RJE INTERNATIONAL, INC.

VADR VEHICLE ACOUSTIC DIRECTIONAL RECEIVER USER MANUAL REV 2.0

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 VADR navigation system comprising the VADR Vehicle Acoustic Directional Receiver and the ATT400D Acoustic Target Transponder. The information herein is arranged into chapters and sections as follows:

Chapter 1 – An overview of the VADR receiver. General notes including brief sections describing the applications and physical characteristics of the Receiver itself.

Chapter 2 – Specifications. Section comprised of a list of specifications both general and unique-to-the-unit.

Chapter 3 – Operation and Installation Notes. Sections detail the unpacking and pre-deployment checkout procedures for the VADR.

Chapter 4 - Maintenance. Section details 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.

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.

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.

CASE 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 air freight, 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.

TABLE OF CONTENTS

WARRANTY

ILLUSTRATIONS

TABLES

Section

1

INTRODUCTION TO THE VADR

VEHICLE ACOUSTIC DIRECTIONAL RECEIVER

1.1 Overall Description

The VADR Vehicle Acoustic Directional Receiver is a small but rugged passive pinger receiver used to assist operators of ROVs and AUVs to track acoustic sound sources from 8kHz to 45kHz. In addition, the VADR receiver can function as an "acoustic transponder interrogator" and provide accurate range and bearing to targets marked with ATT-400 acoustic transponders.

FIGURE 1-1 VADR6000M

1.2 VADR Directional Receiver

The VADR Receiver's small size and rugged design allows for easy mounting on a ROV or AUV. Electronics and a highly directional hydrophone are contained in the pressure housing and are externally powered by the subsea vehicle through a 5-pin SubConn bulkhead connector. In addition, all telemetry data for controlling the VADR receiver, as well as output data, is accessed through this connector.

A RS232 data interface is used to access the directional indication, range to target, operational information, and control functions of the VADR receiver using an ASCII data string. VADR Serial Control Application software is provided to allow the operator easy access to receive and control the necessary directional information to track the acoustic sound source. To track an acoustic sound source, like a "Black Box" beacon, the operator selects the proper frequency through the VADR Serial Control Application software. Once selected, the VADR electronics begins to look for that acoustic signal through a directional hydrophone mounted on the front of the pressure housing. The signal is processed by the electronics and feedback is provided to the ROV operator. The operator can then "fly" the ROV to the target area using the feedback provided by the VADR receiver.

In addition, the ROV operator can change the mode of the VADR receiver to track and locate ATT400 series transponders. This option allows the ROV operator to mark locations or equipment underwater and relocate them within one meter. When the system is operating as a transponder interrogator, the feedback to the ROV operator is more accurate because true range and bearing data is delivered to the operator. Each ATT400 transponder can be programmed to reply on one of eight (8) different frequencies allowing the marking of multiple locations within an operational range up to 1000 meters.

Each VADR Receiver comes with the receiving unit, mating connector with pigtail, test cable, VADR Serial Control Application software, RS232 to USB adapter and operations manual.

Section

2

VADR VEHICLE ACOUSTIC DIRECTIONAL RECEIVER SPECIFICATIONS

2.1 VADR Vehicle Acoustic Directional Receiver

Table 2-1 VADR Vehicle Acoustic Directional Receiver Specifications*

Pinger Receiver Mode	
Receiver Bandwidth	8 kHz to 45 kHz in 100 Hz increments
Receiver Sensitivity	-100 dB re 1μPa @ 1 meter
Transponder Interrogator Mode	
Interrogator Frequency	26 kHz
Receive Frequencies	25, 27, 28, 29, 30, 31, 32, 33, 34 kHz
Acoustic Source Level	+190 dB re 1 μPa @ 1 meter
Range Capability	Up to 1000 meters based on model of ATT-400
Directional Hydrophone	
Beam Width	40 ± 5 degrees conical
Bearing Indication	4 BINS: Left or right, 3, 8, 20 or > 20 degrees
Bearing Accuracy	5 degrees nominal in BINS 1 and 2
Bearing Resolution	2 degrees
Control and Power Interface	
RS232	9600 Baud, No Parity, 8 Data Bits, and 1 Stop Bit
Connector SubConn	SubConn MCBH5F, 5-pin bulkhead
Pigtail Connector SubConn	SubConn MCIL5M with locking sleeve
Power Source	8-32 VDC: 24 VDC Nominal
Current drain	40 ma @ 24 VDC continuous

Mechanical/Environmental	
Housing	Aluminum, Hard Coat Anodized
Operational Depth	VADR6000M: 6000 meters (19,685ft)
Dimensions	VADR6000M: 12.7 cm Ø x 28.0 cm L (5.5" Ø x 11.2" L)
Weight	VADR6000M: Air: 6.8Kg (15lbs.): In Water: 5.5Kg (12lbs.)

***Specifications are subject to change**

RJE International, Inc.
Tel: (949) 727-9399 | Fax: (949) 727-0070 | sales@rjeint.com | www.rjeint.com

Section

3

OPERATIONS & INSTALLATION NOTES

3.1 Introduction

The VADR Vehicle Acoustic Directional Receiver is an externally powered directional receiver and transponder interrogator designed to be operated from the surface when fixed mounted to a subsea vehicle. The receiver can be operated in a passive mode for pinger relocation or active mode for transponder relocation and ranging. A RS232 interface provides navigation data to the operator and allows the operator to control various functions of the VADR with the VADR Serial Control Application software.

