



RJE INTERNATIONAL, INC.



**DIVE-TRAK PRO
DIVER NAVIGATION SYSTEM
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 DIVE-TRAK PRO Diver Navigation System comprising the DTI-300 Diver Transponder Interrogator and the ATT-400 Acoustic Target Transponder. The information herein is arranged into chapters and sections as follows:

Chapter 1 – An overview of the DTI-300. General notes including brief sections describing the applications and physical characteristics of the Beacon itself.

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 predeployment checkout procedures for the DTI-300.

Chapter 4 - Maintenance. Sections detail periodic maintenance, battery replacement and calibration procedures.

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.

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- 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 air freight, contact FSI 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 FSI issued RMA number on all documents and correspondence.
- Prepay the freight.

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Title shall pass to buyer on delivery to carrier at Cataumet, MA. 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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TABLE OF CONTENTS

FORWARD

WARRANTY

1 - Introduction to the Dive-Trak Pro System

1.1 Overall Description	1
1.1.1 DTI-300 Diver Transponder Interrogator	2
1.1.2 ATT-400 Acoustic Target Transponder	3

2 – Dive-Trak Pro System Specifications

2.1 DTI-300 Diver Transponder Interrogator Specifications.....	4
2.2 ATT-400 Acoustic Target Transponder Specifications.....	5
2.3 Specifications Unique to Unit(s) Shipped.....	5

3- Operations & Installation Notes

3.1 Introduction	6
3.2 System Components	6
3.3 Unpacking.....	7
3.4 Display and Control Settings.....	7
3.5 Charging the battery	9
3.6 Operating Procedures.....	10

4 – Dive-Trak Pro System Maintenance

4.1 Maintenance	21
4.2 Replacing the ATT-400 Battery.....	22
4.3 Setting the ATT-400 Transmit Frequency Selector Dip Switches	23
4.4 Calibrating the Electronic Compass.....	24
4.4 Replacing the DTI-300 Rechargeable Battery Pack	25

TABLE OF CONTENTS (Continued)

APPENDICES

APPENDIX A – MECHANICAL AND ELECTRICAL DRAWINGS

APPENDIX B – SPARES LISTING

ILLUSTRATIONS

FIGURE 1-1 Dive-Trak Pro System.....	1
FIGURE 1-2 Model DTI-300 Diver Transponder Interrogator	2
FIGURE 1-3 Model ATT-400 Acoustic Target Transponder	3
FIGURE 3-1 Dive-Trak Pro System Components.....	3
FIGURE 3-1A DTI-300.....	4
FIGURE 3-1B ATT-400.....	4
FIGURE 3-1C Battery Charger	5
FIGURE 3-2 DTI-300 Display and Controls	7
FIGURE 3-2A Zoomed View of DTI-300 Display and Controls.....	8
FIGURE 3-3 Charging Port Plug Removal.....	10
FIGURE 3-4 Charging Connection to DTI-300	10
FIGURE 3-5 Charging Connector Dummy Plug	11
FIGURE 3-6 Charging Port Plug.....	11
FIGURE 3-7 Heading Display Mode	13
FIGURE 4-1 ATT-400 Disassembly.....	15
FIGURE 4-2 ATT-400 Battery Connections.....	15
FIGURE 4-3 ATT-400 Battery Installation.....	15
FIGURE 4-4 ATT-400 Disassembly.....	16
FIGURE 4-5 Channel Selector Switch	16
FIGURE 4-6 DTI-300 Normal Operation Display Mode	17
FIGURE 4-7 DTI-300 Heading Display Mode	18
FIGURE 4-8 DTI-300 Hard Iron Compass Calibration Mode	18
FIGURE 4-9 DTI-300 Hard Iron Compass Calibration X-Y Operation	18
FIGURE 4-10 DTI-300 Hard Iron Compass Calibration X-Y Complete.....	19
FIGURE 4-6 DTI-300 Hard Iron Compass Calibration Z Complete	19

TABLES

TABLES 2-1 DTI-300 Specifications.....	7
TABLES 2-2 ATT-400 Specifications.....	8
TABLES 3-1 DTI-300 Display and Controls	8
TABLES 4-1 Channel Select Switch Settings.....	17

INTRODUCTION TO THE DIVE-TRAK PRO SYSTEM

1.1 Overall Description

The RJE International Dive-Trak Pro system (Figure 1-1) is the next generation in diver marking and relocation. Using the latest in underwater acoustic technology, the Dive-Trak Pro allows divers to mark targets underwater and relocate them up to 750 meters (2250 feet) away.



