



# Two-Diver Air Intercom (P/N 415-107)

## User Guide

**Part #: 100-400**

Kirby Morgan Dive Systems, Inc.

1430 Jason Way, Santa Maria, CA 93455

Phone: 805/928-7772 Fax: 805/928-0342

[www.kirbymorgan.com](http://www.kirbymorgan.com) E-mail: [kmddsi@kirbymorgan.com](mailto:kmddsi@kirbymorgan.com)

Kirby Morgan, SuperLite<sup>®</sup>, BandMask, Band Mask, KMB, KMB-Band Mask, DSI, Diving Systems International, EXO, REX<sup>®</sup>, SuperFlow<sup>®</sup> and DECA are all registered trademarks of Kirby Morgan Dive Systems, Inc. **Use of these terms to describe products that are not manufactured by KMDDSI is illegal.**

© MMXIV Kirby Morgan Dive Systems, Inc. All rights reserved. This manual is made available for the express use of owner of this Kirby Morgan product. No part of this manual may be reproduced, stored in any retrieval system, or transmitted, or used in any form or by any means, whether graphic, electronic, mechanical, photocopy, or otherwise by technology known or unknown, without the prior written permission of Kirby Morgan Dive Systems, Inc.

Document # 140801004

## *Limited Warranty*

The KMDSI Two-Diver Air Intercom is fully warranted against defects in materials and workmanship for a period of 90 days from the time of purchase. Our obligation under this warranty is limited to the replacing of any part or parts which prove to our satisfaction to have been defective, and which have not been misused or carelessly handled. Labor is warranted for 90 days from time of purchase. The complete unit and/or part must be returned to our factory, transportation charges prepaid. We reserve the right to decline responsibility where repairs have been made or attempted by other than a KMDSI factory-trained service center or properly trained personnel. In no event shall KMDSI be liable for consequential damages

## **Definition of Signal Words Used in this Manual**

For your protection, pay particular attention to items identified by signal words in this manual. These terms are identified as, CAUTION, WARNING and DANGER. It is especially important for you to read and understand these sections.

### **DANGER**

**This word indicates an imminently hazardous situation, which if not avoided, could result in death or serious injury.**

### **WARNING**

**This word indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.**

### **CAUTION**

**This word indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.**

# Table Of Contents

Definition of Signal Words Used in this Manual .....	2
<b>Section 1</b> Important Information—Please Read! .....	4
<b>Section 2</b> Introduction .....	5
<b>Section 3</b> Equipment Specifications.....	6
<b>Section 4</b> Panel Functions .....	7
<b>Section 5</b> Controls And Connections: .....	8
<b>Section 6</b> Maintenance & Troubleshooting Diver Radio Field Check Procedures:.....	11

## Illustrations

Figure 1 Controls/Connections Panel.....	7
<b>Figure 2</b> 2-Wire Mode.....	17
<b>Figure 3</b> 4-Wire Mode.....	18
<b>Figure 4</b> Blowaparts/Parts List.....	19

### **WARNING**

**Follow all the instructions in this manual carefully and heed all safety precautions. Improper use of this diving mask could result in serious injury or death.**

### **WARNING**

**Diving is a life threatening occupation. Even if you do everything right you can still be killed or injured. None of the models of Kirby Morgan helmets or masks can prevent accidents, injuries or death due to improper training, poor-health, improper supervision, improper job requirements, improper maintenance or acts of God.**

If you have any questions concerning this manual, contact KMDSI (805) 928-7772 or by Email at [kmdsi@kirbymorgan.com](mailto:kmdsi@kirbymorgan.com) or Dive Lab Inc. (850) 235-2715 or at [divelab@divelab.com](mailto:divelab@divelab.com)

# Section 1

## Important Information—Please Read!

Your new KMDSI Two-Diver Air Intercom represents state-of-the-art technology and innovation—the choice of discriminating divers throughout the world. Please take the time to read this owner’s manual. With proper care and use, your communicator will provide you with the ultimate in high-quality communications.

The following guidelines and illustrations are presented to assist you. If you still need additional information, do not hesitate to confer with your local KMDSI dealer or representative. If you are not able to adequately obtain service, contact KMDSI.

# Section 2

## Introduction

The KMDSI communicator is a compact, self-contained, Two-Diver Air Intercom providing 2- or 4-wire communications between the operator and one or two divers. *Please note that standard 4-wire cable is necessary when using this product in the 4-wire mode.*

This manual covers Specifications, Operating Instructions, 2-Wire or 4-Wire Communications, Batteries, and Warranty Information.