Once an acoustic sound source has been received (acoustic beacon or ATT-400 series transponder), the VADR provides accurate range and bearing to the source.

3.2 VADR System Components

The VADR System includes:
VADR Vehicle Acoustic Directional Receiver (FIGURE 3-1A)
Mating Connector Pigtail (FIGURE 3-1B)
Test Cable (FIGURE 3-1C)
VADR Serial Control Software (FIGURE 3-1D)
RS232 to USB Adapter (FIGURE 3-1E)

FIGURE 3-1A VADR6000M

FIGURE 3-1B Pigtail

FIGURE 3-1C Test Cable

FIGURE 3-1D Application Software

FIGURE 3-1E RS232 to USB Adapter

RJE International, Inc.
Tel: (949) 727-9399 | Fax: (949) 727-0070 | sales@rjeint.com | www.rjeint.com

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:

- The end caps are properly secured and the end cap screws are tightened.
- There is no damage to the housing.
- The mating connector pigtail is in good condition.

3.4 Connector Wiring

All functions of the VADR Vehicle Acoustic Directional Receiver are accessed by the RS232 port on the end cap connector. Note wiring and connector orientation in Figure 3-2 for the SubConn connectors.

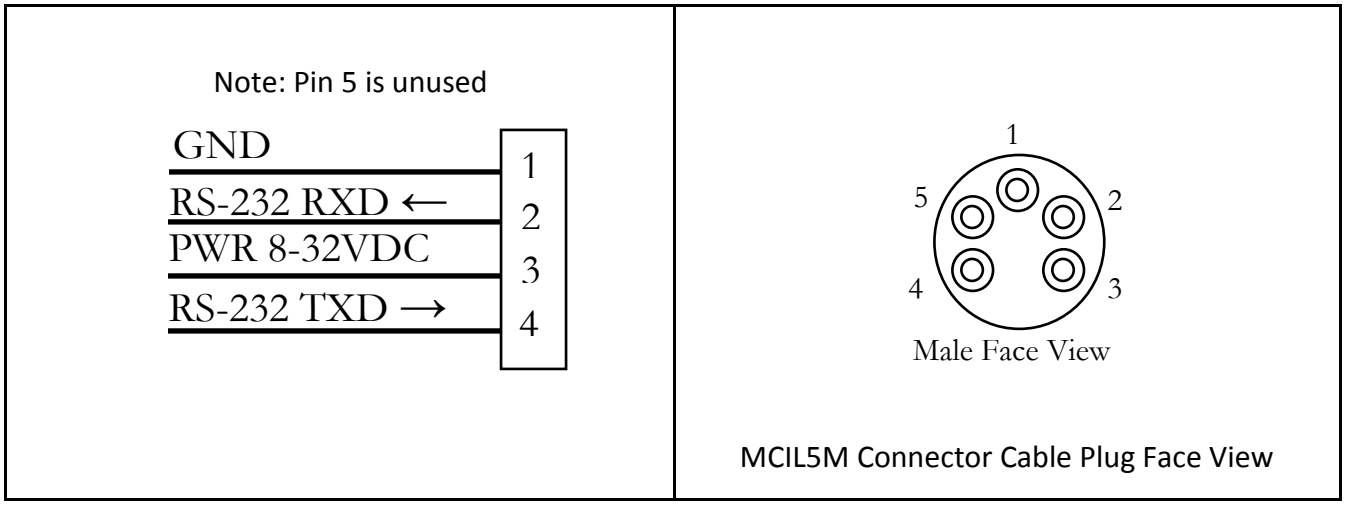


Figure 3-2 VADR SubConn MCIL5M Connector Wiring

3.5 Powering Up and Shutting Down the VADR

Power is supplied to the electronics of the VADR through an underwater connector at the base of the unit. Application of 8-32 VDC via the underwater connector will enable the receiver to turn on.

