RJE INTERNATIONAL, INC.

DTI-300A DIVER ACOUSTIC RECEIVER USER MANUAL REV 3.0

10/27/2017

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Forward

This manual is comprised of figures and text intended to provide descriptions and instructions for the installation, operation and maintenance of the RJE International DTI-300A Diver Acoustic Receiver. The information herein is arranged into chapters and sections as follows:

Chapter 1 – Overview of the DTI-300A. *General notes as well as brief descriptions of the applications and physical characteristics of the DTI-300A.*

Chapter 2 – Specifications. *List of both general and unique-to-the-unit specifications.*

Chapter 3 – Operation and Installation. *Details regarding the unpacking, battery charging, and pre-deployment procedures.*

Chapter 4 - Maintenance. *Details regarding periodic maintenance.*

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

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PROPRIETARY MATERIAL

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LIMITED WARRANTY

RJE International, Inc. (hereafter mentioned as "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 held responsible for any damage during shipment.

Repairs or replacements, parts, labor and return shipments under this warranty will be at no cost to the customer. This warranty is voided if, in RJE's opinion, the product has been damaged by accident or mishandled, or otherwise altered or repaired by the customer, where such treatment has affected its performance or reliability. In the event of such mishandling described, 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-covered repair and no defect is found, the customer will be charged a diagnostic fee plus all shipping costs incurred in returning the product to the customer. RJE does not take responsibility for any incidental or consequential damages or costs incurred as a result of a product's malfunctioning.

Equipment not manufactured by RJE is supported only to the extent of the warranties of the original equipment manufacturers (OEM). 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 defective within the OEM's warranty, RJE will replace the product or defective part with a similar model, product or part to the extent that the OEM warrants.

A Case Number issued by RJE must accompany all returned products. Shipments without a Case Number will not be accepted.

LIABILITY

RJE shall not be held 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 of returned items as well as tracking them during shipment.

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 unto the buyer upon delivery to carrier in Irvine, California. Following such delivery, risk of damage or loss shall also be passed unto the buyer, therefore RJE International will in no way be held responsible for safe arrival of the shipment. Title shall pass unto buyer regardless of any provision for payment of freight or insurance by RJE International or provision in the form of shipping documents. If shipment is consigned to RJE International, it shall only be for the purpose of securing the buyer's obligations under the contract.

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INTRODUCTION TO THE DTI-300A

1.1 Overall Description

Figure 1-1
DTI-300A

The RJE International DTI-300A (Figure 1-1) is the next generation in diver marking and relocation. Using the latest in underwater acoustic technology, the DTI-300A allows divers to mark and relocate targets underwater using active and passive technology.

Designed for use by divers, the DTI-300A Diver Acoustic Receiver can operate both as an active transponder-interrogator or as a passive pinger-receiver to accurately navigate a diver to a target or location that has been marked with an ATT-400 Underwater Transponder or an acoustic pinger to within 1 meter (3 ft).

In Active Mode, the DTI-300A sends a CW signal through the water up to 750 meters (2461ft) away. Once an ATT-400 receives this signal, it responds to the DTI-300A. The DTI-300A receives and uses this response to provide range and bearing to the diver.

In Passive Mode, the DTI-300A passively listens for a ping with a frequency between 8 kHz to 40 kHz. Once the DTI-300A detects such a ping, it provides relative signal strength and bearing to the diver.

The DTI-300A is a multi-channel system that allows the diver to track up to nine different transponders for a maximum of six hours. Using sealed switches on the panel of the DTI-300A, a diver can select the corresponding frequency on the LCD display for the transponder or pinger being located.

The DTI-300A has a single external connector for the battery charger. It is shipped with a battery charger in a durable, weatherproof carrying case.

Section

2

DTI-300A SPECIFICATIONS

2.1 DTI-300A Diver Acoustic Receiver

Table 2-1 DTI-300A Specifications

Active Mode	
Transmit Frequency	26kHz
Acoustic Source Level	190 dB re 1μPa @ 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 (2461ft), Resolution 1m (3.28ft)
Acoustic Bearing	Range +/- 30 Deg., Resolution 5 Deg.
Passive Mode	
Frequency	8 kHz to 45 kHz 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
Electronic Compass	
Accuracy	<0.5 to 1.5 Deg. RMS
Repeatability	+/- 0.3 Deg.