# Section 3

## Equipment Specifications

### Model 415-107 Specifications

#### Electrical

Input Impedance (Each Input)	250 Ohms
Frequency Response	300 - 10000 Hz
Common Mode Rejection	40 dB Minimum
Current Drain	Maximum Full Volume 3 Amps Minimum Quiescent 0.25 Amps
Output Impedance	4 Ohm
Sensitivity (Input)	16 mV <sub>RMS</sub>
Output Power (RMS @ 4 Ohm Load, 12 VDC)	20 Watts Audio
External Power Supply Voltage	12 VDC non regulated supply (9-18 VDC operating supply)
Internal Battery Voltage	12 VDC
Battery Life (Using 12V 7Ah battery)	Approx. 20 Hours

#### Mechanical

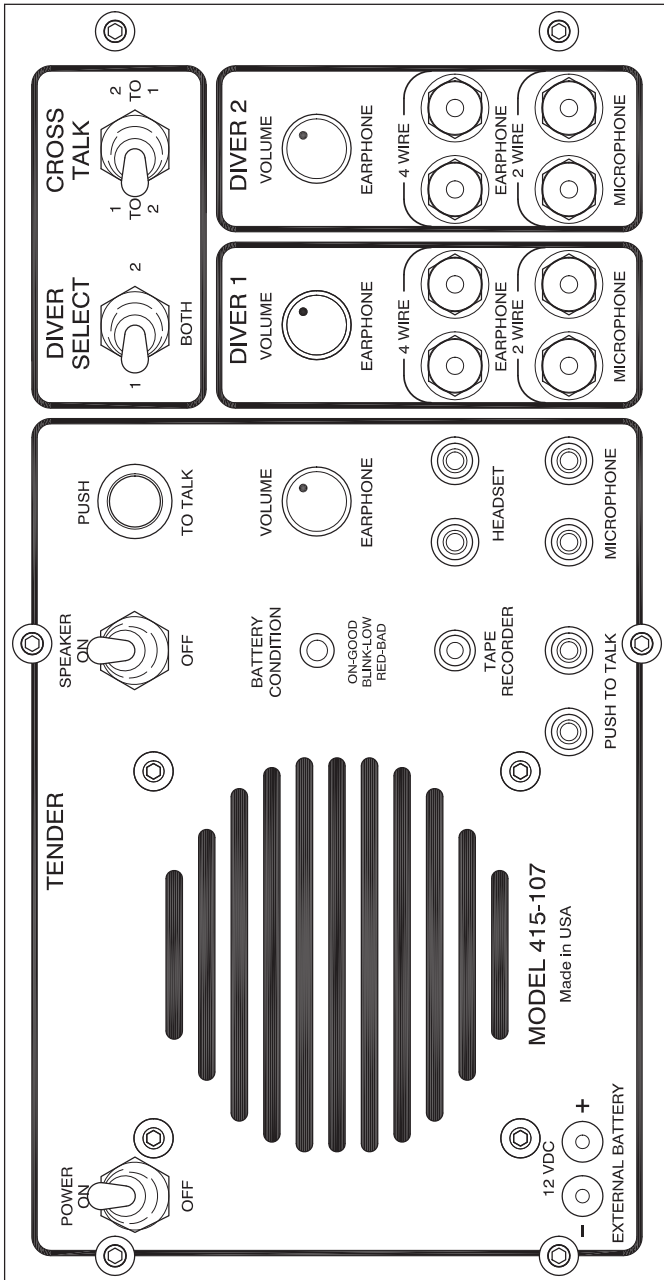
Front Panel Material	Aluminum 6061-T6
Front Panel Finish	Gold Chemfilm Base with Polyurethane Top Coat

#### Dimensions

Length	11.30 In. (28.7 Cm)
Width	6.13 In. (15.6 Cm)
Depth	2.25 In. (5.7 Cm)
Weight	3.66 Lbs. (1.66 Kg)

# Section 4 Panel Functions

Figure 1  
Controls/Connections Panel



## Section 5

# Controls And Connections:

Before using the KMDSI 415-107 Diver Communication System, you should familiarize yourself with its operating controls and connections. Improper use of controls and connections will deprive the user of the full benefits of this communication system

## Tender Controls

**Power Switch**—Applies power to the unit from internal batteries or from external source.

**Speaker Switch**—Turns panel speaker and microphone on/off. It may be necessary to turn speaker off when using a headset to prevent feedback

**Push To Talk All Divers Switch**—This Switch allows tender to divers communication in 2-wire mode. (No push to talk is required when operating in 4-wire mode, if using a headset/boom microphone combo). In 4-Wire mode, this switch allows the tender to interrupt divers with a priority message; all divers will be listening.

**Earphone Volume**—Controls panel speaker and/or tender headset volume. Use as master volume control, clockwise increases volume.

**Battery Condition Indicator**—Steady GREEN light indicates battery voltage level is good. Blinking GREEN light indicates battery voltage is approaching a low level. Steady RED light indicates battery voltage is below the level necessary to guaranty proper operation.

### **WARNING**

**When Battery Condition indicator is steady RED light, communication will stop.**

**Panel Speaker**—5 inch round speaker, operates when Speaker Switch is ON.



## **Tender Connections:**

**Headset Jack (output/input)**—Is a dual banana jack (color coded black) connection for headset earphones or external remote speaker. It functions as an earphone (output) and a microphone (input) when PTT switches depressed. In 2-wire mode of operation both headset microphone and earphones are plugged into this jack, conversation (up-link & down-link) are switched automatically when push to talk switch is actuated. In Simulcom mode this jack is earphone only, both up-link & downlink conversations are heard.