3.6 Installing the VADR Receiver onto the Subsea Vehicle

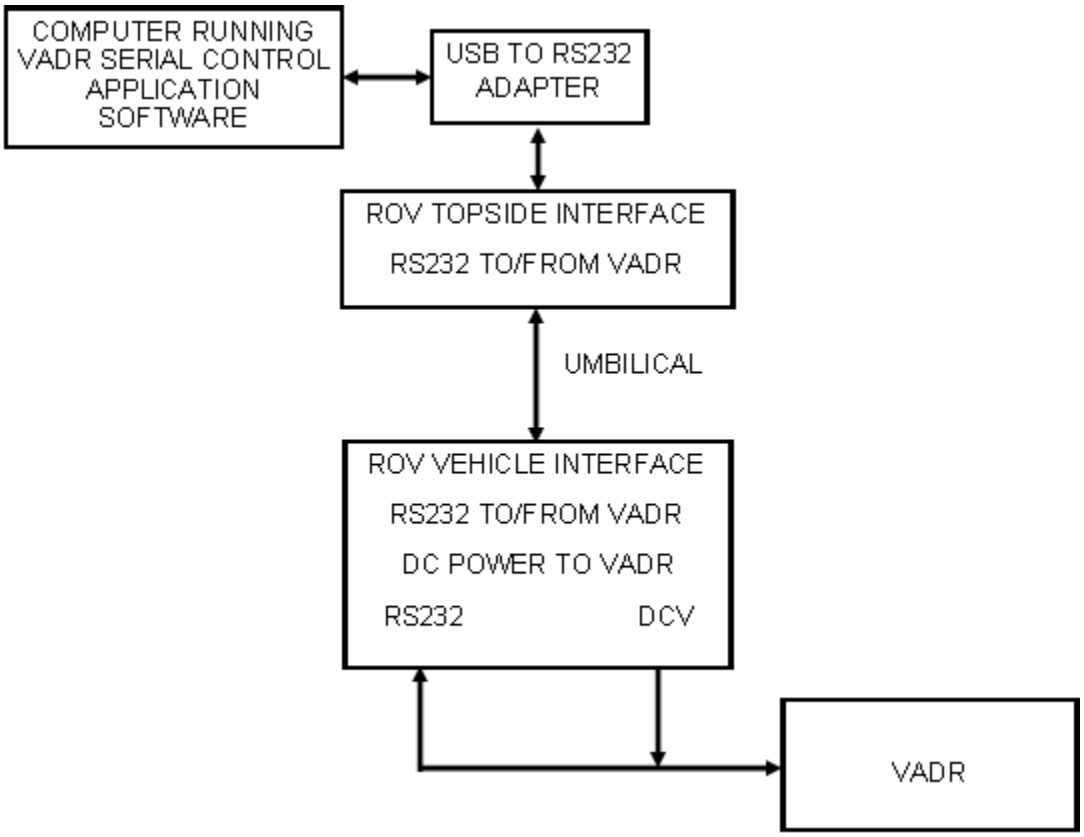


FIGURE 3-4 Block Diagram, Installation of the VADR Receiver

When mounting the receiver on a subsea vehicle, ensure that:

- The receiver is clear of any noise generating equipment such as motors and high voltage cables. These could generate noise.
- The hydrophone is pointing out toward the front of the vehicle and is clear of any obstructions.
- The hydrophone orientation is correct (see FIGURES 3-5 and 3-6).
- The mounting hardware is aluminum or plastic, eliminating any issues of dissimilar metals and corrosion.

FIGURE 3-5 VADR Orientation

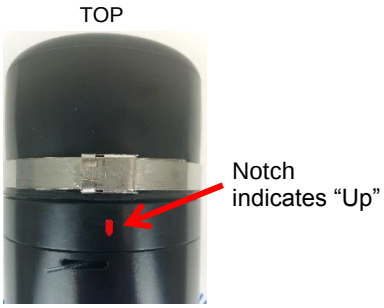


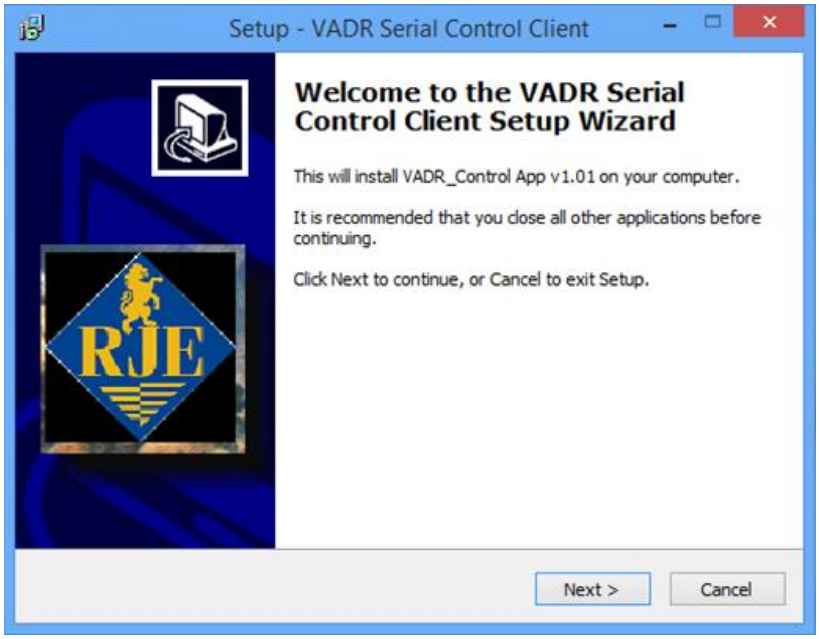
FIGURE 3-6
Hydrophone
Mounting Orientation

3.7 Using the VADR Control Application Software

To support the VADR receiver, a simple user interface software application is provided to assist in controlling the receiver’s functions and accessing the tracking data. This interface is Windows based and requires Mouse Clicks to access the software.