Mechanical	
Operational Depth	100m (328ft)
Housing Material	Delrin and polycarbonate; O-ring sealed
Dimensions	33cm (L) x 18cm (W) x 7cm (H) 13 in (L) x 7in (W) x 3in (H)
Weight	In Air: 5kg (11 lbs.): In Water: -0.185kg (-0.5 lbs.)
Accessories	Battery charger, wrench, user's manual

Specifications are subject to change.

Section

3

OPERATION & INSTALLATION

3.1 Introduction

The DTI-300A comes with a battery charger, wrench and shipping case. The DTI-300A employs a LCD display to provide navigation data to the user. Sealed switches allow access to the control functions of the unit. Once an ATT-400 or acoustic source has been detected, the DTI-300A provides accurate range and bearing (in Active Mode) or signal strength and direction (in Passive Mode) to an underwater acoustic device. In addition, an internal electronic compass helps the diver navigate to the marked location.

3.2 Components

- DTI-300A Diver Acoustic Receiver with electronic compass (Figure 3-1A)
- Battery charger assembly (Figure 3-1B)
- Wrench (Figure 3-1C)

Figure 3-1A
DTI-300A Diver Acoustic Receiver

Figure 3-1B
Battery Charger

Figure 3-1C
Wrench

3.3 Unpacking

When opening the shipping carton, carefully inspect each piece of equipment as it is unpacked. Report any damage to the freight carrier and 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 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 DTI-300A Display and Control Functions

All functions of the DTI-300A Diver Acoustic Receiver are accessed by viewing the LCD display and using the control switches on the left and right sides of the instrument (Figure 3-2).

