



*RJE INTERNATIONAL, INC.*

---



**STI-350  
SURFACE  
ACOUSTIC  
RECEIVER  
USER MANUAL  
REV 1.0**



# 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.**

**Appendices – Separate appendices contain mechanical and electrical drawings and diagrams, parts lists, and integrated components list.**

**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, 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.

Repairs or replacements, 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.

**THIS PAGE IS INTENTIONALLY LEFT BLANK**

v

*RJE International, Inc.*

*Tel: (949)727-9399 Fax: (949)727-0070, E-mail: [sales@rjeint.com](mailto:sales@rjeint.com) Web Page: [www.rjeint.com](http://www.rjeint.com)*

---

# TABLE OF CONTENTS

## FORWARD

## WARRANTY

### 1 – Introduction to the STI-350

1.1 Overall Description.....	1
------------------------------	---

### 2 – STI-350 Specifications

2.1 STI-350 Specifications .....	2
----------------------------------	---

### 3 – STI-350 Operations & Installation Notes

3.1 Introduction .....	4
3.2 System Components.....	4
3.3 Unpacking .....	5
3.4 Assembling the STI-350.....	5
3.4.1 Staff Assembly .....	5
3.4.2 Connecting the Deck Box.....	6
3.5 Display and Control Settings.....	7
3.6 Powering Up and Shutting Down the STI-350.....	11
3.7 Selection of Operation and the “Mode Screen” .....	11
3.8 STI-350 Pre-Deployment Setup and Check-out.....	12
3.9 STI-350 Operating Procedures .....	13

### 4 – STI-350 System Maintenance

4.1 Maintenance .....	15
4.2 Charging the Battery .....	15
4.3 Replacing the STI-350 Battery Pack .....	17



## **INTRODUCTION TO THE STI-350**

### **1.1 Overall Description**

The RJE International STI-350 is the next generation in acoustic receiver for relocating acoustic sound sources. Using the latest in underwater acoustic technology, the STI-350 allows the tracking of marked targets underwater and relocation 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 (2461ft) away. Once an ATT-400 receives this signal, it responds to the STI-350 and, by receiving the signal on multi elements, the STI-350 provides range and bearing to the operator.

In Passive Mode, the STI-350 passively listens for a ping corresponding to the frequency between 25 kHz to 40 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 that 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 Surface Acoustic Receiver

#### STI-350 Surface Acoustic Receiver Specifications

<b><u>Active Mode</u></b>	
Transmit Frequency	26kHz
Acoustic Source Level	190 dB re 1 $\mu$ Pa @ 1 meter
Transmit Repetition Rate	Normal: 1.0 sec
Transmit Pulse Length	5.0 ms
Receive Frequency	Switch-selectable to 27, 28, 29, 30, 31, 32, 33, 34 kHz
Acoustic Range	750m (2461ft), Resolution 1m (3.28ft)
Acoustic Bearing	Range +/- 30 Deg., Resolution 5 Deg.
<b><u>Passive Mode</u></b>	
Frequency	25kHz to 40kHz in 100Hz increments
Acoustic Bearing	Range +/- 30 Deg., Resolution 5 Deg.
<b><u>Electrical</u></b>	
Display	LCD
Controls	Piezoelectric Switches
Power Source	Rechargeable NiMH Battery
Charger	100-240VAC, 50/60Hz, 2.0A
Operating Life	6 hours

<b><u>Mechanical</u></b>	
Staff Assembly	Anodize Aluminum, three(3) one meter sections
Deck Box Housing	UK613 Case
Deck 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.)
Accessories	Battery charger, user's manual

**Specifications are subject to change**

### **2.3 Specifications Unique to Unit(s) Shipped**

## OPERATIONS & 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 (Active Mode) or signal strength and direction (Passive Mode) to an underwater acoustic device. In addition, an internal electronic compass assists the operator in navigating to the marked location.

### 3.2 System Components

- STI-350 Surface Acoustic Receiver
- Battery Charger Assembly
- Directional Hydrophone Assembly
- Transducer Cable Assembly
- Staff Assembly



STI-350 Deck Box



Battery Charger Assembly



Directional  
Hydrophone  
Assembly



Transducer Cable  
Assembly



Staff Assembly

### 3.3 Unpacking

When opening the shipping cartons, 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 work 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 three (3) one meter sections that connect using pins. The directional hydrophone connects to the bottom of the staff assembly and the compass head is attached to the top. Select the number of sections necessary to have the hydrophone one meter below the water line.