3.7.1 Installing and setting up the VADR Control Application Software

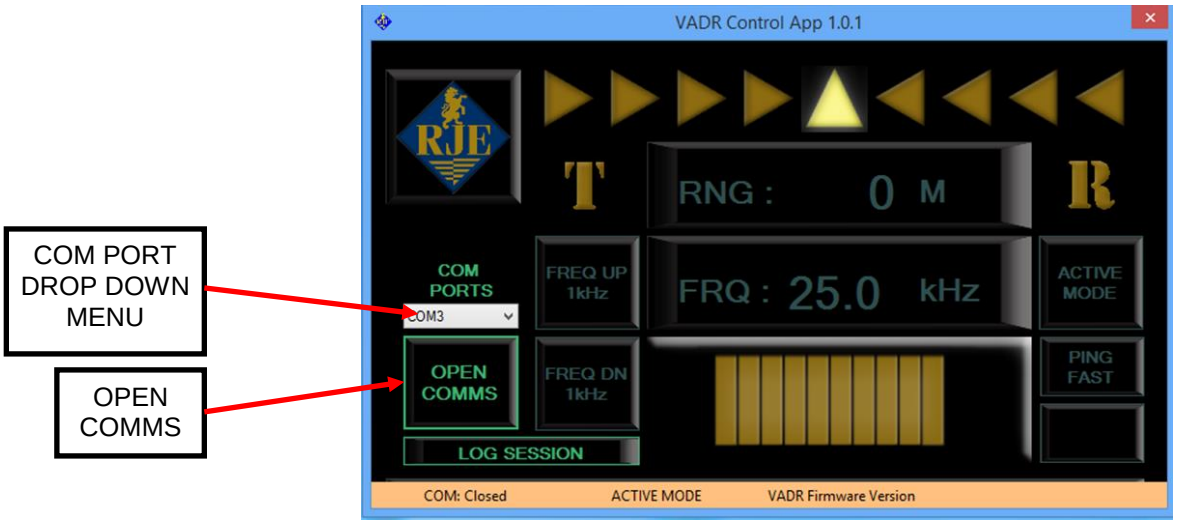
- Install memory stick into PC USB port and navigate to memory stick folder. Invoke VADRsetup.com, follow prompts to install VADR Serial Control Application.



- Connect the test cable to the VADR receiver and the PCs' COM or USB port via the RS232 adapter. Insure that the VADR Serial Control Application Software is loaded on the PC being used. Power up the test cable using the supplied AC adapter.

- Right click the COM PORT drop down menu, and select the COM port that you will be using on your PC. Keep in mind that you may need to use the RS232 to USB adapter provided with the test cable if your PC does not have a COM Port. Right click OPEN COMMS button, observe VADR communicating with PC.

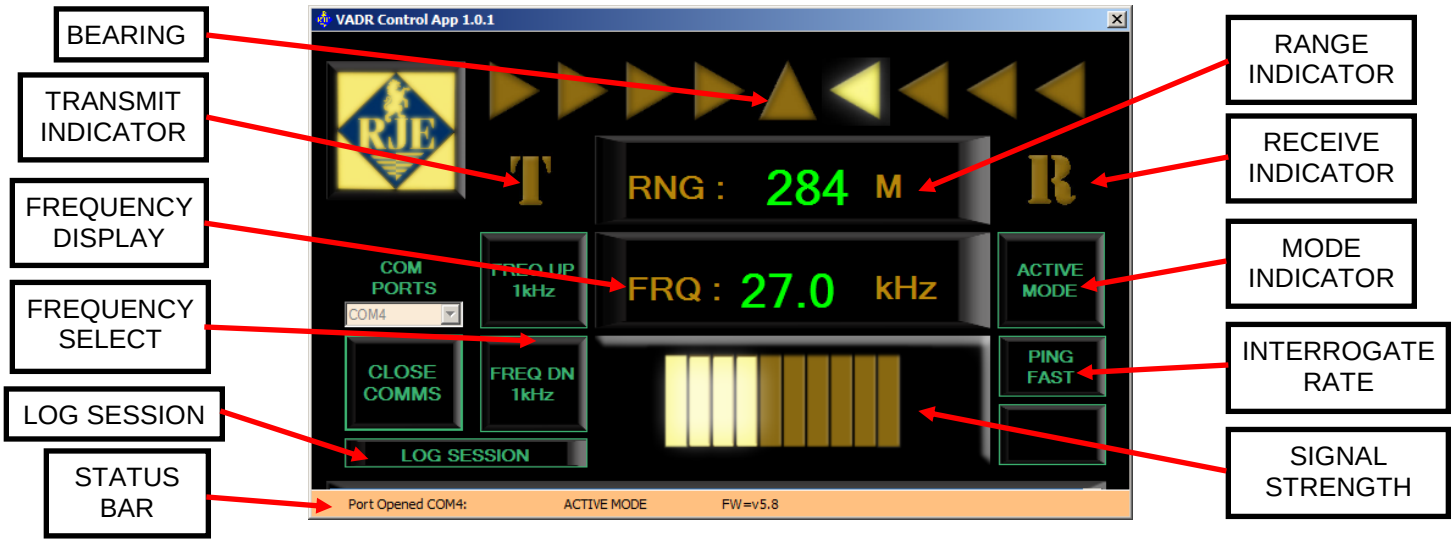
- It is highly recommended that the operator become familiar with the operation of the VADR Serial Control Application Software. Use an ATT-400, Legacy transponder or pinger on the bench in air for this training.