Figure 1-1
**Dive-Trak Pro
System**



While most underwater marking and relocation system use active acoustic technology to locate targets underwater, the Dive-Trak Pro uses a coded based system that provides range and bearing to the marked target. Using this approach, a diver can accurately relocate an underwater target within 1 meter (3ft) with a minimum amount of bottom time.

The Dive-Trak Pro consists of two components, the DTI-300 Diver Transponder Interrogator (Figure 1-2), which navigates the diver to marked location and the ATT-400 Acoustic Target Transponder (Figure 1-3), which is used to mark underwater targets, and



Figure 1-3 DTI-300
Diver Transponder Interrogator



Figure 1-2 ATT-400
Acoustic Target Transponder

1.1.1 DTI-300 Diver Transponder Interrogator

Designed for use by divers, the DTI-300 Diver Transponder Interrogator accurately navigates a diver to a target or location that has been marked with an ATT-400 Underwater Transponder to within 1 meter (3ft). Once activated, the DTI-267 sends a coded acoustic beam through the water up to 750(2250ft) meters away. Once an ATT-400 receives this signal, it responds to the DTI-300 and, through this communication protocol, the DTI-300 provides range and bearing to the diver.

The DTI-300 is a multi-channel system that allows the diver to track up to eight different ATT-400's for up to 6 hours. Using sealed switches on the panel of the DTI-400, a diver can select the corresponding channel on the LCD display for the ATT-400 to be located.

The LCD displays range and bearing to the selected ATT-400, compass heading, verification of sending a transmit signal and receiving one for an ATT-400, and a low battery condition.

The DTI-300 has a single external connector for the battery charger.

The DTI-300 is shipped with a battery charger and a tool kit in a durable, weatherproof carrying case.

1.1.2 ATT-400 Acoustic Target Transponder

The ATT-400 is a small battery operated underwater acoustic that works with the DTI-300 to mark and relocate targets underwater in ranges of 750 meters (2250ft). Once deployed, a water switch activates the transponder where it can remain in the receive mode for up to 6 months waiting quietly for an interrogation signal for the DTI-300 Diver Transponder Interrogator. Once interrogated, the ATT-400 responds to the DTI-300 using eight different user programmable channels.

In addition, the ATT-400 is positively buoyant and requires no additional flotation so deployment is easy. Constructed of non corrosive material, the ATT-400 can be deployed to depth of 100 meters.

DIVE-TRAK PRO SYSTEM SPECIFICATIONS

2.1 DTI-300 Diver Transponder Interrogator

Table 2-1 DTI-300 Diver Transponder Interrogator Specifications

Transmit Frequency	25KHz
Acoustic Source Level	180 dB re 1 μ Pa @ 1 meter
Transmit Repetition Rate	Normal: 1.0 sec
Transmit Pulse Length	5.0 msec
Receive Frequency	Switch-selectable to 27, 28, 29, 30, 31, 32, 33, 34 kHz
Acoustic Range	750m (2460ft), Resolution 1m (3.28ft)
Acoustic Bearing	Range +/- 30 Deg, Resolution 5 Deg
Display	LCD
Controls	Piezoelectric Switches
Power Source	Rechargeable, 9.6 volt NiCad battery pack
Charger	100-240VAC 2.0A
Operating Life	12 hours per 12-hour charge
Electronic Compass Accuracy	<0.5 to 1.5 deg RMS
Repeatability	+/- 0.3 deg
Operational Depth	100m (328ft)
Housing Material	Delrin and polycarbonate; O-ring sealed
Dimensions	30cm (L) x 18cm (W) x 9cm (H) 12 in (L) x 7in (W) x 3.5in (H)
Weight	In Air: 2.9Kg (8 lbs.): In Water: -0.185Kg (-0.5 lbs.)
Accessories	Battery charger, spares kit, user's manual

2.2 ATT-400 Acoustic Target Transponder

Table 2-2 ATT-400 Acoustic Target Transponder Specifications

Receive Frequency	25 kHz
Acoustic Source Level	180 dB re 1 μ Pa @ 1 meter
Transmit Repetition Rate	Normal: 1.0 sec
Transmit Pulse Length	5.0 msec
Transmit Frequency	Switch-selectable to 27, 28, 29, 30, 31, 32, 33, 34 kHz
Transponder Turnaround Time Compensation	20 msec
Activation	Water Activated Switch
Battery	9 Volt Battery QTY 2
Range	To 3,280 feet (1,000 m)
Operating Life	6 Months
Operational Depth	To 300 feet (100 m)
Housing Material	Delrin and glass-filled polycarbonate; O-ring sealed
Dimensions	21cm (L) x 6.4cm (D) 8.5in (L) x 2.5in (D)
Weight	In Air: 0.37Kg (1 lbs) In Water: Positively Buoyant