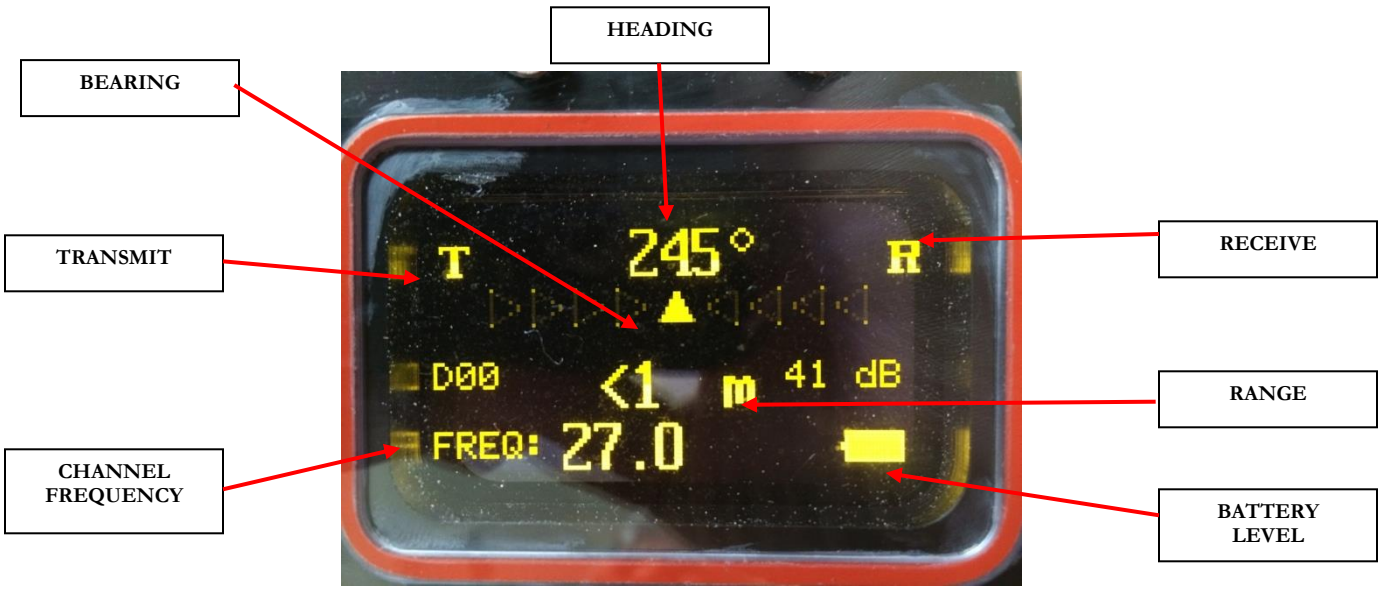

Figure 3-2 Zoomed View of Display in Active Mode

Table 3-1 DTI-300A Active Mode Display and Controls

DISPLAY	DESCRIPTION
	Battery Level Indicator
T	Marker flashes each time the Diver Acoustic Receiver sends an interrogation signal.
XX m:	Displays the range (in meters) to the ATT-400 that is set to the selected channel.
Heading	Displays the heading from the electronic compass.

▷▷▷▷△◁◁◁◁	Bearing Indicator. Nine arrows show the directional adjustment required to determine bearing to the target: • When the unit is pointed directly at the target, only the central arrow is illuminated. • As the direction moves off course to the left, the arrows that are left of the center arrow will illuminate in turn. Likewise, when the direction moves off course to the right, arrows to the right of the center arrow will illuminate. • The number of arrows displayed shows the movement required to correct the operator's aim relative to the target: o One arrow indicates the direction is off about 5 degrees. o Two arrows indicate the direction is off as much as 10 degrees. o Three arrows indicate the direction is off by as much as 20 degrees. o Four arrows indicate the direction is off by more than 30 degrees.
R	Indicator illuminates each time the Diver Acoustic Receiver receives an acoustic signal at the selected frequency.
FREQ:	Frequency currently selected from the frequency up down switches. 25, 27, 28, 29, 30, 31, 32, 33 & 34 kHz
SWITCH	**FUNCTION**
Frequency DOWN	Decreases the frequency by 1 kHz increments.
Frequency UP	Increases the frequency by 1 kHz increments.
Mode Switch	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 function.
Fast Interrogate	Interrogates transponder at 0.55 sec rate.