>Assembly the staff assemblies together using the pins to couple them together.



>Mount the direction hydrophone to the bottom of the staff assembly using the locking pin.



>Now mount the compass head to the top of the staff assembly. Make sure that the handle points away from the hydrophone.



The finish assembly should look like this:

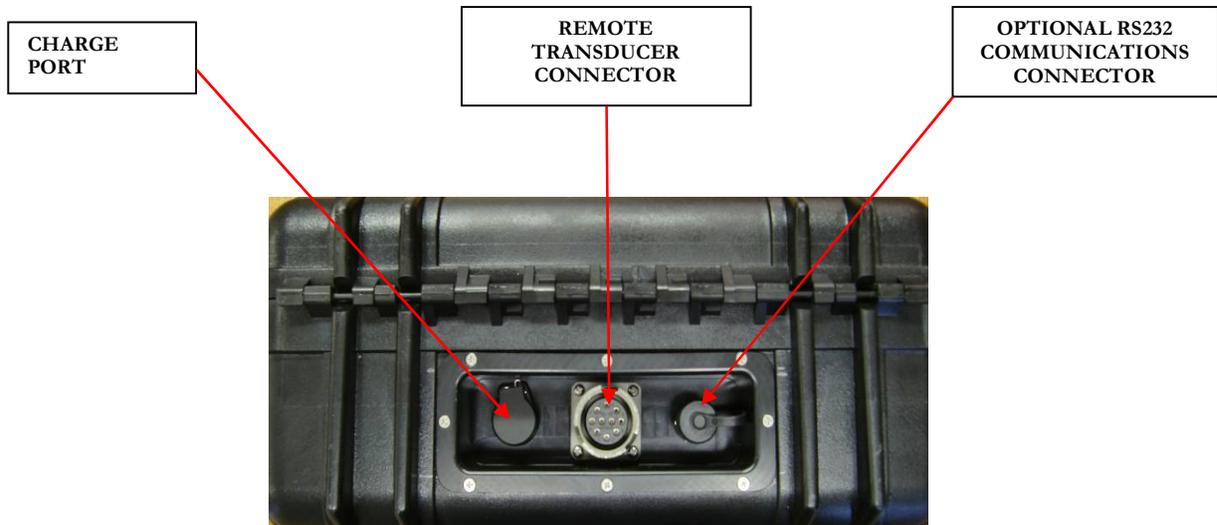


### 3.4.2 Connecting the Surface Box to Hydrophone

Connect the Transducer Cable Assembly to the hydrophone. Use the 'locking sleeve' to secure the cable to the hydrophone assembly.

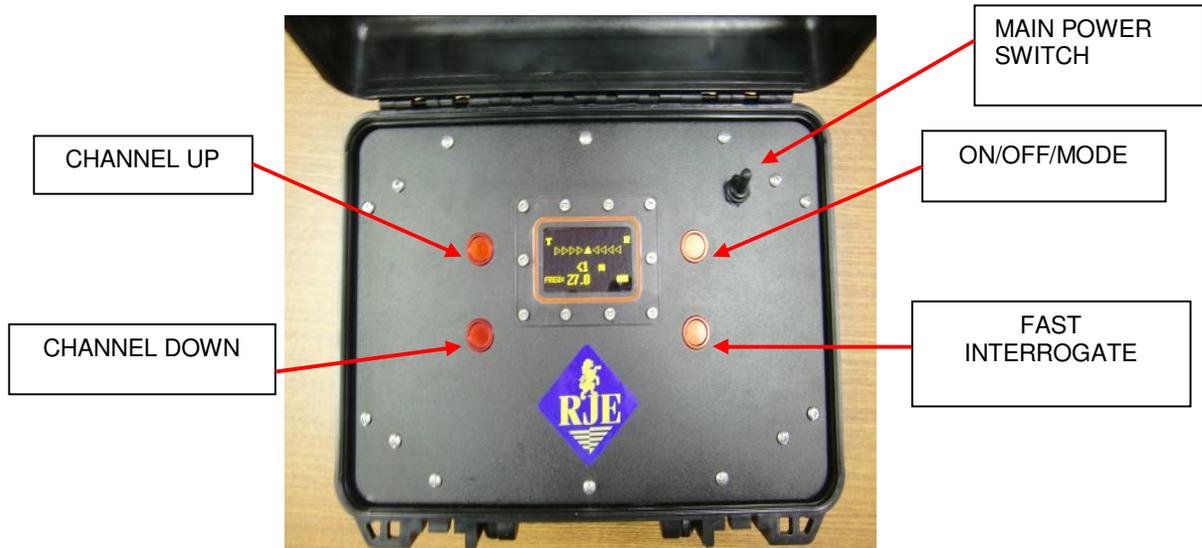


The STI-350 has external connectors to access the battery charging port, connect the remote transducer array, and the optional RS-232 communications connector (contact the factory for further information on this non-standard option). The rear connector panel is shown below. Connect the other end of the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