RJE International, Inc.
Tel: (949) 727-9399 | Fax: (949) 727-0070 | sales@rjeint.com | www.rjeint.com

3.7.2 Controls and Display of the VADR Serial Control Software.

- Active Mode Screen

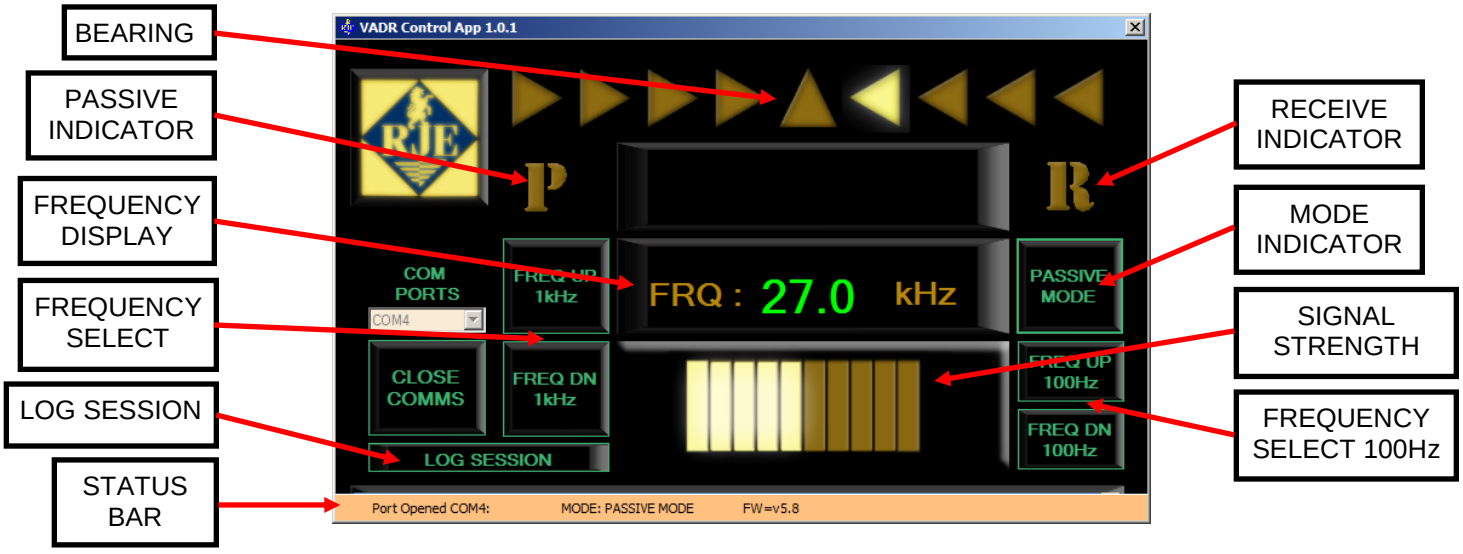


- Active Mode Display and Controls

DISPLAY	DESCRIPTION
▷▷▷▷△◁◁◁◁ **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 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 more than 20 degrees.

T	Marker flashes each time the Receiver sends an interrogation signal.
FRQ:	Frequency currently selected. 25kHz Legacy transponders, ATT-400 Channel Switch setting: 0=27.0 kHz 1=28.0 kHz 2=29.0 kHz 3=30.0 kHz 4=31.0 kHz 5=32.0 kHz 6=33.0 kHz 7=34.0 kHz.
FREQUENCY SELECT	Right click to raise or lower selected frequency by 1kHz.
LOG SESSION	Right click to open "save as" window.
STATUS BAR	Shows open COM PORT, current mode and firmware revision.
RXXXX:	Displays the Range in meters to the ATT-400 set to the selected Channel.
R	Indicator illuminates each time the Receiver receives an acoustic signal at the selected frequency.
MODE INDICATOR	Indicates current mode. Right click to change modes.
INTERROGATE RATE	Increases repetition rate from 1 pulse per second to 2 pulses per second
SIGNAL STRENGTH	Relative Signal strength (like bars on a cell phone)