Figure 3-3 Display and Controls in Active Mode

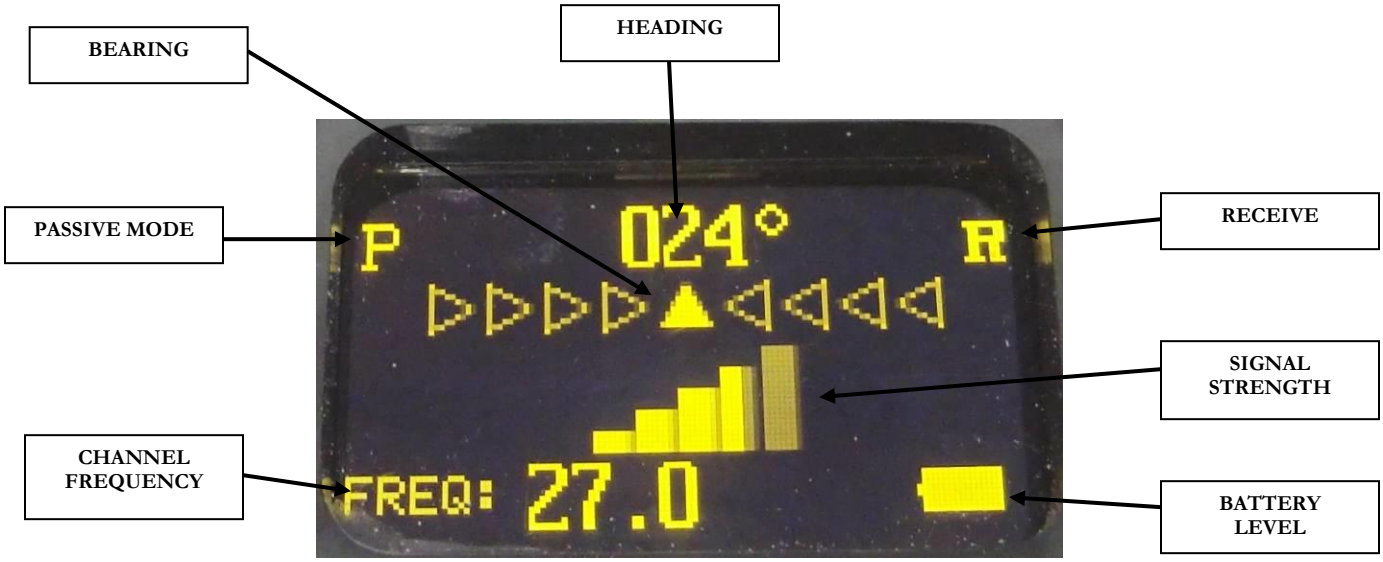

Figure 3-4 Zoomed View of Display in Passive Mode

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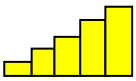
Table 3-2 DTI-300A Passive Mode Display and Controls

DISPLAY	Description
	Battery Level Indicator.
P	Indicates DTI-300A is in Passive Mode.
	Displays signal strength of detected pinger transmission.
Heading	Displays the heading from the electronic compass.

▷▷▷▷△◁◁◁◁	Bearing Indicator. 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 illuminates.
	• As the direction moves off course to the left, arrows that are left of the center arrow will illuminate. Likewise, when the direction moves off course to the right, arrows to the right of the center arrow will illuminate.
	• The number of arrows displayed shows the movement required to correct the operator's aim relative 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 more than 30 degrees.

R	Indicator illuminates each time the Diver Acoustic Receiver receives an acoustic signal at the selected frequency.
FREQ:	Frequency currently selected from the frequency select switches.
SWITCH	**FUNCTION**
100 Hz Up	Increases frequency by 100Hz.
100 Hz Down	Decreases frequency by 100Hz.
Mode Switch	The Mode switch allows the user to turn the unit display ON and OFF as well as change mode from Passive to Active and vice versa. It also accesses the Compass Calibration function.
1kHz Adjustment	Increase frequency from 8 kHz to 40 kHz by 1kHz increments.

Figure 3-5 Display and Controls in Passive Mode

3.5 Powering Up and Shutting Down the DTI-300A

Power is supplied to the DTI-300A through a mechanical switch at the base of the unit. Turning the switch on applies power to the electronics and causes the LCD to light up. To continue the "Power Up" process, press any button on the top of the unit within 10 seconds of turning on the switch. Failure to do so will cause the LCD display to shut down. In order to power down the unit completely, turn the mechanical switch at the base of the unit off.

Figure 3-6 Power ON/OFF Switch

3.6 Selection of Operation and the "Mode Screen"

Once the DTI-300A has powered up and the LCD is active, press the top-right switch to reach the Mode Screen. Once you are at the Mode Screen, you have 10 seconds to make a selection or the unit will shut down to conserve power. Your three options are:

- Compass Calibration (see Section 4.2)
- Change Mode of Operation (choose between Active or Passive)
- Exit (which will shut the unit down)

Note: Once you have made a selection, you have 10 seconds to confirm it, which you can do by pressing the top-right button to move into that mode.

3.7 DTI-300A Pre-Deployment Setup and Check-Out Procedures

- Inspect the pressure housing and all enclosure screws before diving.
- **WARNING: MAKE SURE THE PORT PLUG COVERING THE CHARGING JACK IS INSTALLED.**