Specifications are subject to change

2.3 Specifications Unique to Unit(s) Shipped

OPERATIONS & INSTALLATION NOTES

3.1 Introduction

The Dive-Trak Pro System DTI-300 Diver Transponder Interrogator is a small battery operated transponder interrogator that is ergonomically design to be operated by a diver. A color LCD display provides navigation data to the diver while sealed switches allow the diver access to control functions of the unit. Once an ATT-400 has been interrogated, the DTI-300 provides accurate range and bearing to the transponder. In addition, an internal electronic compass assists the diver in navigating to the marked location. Note the DTI-300 is compatible with the ATT-400 Acoustic Target Transponder. Consult with RJE International for a locator configured for different frequencies.

The ATT-400 Acoustic Target Transponder is a small self contained acoustic transponder that activates once it is placed in the water. Marking a location is easy using the ATT-400. Once the ATT-400 is deployed it will remain covertly activated for up to six months while it waits to receive a coded interrogation signal from the DTI-300. The ATT-400 can be programmed to operate on eight different channels allowing the diver to mark and relocate eight different locations simultaneously, selecting each with a simple control command on the DTI-300.

3.2 System Components

The Dive-Trak Pro System includes:

- DTI-300 Diver Transponder Interrogator with electronic compass (Figure 3-1A)
- ATT-400 Acoustic Target Transponder (Figure 3-1B)
- Battery charger assembly (Figure 3-1C)



Figure 3-1A
DTI-300 Diver Transponder Interrogator



Figure 3-1B
ATT-400 Acoustic Target Transponder



Figure 3-1C
Battery Charger 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:

- The end caps are properly secured and the end cap screws are tightened.
- 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 Control Panel