### 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



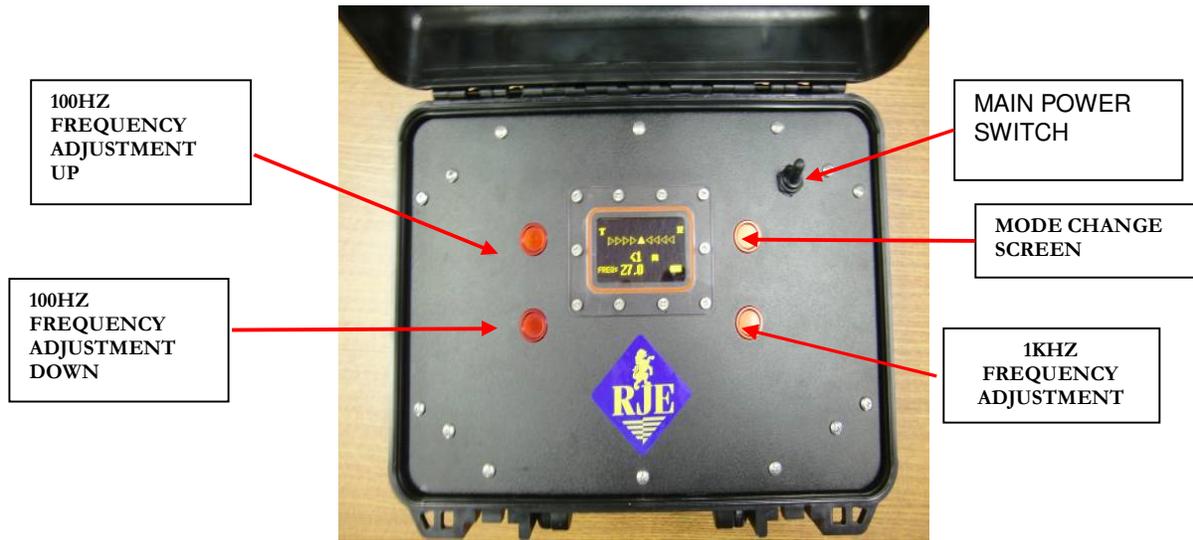
**Panel Functions in Active Mode**



**Display in Active Mode**

## STI-350 Active Mode Display and Controls

DISPLAY	Description
	Battery Level Indicator
<b>T</b>	Marker flashes each time the Diver Transponder Interrogator sends an interrogation signal.
<b>XX m:</b>	Displays the Range in meters to the ATT-400 set to the selected Channel
<b>Heading</b>	Heading is obtained from analog compass mounted on remote transducer staff assembly.
	<p>Bearing Indicator</p> <ul style="list-style-type: none"> <li>• Nine Arrows show the direction adjustment required to determine bearing to the target:</li> <li>• When the unit is pointed directly at the target, only the center arrow is illuminated.</li> <li>• 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.</li> <li>• The number of arrows displayed shows the movement required to correct the aim to the target:</li> </ul> <p>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 user is direction by more than 30 degrees.</p>
<b>R</b>	Indicator illuminates each time the Diver Transponder Interrogator receives an acoustic signal at the selected frequency.
<b>FREQ:</b>	Channel Frequency currently selected from the channel select switches <b>1:27KHz 2:28KHz 3:29KHz 4:30KHz</b> <b>5:31KHz 6:32KHz 7:33KHz 8:34KHz</b>
SWITCH	FUNCTION
<b>Channel DOWN</b>	Decrements the channel number selected by 1
<b>Channel UP</b>	Increments the channel number selected by 1
<b>ON/OFF/Mode</b>	The ON/OFF/Mode control allows the user to turn the unit display ON and OFF as well as change mode from passive to active or back.
<b>Fast Interrogate</b>	Switch between normal and fast interrogate. Fast will interrogate transponder at 0.5Sec rate