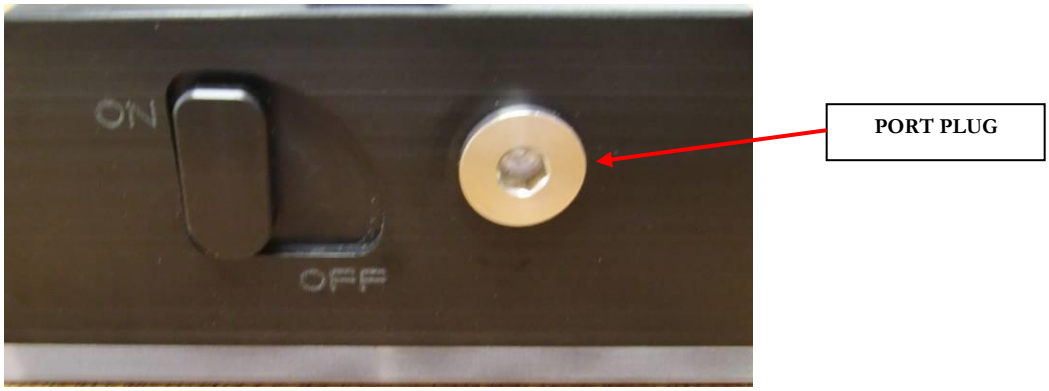


Figure 3-7 Charging Port Plug

Perform an in-air check of the DTI-300A using the following sequence:

> Turn the receiver on (Fig 3.6) by using the switch at the base of the unit. Press any control switch within 10 seconds to confirm activation.

> Confirm what mode you want to operate in: Active (transponder) or Passive (acoustic pinger). If the DTI-300A is in the wrong mode, check Section 3.6 to change the mode.

ACTIVE MODE (transponder mode using an ATT-400)

- On the DTI-300A, press the UP or DOWN buttons to set **FREQ** to 30 kHz.
- On the ATT-400 transponder, set the 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 DTI-300A's transducer at the transponder. Observe the DTI-300A **T** (transmit) flash, and verify that the DTI-300A **R** (receive) flashes alternately. The unit will display range and bearing to the transponder being tested.

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

- On the DTI-300A, set **FREQ** to correspond with the acoustic pinger being tested. Use the lower right control to raise the frequency by 1 kHz, and use the left control to fine-tune the frequency by 100 Hz increments.
- Place the acoustic pinger into a glass of water and place the two devices within half a meter of each other.
- Aim the DTI-300A's transducer at the pinger and verify that it is receiving a signal by observing the flashes of the **R** indicator. The unit will then display signal strength and bearing to the pinger being tested.

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

3.8 DTI-300A Operating Procedures

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

Active (Transponder) Mode Operation

- Use the UP and DOWN buttons to select the appropriate receiving frequency for the ATT-400 transponder that is being relocated.
- Descend to the approximate depth of the target.
- Hold the unit horizontally and begin a slow 360-degree turn. While turning, observe the 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 DTI-300A to the ATT-400 is beyond 500 meters, the DTI-300A should be switched into the **"Fast Interrogate"** mode to allow for easier acquisition of the ATT-400's location. You can turn on this mode by pressing the lower right control switch (Fig 3-2). During this mode, the range will **not** be accurate. Once the ATT-400 has responded and the unit displays the bearing, turn off the **"Fast Interrogate"** function.

- When receiving transponder signals, use the bearing indicator to aim the Diver Acoustic Receiver at the target. In order to correctly determine bearing, the Diver Acoustic Receiver must be positioned horizontally with the display facing up.

Note: The DTI-300A will be pointed directly at the target when only the central 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.

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

  Note: If the range suddenly begins to increase, it is possible to have passed over or under the transponder. Check above and below for the transponder. If visibility is low, point the Diver Acoustic Receiver up and down to see if there is a change in the range.

Passive (Pinger) Mode Operation

- Verify that the **FREQ:** display on the LCD corresponds with the acoustic pinger that is being located. Use the lower right control to raise the frequency by 1 kHz, and use the left control switches to fine-tune the frequency by 100 Hz increments.
- Descend to the approximate depth of the target pinger.
- Hold the unit horizontally and begin a slow 360-degree turn, observing the LCD for an indication of a received signal and a bearing to the target pinger.
- When receiving signals from the pinger, use the bearing indicator to aim the Diver Acoustic Receiver at the target. To correctly determine bearing, the

Diver Acoustic Receiver must be positioned horizontally with the display facing up.