- Passive Mode Screen

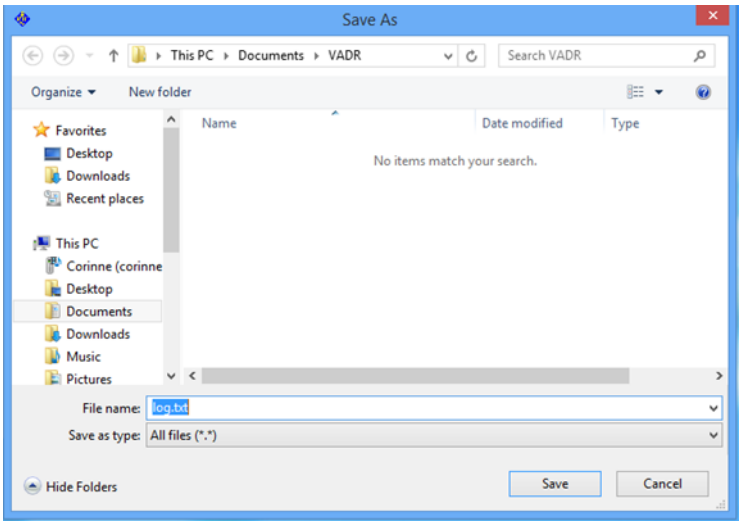


- Passive Mode Display and Controls

DISPLAY	DESCRIPTION
▷▷▷▷△◁◁◁◁ **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 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 more than 20 degrees.
P	Indicates Passive Mode.
FRQ:	Frequency currently selected from 8 kHz to 45 kHz.
FREQUENCY SELECT 1kHz	Right click to raise or lower selected frequency by 1kHz.
LOG SESSION	Right click to open “save as” window.
STATUS BAR	Shows open COM PORT, current mode and firmware revision.
R	Indicator illuminates each time the Receiver receives an acoustic signal at the selected frequency.
MODE INDICATOR	Indicates current mode. Right click to change modes.
FREQUENCY SELECT 100Hz	Right click to raise or lower selected frequency by 100Hz.
SIGNAL STRENGTH	Relative Signal strength (like bars on a cell phone).

3.8 Session Logging

To save a text file of the data, right click the Log Session button. A "Save As" window will open. Enter name of session file and select directory or folder for data storage file. The VADR outputs data strings. See section 3.9 Output Data Strings for more information.



3.9 Output Data Strings

Active Mode

In Active Mode" the VADR transmits a 26 kHz interrogate pulse to the ATT-400 once per second. Each time the system transmits it will output an ASCII string indication. The string will consist of a **'$T',** carriage return and linefeed, in the following format;

(Example String: $T<CR><LF>)

When the system detects a reply from a transponder corresponding to the selected receive channel it will output an ASCII string. The output string will consist of a **'$A'**, space, channel setting (frequency), space, bearing indication, space, range, space, signal strength level, space, AGC setting, gain, carriage return and linefeed, in the following format;

(Example String: $A, Fxx.x, Bn, Rxxxx, Sxx, Dxx, xxdB<CR><LF>)

RJE International, Inc.
Tel: (949) 727-9399 | Fax: (949) 727-0070 | sales@rjeint.com | www.rjeint.com

Table 3-1 Active Data Stream Format

Output String / Parameter	Corresponding Indication
$T<CR><LF>	Each time the system transmits.
$A(space)Fxx.x(space)Bn(space)Rxxxx(space)Sxx(space)Dxx(space)xxdB<CR><LF>	$A indicates a received ping was detected in Active mode. Fxx.x is the selected receive frequency in kHz. Bn represents the corresponding bearing indication. Rxxxx Represents Range to transponder in meters. Sxx is a relative measure of the received signal strength. Dxx is the AGC setting. xxdB is receiver gain.
Fxx.x = Selected receive frequency	xx.x = Receive frequency for selected channel. Frequencies correspond to channel number as follows; 0- 25kHz Legacy, ATT-400 Channel; 1-27.0kHz; 2-28.0kHz; 3-29.0kHz; 4-30.0kHz; 5-31.0 kHz; 6-32.0 kHz; 7-33.0 kHz; 8-34.0 kHz
Bn = Corresponding bearing indication	Bn = 00 (zero zero), target is dead ahead. B = L for left of target. B = R for right of target. n = Numbers 1 to 4 indicating the magnitude of the bearing angle as follows: 1 – Bearing is as much as 3 degrees off target. 2 – Bearing is as much as 8 degrees off target. 3 – Bearing is as much as 20 degrees off target. 4 – Bearing is off by greater than 20 degrees.
Rxxxx = Range to transponder in meters	xxxx = 000 – 1000 meters
Sxx = Relative Signal strength (like bars on a cell phone)	xx = Numbers 1-10 indicating the relative magnitude of the detected ping - 1 being minimum detectable and 10 being receive limit or saturated.
Dxx	AGC setting
xxdB	Receiver Gain in dB

Passive Mode

When the receiver detects a ping in "Passive Mode", it will output an ASCII data string. The output string will consist of a '$P', space, channel setting (frequency), space, bearing indication, space, signal strength level, space, AGC setting, space, gain, carriage return and linefeed, in the following format;

(Example String: $P, Fxx.x, Bn, Sxx, Dxx, xxdB<CR><LF>)

Table 3-2 Passive Data String Format

Output String / Parameter	Corresponding Indication
$P(space)Fxx.x(space)Bn(space)Sxx(space)Dxx(space)xxdB<CR><LF>	P indicates a received ping was detected in Passive mode. Fxx.x is the selected receive frequency in kHz. Bn represents the corresponding bearing indication. Sxx is a relative measure of the received signal strength. Dxx is the AGC setting. xxdB is receiver gain.
Fxx.x = Selected receive frequency	xx.x = Receive frequency in kHz; 8.0kHz to 45.0kHz in 100Hz increments
Bn = Corresponding bearing indication	Bn = 00 (zero zero), target is dead ahead B = L for left of target. B = R for right of target. n = Numbers 1 to 4 indicating the magnitude of the bearing angle as follows: 1 – Bearing is as much as 3 degrees off target. 2 – Bearing is as much as 8 degrees off target. 3 – Bearing is as much as 20 degrees off target. 4 – Bearing is off by greater than 20 degrees.
Sxx = Relative Signal strength (like bars on a cell phone)	xx = Numbers 1 – 10 indicating the relative magnitude of the detected ping - 1 being minimum detectable and 10 being receive limit or saturated.
Dxx	AGC setting.
xxdB	Receiver Gain in dB