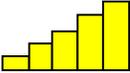


**Display and Controls in Passive Mode**



**Display in Passive Mode**

## STI-350 Passive Display and Controls

DISPLAY	Description
	Battery Level Indicator
<b>P</b>	Indicates STI-350 is in Passive Mode
	Displays signal strength of detected pinger transmission.
<b>Heading</b>	Displays the heading from the electronic compass.
	<p>Bearing Indicator</p> <ul style="list-style-type: none"> <li>• Nine Arrows show the direction adjustment required to determine bearing to the target:</li> <li>• When the unit is pointed directly at the target, only the center arrow is illuminated.</li> <li>• 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.</li> <li>• The number of arrows displayed shows the movement required to correct the aim to the target:</li> </ul> <p>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 user is direction by more than 30 degrees.</p>
<b>R</b>	Indicator illuminates each time the Diver Surface Acoustic Receiver receives an acoustic signal at the selected frequency.
<b>FREQ:</b>	Frequency currently selected from the frequency select switches
<b>SWITCH</b>	<b>FUNCTION</b>
<b>100Hz Up</b>	Increase frequency by 100Hz
<b>100Hz Down</b>	Decreases frequency by 100Hz
<b>Mode Switch</b>	The Mode control allows the user to turn the unit display ON and OFF as well as change mode from passive to active or back. It also accesses the Compass Calibration
<b>1kHz Adjustment</b>	Increase frequency by 1kHz from 25kHz to 40kHz

### 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.

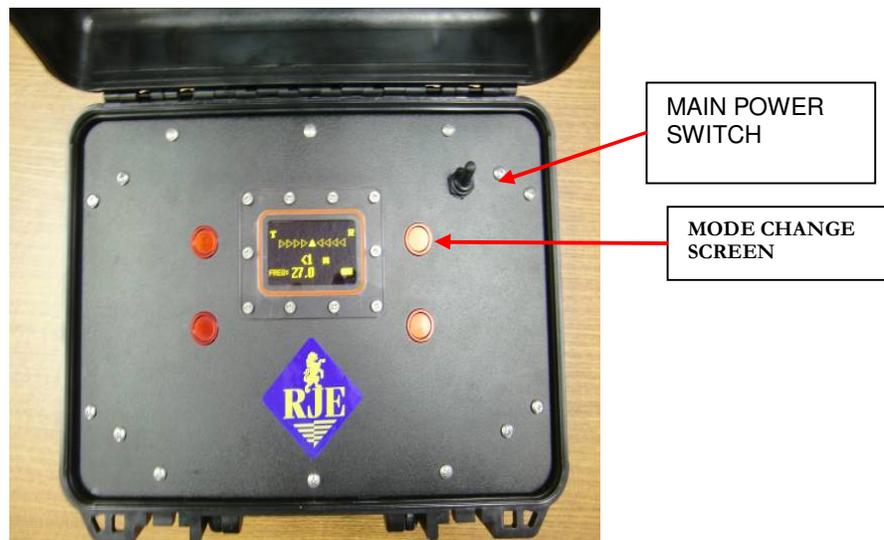
### 3.7 Selection of Operation and the “Mode Screen”

Once the STI-350 is been powered up and the LCD is active, press 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 three 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 On/Off and Mode Switch

### **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)**

- Press UP or DOWN button and verify the **FREQ:** display corresponds with the ATT-400 channel setting (Channel 0 -7 or 27, 28, 29, 30, 31, 32, 33, 34 kHz).
- Use an ATT-400 transponder that is set at same channel (frequency) as selected on the STI-350 receiver. Activate the transponder by placing it into a glass of water and place the ATT-400 within half a meter of the front of the directional hydrophone.
- Aim the front STI-350 hydrophone at the transponder and verify that it is receiving a signal from the ATT-400. The **R** indicator will flash, and the unit will display a range and bearing to the transponder under test.

#### **PASSIVE MODE (acoustic pinger mode operating between 25 kHz and 40 kHz)**

- Verify the **FREQ:** display on the LCD corresponds 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 pinger within half a meter of the front of the directional hydrophone
- Aim the front STI-350 hydrophone at the pinger and verify that it is receiving a signal from the other pinger. The **R** indicator will flash, 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 to 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 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.
- 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 to 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 from the Power Switch
- Locate the charge port at the rear 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.