- 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 increments) for the strongest signal as displayed on the LCD.
- Using the compass and the bearing indicator for navigation, begin swimming toward the target, while continually monitoring the signal strength indicator until the pinger is located.

  Note: If the signal strength suddenly weakens significantly, it is possible that you have passed over or under the target pinger. Check above and below for the pinger. If visibility is low, point the Diver Acoustic Receiver up and down to see if there is a change in the signal strength.

Section

4

DTI-300A SYSTEM MAINTENANCE

4.1 Maintenance

Upon completion of each dive mission, take these steps to assure continued reliable performance from the DTI-300A.

- Turn the equipment OFF by using the power switch.
- Wash the exterior of the equipment with fresh water and mild detergent. Make sure to clean off any 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 DTI-300A battery. Contact your authorized representative to replace the DTI-300A battery if the unit fails to hold a charge.
- Plan sufficient time before the next use of the equipment so you can thoroughly test the DTI-300A and charge the battery if needed.
- For long-term storage (> 1 month), it is recommended that the charge plug be removed to prevent the possible buildup of gas from a discharged battery.

4.2 Charging the Battery

It is recommended that the DTI-300A be charged before each use. A fully-charged battery will provide 6 hours of continuous operation. If the **BATT** indicator is blinking or is lit only on the right edge of the battery display, 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 by using the power switch.

- Remove the port plug (Figure 4-1) located at the rear of the DTI-300A with the wrench provided:

Figure 4-1 Removing the 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.

- Plug the battery charger connector into the charging jack located inside the DTI-300A port opening (Figure 4-2):

Figure 4-2 Charger Connected to the DTI-300A

- Plug the charger into a standard 100-240 VAC wall socket. The charger's "Power On" red LED will light up.
- Allow the battery to charge for 3-6 hours, or until the "Charged" green LED lights up.

- Unplug the charger and remove the connector from the charging jack.
- Re-install the port plug using the tool supplied.

4.3 Calibrating the Electronic Compass

- Use Section 3.6 to access the “Calibrate Compass” function (Figure 4-3).
- Press **“Y”** to enter the calibration function.

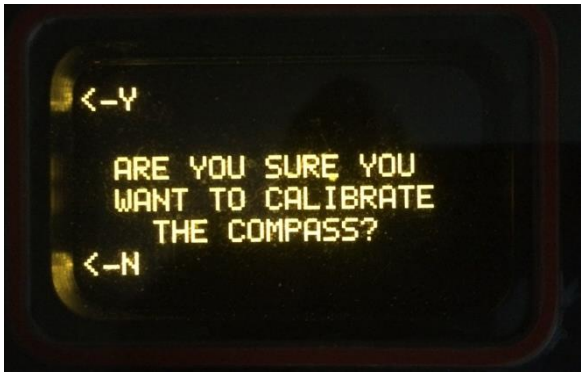


Figure 4-3 DTI-300A Compass Calibration

- Lay the DTI-300A on a flat surface, bottom down, as far away as possible from any ferrous or magnetic objects.
- Press any control switch button to enter the X-Y calibration mode.
- Rotate the DTI-300A through a complete 360-degree rotation, taking more than 20 seconds to do so. The display will indicate varying characters as shown in Figure 4-4.

Figure 4-4 DTI-300A Hard Iron Compass Calibration X-Y Operation

- Continue rotating the DTI-300A until the display shows a full row of dots. Press any button to move into the Z calibration.

- Orient the DTI-300A on its right side, and push any button to start the calibration process (Figure 4-5).

- Rotate the DTI-300A through a complete 360-degree rotation, taking more than 20 seconds to do so. Continue rotating the DTI-300A until the display indicates a full row of dots.

Figure 4-5 DTI-300A Hard Iron Compass Calibration Z Operation

- When the display indicates a full row of dots, press any button to stop the Z calibration. The compass calibration is complete as shown in Fig 4-6. Press any button to go to the operational screen.

Figure 4-6 DTI-300 Compass Calibration is Complete

4.4 Replacing the Battery

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-supplied battery pack. Return unit to authorized supplier for replacement.