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



Figure 3-2 DTI-300 Display and Controls

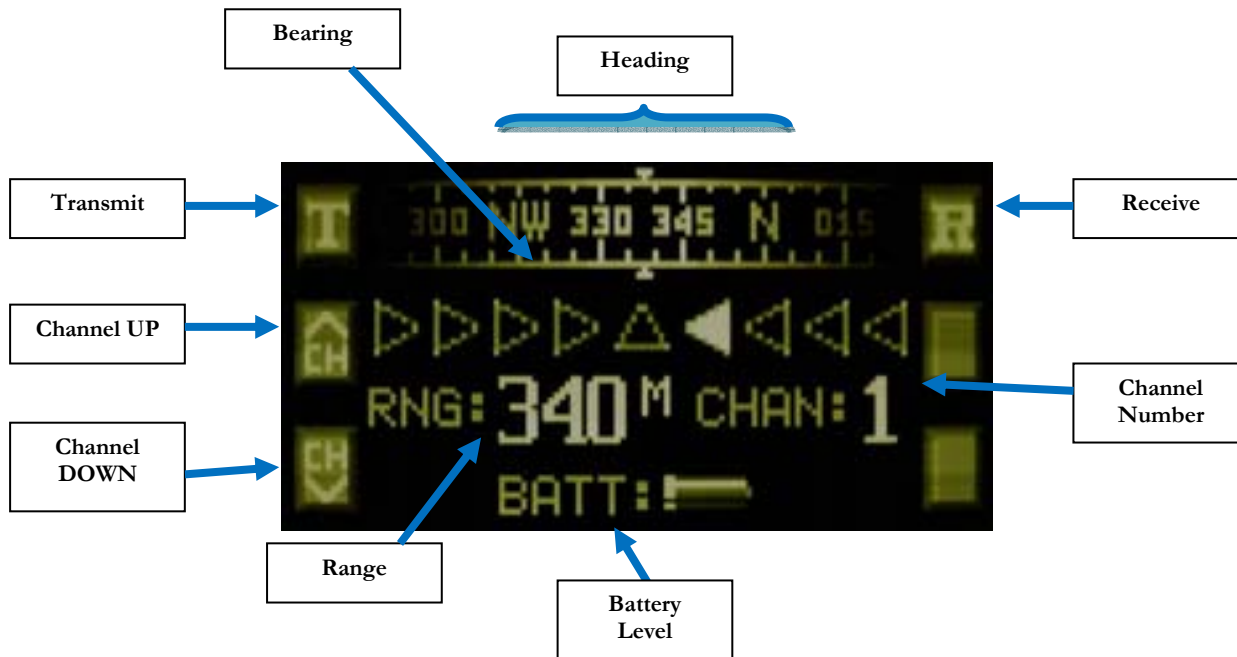


Figure 3-2A Zoomed View of DTI-300 Display and Controls

Table 3-1 DTI-300 Display and Controls

DISPLAY	Description
BATT:	Battery Level Indicator
CH▲	Displays Channel UP Function Switch Activation
CH▼	Displays Channel DOWN Function Switch Activation
T	Marker flashes each time the Diver Transponder Interrogator sends an interrogation signal.
RNG:	Displays the Range in meters to the ATT-400 set to the selected Channel
Heading	Displays the heading from the electronic compass
▶▶▶▶▶▲◀◀◀◀◀	Bearing Indicator <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

	<p>direction moves off center to the right, arrows to the right of the center arrow will be illuminated.</p> <ul style="list-style-type: none"> The number of arrows displayed shows the movement required to correct the aim to the target: <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>
R	Indicator illuminates each time the Diver Transponder Interrogator receives an acoustic signal at the selected frequency.
CHAN:	Channel Number current selected from the channel select switches 1:27KHz 2:28KHz 3:29KHz 4:30KHz 5:31KHz 6:32KHz 7:33KHz 8:34KHz
SWITCH	FUNCTION
Channel DOWN	Decrements the channel number selected by 1
Channel UP	Increments the channel number selected by 1
ON/OFF	The ON/OFF control allows the user to turn the unit ON and OFF
MODE	<p>Selects the operating Mode of the DTI-300</p> <p>1: NORMAL Display mode 2: HEADING Display mode 3: COMPASS CALIBRATION display mode (accessed from HEADING display using UP button)</p>

3.5 Charging the battery

The DTI-300 battery is fully charged at the factory prior to shipment and should be recharged before each use. A fully charged battery will provide twelve hours of continuous operation. If the **BATT** indicator is lit only on the left edge of the battery display or is completely dim, 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.
- Remove the port plug (Figure 3-3) at the rear the DTI-300



Figure 3-3
Charging Port Plug Removal

! **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 inside the DTI-300 port opening



Figure 3-4
Charging Connector to DTI-300

- Plug the charger assembly into a standard 100-240VAC wall socket.
- The charger's "power on" LED will light.
- Allow the battery to charge for 3 hours or until the "charge" LED is off.

- Unplug the charger and remove the connector from the charging jack.
- Re-install the dummy charging plug (Figure 3-3) at the rear the D'TI-300.



Figure 3-5
Charging Connector Dummy Plug

- Store the unit until required for the next deployment.

3.6 Pre-deployment Setup and Check-out

- Inspect the pressure housing and all closure screws before diving.
- Make sure the port plug covering the charging jack is installed.

⇒ Note: The Diver Transponder Interrogator will not operate properly if the dummy charging plug is installed when deployed. The system will flood causing serious damage if the charging port plug is not installed.



Figure 3-6
Charging Port Plug

Perform an in-air check of the Diver Transponder Interrogator using the following sequence:

- Turn the Diver Transponder Interrogator on by selecting the pressing the ON button.

⇒ **Note:** The unit will transmit an acoustic signal once every second. The **T** indicator will light up with the first transmission, and a click will be heard every second. It may be necessary to place the transducer close to the user's ear in order to hear the signal.

- Press UP or DOWN button and verify the CHAN: display corresponds with the ATT-400 channel setting.
- Use a transponder that transmits at same channel as selected on the Diver Transponder Interrogator's. Turn ON the transponder via the turn on contacts and place the two devices within a meter of each other.
- Aim the DTI-300 at the transponder and verify that it is receiving a signal from the other device. The **R** indicator will flash, and the unit will display a range and bearing to the transponder.

⇒ **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.

3.7 Operating Procedures

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

- Use the UP and DOWN buttons to select the appropriate receive channel.
- Descend to the approximate depth of the target.
- Hold the unit horizontally and begin a slow 360° turn, observing the LCD for an indication of a received signal and a bearing to the transponder.
- When receiving transponder signals, use the bearing indicator to aim the Diver Transponder Interrogator at the target.