3.10 Controlling The VADR Receiver with TTY Terminal

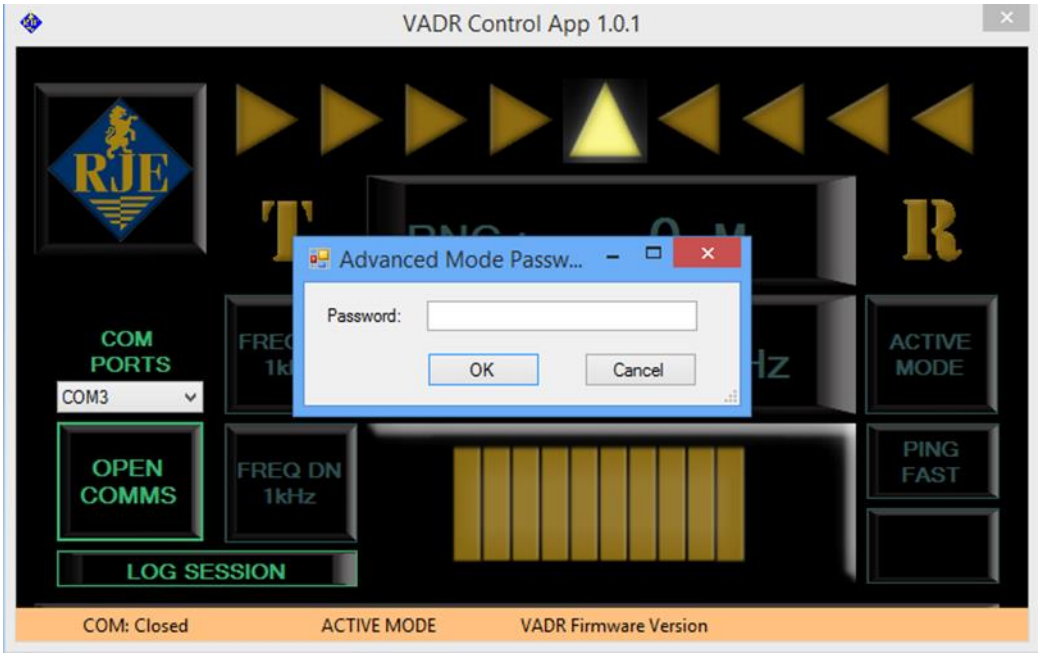
The VADR receiver is accessed through a RS232 communications protocol that allows the operator to control the functions of the receiver and monitor the tracking data.

Control functions include: adjusting the receive frequency, changing mode from active to passive, and setting AGC. The VADR receiver will also provide tracking data that includes: range and bearing to an ATT-400 transponder in active mode or signal strength and bearing to an acoustic sound source that is operating from 8 kHz to 45 kHz in passive mode.

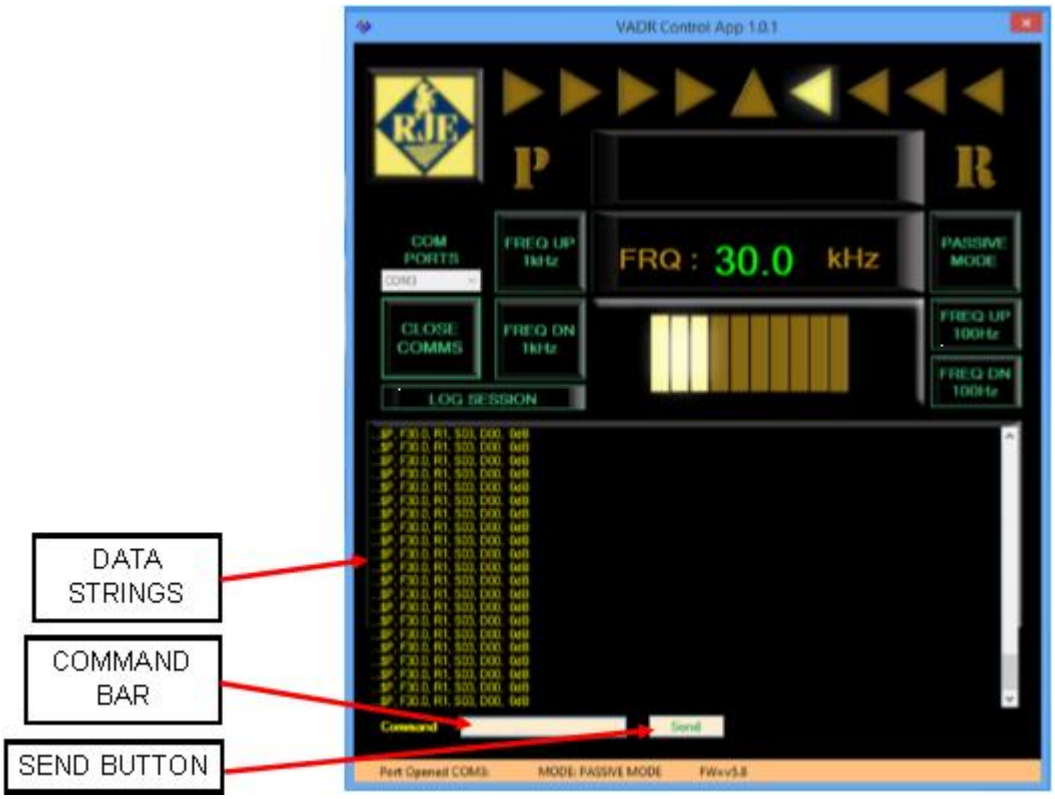
The input or output is an ASCII data string that allows the operator to use PuTTY, a common terminal program, to connect to the VADR receiver and to incorporate coding into the existing software package. To operate the VADR via ASCII commands, switch to Advanced Mode.

