufficient time before the next use of the equipment to thoroughly test the STI-350 and to charge the battery if needed.

4.2 Charging the STI-350 battery

It is recommended that the STI-350 be charged before each use. A fully charged battery will provide 6 hours of continuous operation. If the **BATT** indicator is lit only on the right edge of the battery display or is blinking, the battery needs charging. Follow these steps to charge the battery:



Caution: Make sure the unit is thoroughly dried before connecting it to an AC power supply.

- Turn the unit off using the Power Switch
- Locate the charge port at the rear of the STI-350



STI-350 Charging Port Plug

 **Caution:** Removing the port plug will relieve any pressure caused by charging a battery that has a defective cell. This also vents the gas that may build up in the unit during use and storage.



Charger Connected to STI-350

- Plug the battery charger connector into the charging jack.
- Plug the charger assembly into a standard 100-240VAC wall socket.
- The charger's "Charging" red LED will light.
- Allow the battery to charge for 3-6 hours or until the "Full" green LED is on.
- Unplug the charger and remove the connector from the charging jack.

4.3 Replacing the STI-350 battery pack

The rechargeable battery will remain serviceable for several years under normal operating conditions. When the battery no longer maintains a full charge, replace it with a RJE International supplied battery pack. Return unit to authorized supplier for replacement.