⇒ **Note:** The DTI-300 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.

- To correctly determine bearing, the Diver Transponder Interrogator must be positioned horizontally with the display facing up.
- Read the compass for a bearing to target and begin swimming toward the target. The MODE switch can be pressed once to enter a HEADING only display if desired. This display mode allows for a fast HEADING update from the electronic compass.



Figure 3-7
HEADING display mode

- View the RNG: 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.
- 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 Transponder Interrogator up and down to see if there is a change in the range.
- Reset the UP and DOWN buttons to obtain range and bearing to target transponders operating at other frequencies.

DIVE-TRAK PRO SYSTEM MAINTENANCE

4.1 Maintenance

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

- Turn the equipment OFF.
- 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 DTI-300 battery. Contact your authorized representative to replace the DT-300 battery if the unit fails to hold a charge.
- Store the equipment with the charge dummy plug install to prevent any drain on the battery.
- Plan sufficient time before the next use of the equipment to thoroughly test the DTI-300 and to charge the battery if needed.

4.2 Replacing the ATT-400 batteries

The batteries in the ATT-400 transponder should be replaced after six months or prior to each use. To change the ATT-400 batteries follow this procedure:

- Loosen and remove the knurled locking collar from the housing and gently remove the end cap.



Figure 4-1 ATT-400 Disassembly

- Remove the old battery and install the new battery as shown. Note the battery terminal orientation before making connection. Insure the battery terminals are fully seated.



Figure 4-2 ATT-400 Battery Connections

- Rotate the transponder assembly and repeat the same steps for the opposite side. When completed the assembly will look as shown.



Figure 4-3 ATT-400 Battery Installation

- Before installing the end cap assembly, make sure the O-ring and O-ring surfaces are clean and free of debris. Lubricate the O-ring with a light coat of silicon grease (O-lube) supplied in the spares kit.
- Reassemble the unit by reversing the order of disassembly.

4.3 Setting the ATT-400 Transmit Frequency Selector Dip Switches

- Loosen and remove the knurled locking collar from the housing and gently remove the end cap.



Figure 4-4 ATT-400 Disassembly

- Orient the ATT-400 assembly so the switch is located as shown (Figure 4-5).

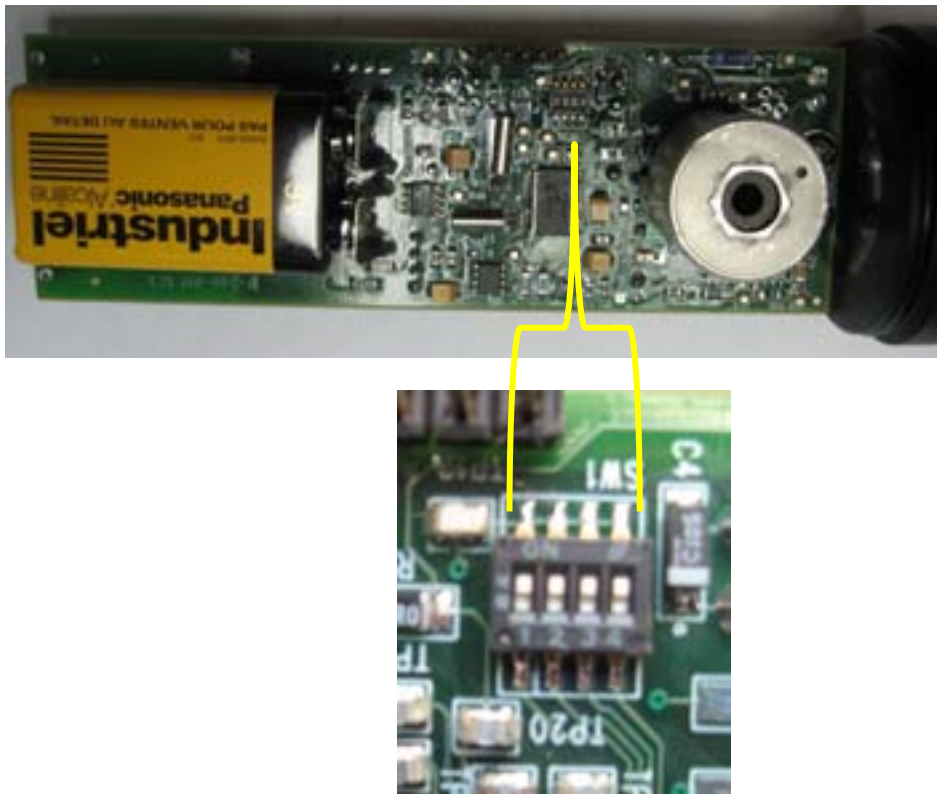


Figure 4-5 Channel Select Switch

- Set the switch positions of SW1 to the position for the desired channel and frequency (Table 4-1). **Note: MSB 1 is OFF for normal operation**