Control Application Software Advanced Mode.

Right click the RJE logo on the VADR Control App window. Enter – VADR – at the password window and click OK.



Observe Advanced Mode Screen.



User commands are sent via the RS232 interface. The commands consist of single ASCII characters which are processed immediately. Enter ASCII characters in the command bar and click the send button. Observe data in the data strings window. See Table 3-3 User ASCII Commands.

The procedures for operating the VADR receiver are quite simple when using Advanced Mode or a terminal program like PuTTY. The unit's output string parameters 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.

- Use the 1-8 key 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 output for an indication of a received signal and a bearing to the transponder.
- View the **Rxxxx**: parameter in the output string to acquire an accurate range to the target.

- When moving towards the target, monitor the range and bearing on the VADR output.
- 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 VADR up and down to see if there is a change in the range.
- Use the 1-8 keys to obtain range and bearing to target transponders operating at other frequencies.

Table 3-3 User ASCII Commands

KEYSTROKE	DESCRIPTION
A	Sets ACTIVE MODE
P	Set PASSIVE MODE
1-8	FOR ACTIVE MODE ONLY: Selects receive channel for the ATT-400 being tracked. 1 = CH1(27 kHz), 2 = CH2(28 kHz), 3 = CH3(29 kHz, 4 = CH4(30 kHz), 5 = CH5(31 kHz), 6 = CH6(32 kHz), 7 = CH7(33 kHz), 8 = CH8(34 kHz)
K	FOR PASSIVE MODE ONLY: Increases receive frequency in 1 kHz increments. In the range of 25kHz to 45kHz.
L	FOR PASSIVE MODE ONLY: Decreases receive frequency in 1 kHz increments. In the range of 25kHz to 45kHz.
.	FOR PASSIVE MODE ONLY: Increase receive frequency in 100 Hz increments.
%	Sets AGC to automatic mode
$	Sets AGC to manual mode
G	Increase AGC gain in manual mode
H	Decrease AGC gain in manual mode

3.11 Pre-deployment Setup and Check-out

Testing the VADR receiver before mounting

- Each VADR receiver comes with a test cable for testing the system prior to mounting on a vehicle. When receiver is mounted on a vehicle, the test cable can be used to verify the system operation and RS232 communication.

- Connect the test cable to the VADR receiver and a PCs' COM or USB port via the RS232 Adapter. Insure that the VADR Serial Control Application software is loaded on the PC being used.

- Turn the Test Cable on via the switch on the junction box. The receiver is powered up and the RS232 communication port is open.

- On the PC, Initialize the VADR Serial Control Application software and select the proper COM port. The VADR receiver should now be communicating with the PC.

- Select an ATT-400 or acoustic pinger operating between 25 kHz and 45 kHz for testing purposes. Activate the pinger or transponder, place it a few inches in front of the receiver hydrophone and verify the VADR Serial Control Application software is tracking the signal.

Pre-deployment - Test VADR receiver when mounted on vehicle

WARNING: REVIEW SECTION 3.4 AND VEHICLE WIRING DIAGRAM - VERIFY CONNECTOR PIGTAIL POWERING THE VADR HAS BEEN WIRED PROPERLY.

- Inspect the installation for loose or missing hardware and proper transducer orientation. Inspect pressure housing of the receiver to insure that end caps are secure.
- Perform an in-air check of the VADR receiver by using the following sequence:
    - Turn the receiver on via the vehicles power supply.
    - Connect the VADR RS232 port to a computer with a serial terminal application set to communicate at 9600, N, 8, 1 or the VADR Serial Control Application Software, via the vehicles umbilical.
    - Select an ATT-400 or acoustic pinger operating between 25 kHz and 45 kHz for testing purposes. Activate the pinger or transponder and place it a few inches in front of the receiver hydrophone and verify the receiver is tracking the signal.

Section

4

VADR VEHICLE ACOUSTIC DIRECTIONAL RECEIVER

Maintenance

Upon completion of each mission, take these steps to assure continued reliable performance from the VADR System components.

- Turn the equipment OFF by disabling the external power source.
- 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.