Table 4-1 Channel Select Switch Settings

MSB 1 ON = Pinger OFF=Transponder	2	3	4 LSB	CH#/Frequency
-	OFF	OFF	OFF	CH1/27KHz
-	OFF	OFF	ON	CH2/28KHz
-	OFF	ON	OFF	CH3/29KHz
-	OFF	ON	ON	CH4/30KHz
-	ON	OFF	OFF	CH5/31KHz
-	ON	OFF	ON	CH6/32KHz
-	ON	ON	OFF	CH7/33KHz
-	ON	ON	ON	CH8/34KHz

4.4 Calibrating the Electronic Compass

- In the NORMAL mode of operation, press the MODE button to get to the HEADING display.



Figure 4-6 DTI-300 NORMAL Operation display mode

- From the HEADING display mode press the UP button to get to the Hard Iron Compass Calibration display



Figure 4-7 DTI-300 HEADING display mode

- Lay the DTI-300 on a flat surface as far away as possible from any ferrous or magnetic objects
- Press the UP button to enter the X-Y Calibration mode



Figure 4-8 DTI-300 Hard Iron Compass Calibration display mode

- Rotate the DTI-300 through a complete 360 degree rotation taking more than 20 seconds. The display will indicate varying characters as shown in Figure 4-9

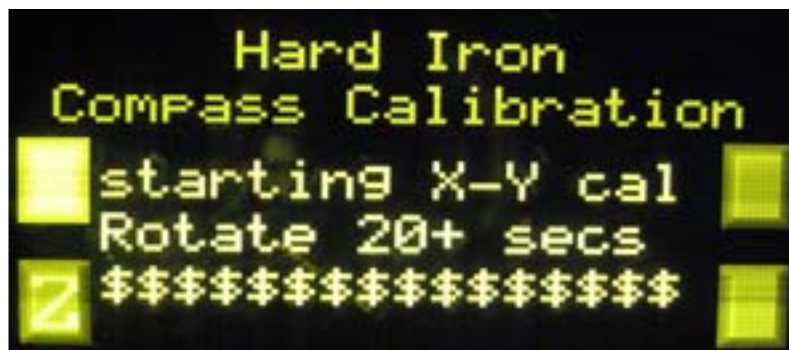


Figure 4-9 DTI-300 Hard Iron Compass Calibration X-Y operation

- Continue rotating the DTI-300 until the display indicates a full row of dots as shown in Figure 4-10, press the UP button to stop the X-Y calibration.

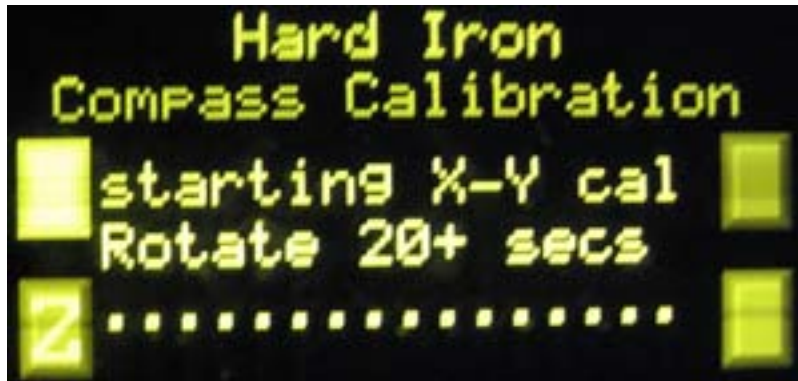


Figure 4-10 DTI-300 Hard Iron Compass Calibration X-Y complete

- Orient the DTI-300 on its side and repeat the steps using the DOWN arrow for the Z calibration. It may be easier to perform the Z calibration with one of the handles removed from the DTI-300.



Figure 4-11 DTI-300 Hard Iron Compass Calibration Z complete

- When display indicates a full row of dots as shown in Figure 4-11, press the DOWN button to stop the Z calibration.

4.5 Replacing the DTI-300 batteries

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.