**Microphone Jack (input)**—Is a dual banana jack (color coded red) connection for the headset microphone. Tender microphone volume control adjusts the sensitivity of the input.

**Push To Talk Jack**—Is a dual banana jack (color coded yellow) connection for remote keying of push to talk.

## **Diver Controls:**

**Earphone Volume**—Controls diver's earphone signal, therefore control diver's hearing volume from tender and to all divers. Each diver circuit has its own volume control.

**Diver Select**—Allows the tender to control communications to either diver 1, diver 2, or both divers. The diver select switch functions in both 2-wire and 4-wire operation and cuts both the microphone and earphone for the diver not selected.

**Cross Talk**—Allows divers to cross talk in the 2-wire mode only.

## **Diver Connections:**

In the 2 wire mode of operation, if the communication wire has 2 sets of 2 pin banana plugs, both diver microphone and earphone banana plugs are stacked

## *Controls And Connections*

into the umbilical microphone jack (red binding posts). Conversation's (up-link & down-link) are switched automatically when push to talk switch is actuated.

In the 4-wire mode, only the diver microphone banana plug is connected into the umbilical microphone jack.

**EARPHONE Jack (output)**—4 Wire - This connector is dual 5-Way Binding Post Jack (color coded black). It is the connection point for the diver's earphone when operating in the 4-wire mode.

## **Other Connections:**

**External Battery - (Input)**—External 12 VDC non-regulated power input, to operate the unit from an external power source. Power requirements are not less than 11 or more than 18 volts. The External Battery Input Jacks are used for charging the internal battery.

### **WARNING**

**When using an external power source, it is required to use an isolated DC power supply that has very low ripple voltage. It has to be properly isolated from AC line for diver protection and safety. An improperly isolated power supply could cause diver electric shock. This could lead to serious personal injury or death.**

**Tape Recorder**—provides an isolated output, of both diver and tender conversations (balanced), suitable to drive a tape recorder or audio input of a VCR. This feature allows recording of conversations between diver and tender.

## **Section 6**

# **Maintenance & Troubleshooting**

### **Diver Radio Field Check Procedures:**

The following procedures are a step by step procedure to do a functional check of your radio, using only a headset. These steps check all communication functions of the radio in both 2 & 4- wire modes. This means that if your radio checks with these steps, any communication problems must be somewhere else in the system, such as umbilical, connections, speakers, and/or microphone.

### **Quick 4-Wire Mode Check:**

This brief procedure checks diver radio functions in the 4-wire mode: set all volume controls at mid-scale, turn unit on.

#### **Tender Circuit Check:**

1. Identify headset microphone lead and headset earphone lead. The microphone plug is red. The earphone plug is Black.
2. Plug in headset microphone to tender microphone (input) and headset earphone to tender headset (output). You should be able to hear yourself talk. This verifies Tender circuit.
3. Move headset microphone to Diver 1, microphone (input) and headset earphones to Diver 1 earphone (output). You should be able to hear yourself talk. This verifies Diver 1 circuit.
4. Move headset microphone to Diver 2, Microphone (input) and headset earphones to Diver 2 earphone (output). You should be able to hear yourself talk. This verifies Diver 2 circuit

The basic 4-wire function of the diver radio has now been checked.

### **Comprehensive 2 & 4-Wire Check**

Set all volume controls at mid-scale and turn power on.

#### **Tender Circuit Check:**

1. Identify headset microphone lead and headset earphone lead. Plug into dual banana jack adapters. (The microphone plug is red.)

## *Maintenance & Troubleshooting*

2. Plug headset earphone into Tender, Headset (output) and the headset microphone into Tender, Microphone (input).
3. Turn power on, speaker off.
4. Put on headset and speak into microphone, listening for your own voice.
5. Adjust tender volume, and check that controls respond and there is adequate volume. If you can talk to yourself, then tender circuit is operating properly

### **Diver 1 Downlink Check**

6. Move Headset microphone plug to tender Headset jack and move headset earphone plug to Microphone jacks, Diver 1.
7. Talk into headset while pressing the Push To Talk switch. You should be able to talk to yourself with plenty of volume as long as the “Push To Talk, all Divers” switch is depressed. This verifies 2-wire communication from tender to Diver 1.
8. Move headset earphone plug from Microphone (input) Diver 1 to Earphone (output) Diver 1.
9. Talk into headset. There should be plenty of volume. This checks earphone output for diver 1

### **Diver 2 Downlink Check**

10. Move Headset microphone plug to tender Headset jack and move headset earphone plug to Microphone jacks, Diver 2.
11. Talk into headset while pressing the Push To Talk switch. You should be able to talk to yourself with plenty of volume as long as the “Push To Talk, all Divers” switch is depressed. This verifies 2-wire communication from tender to Diver 2.
12. Move headset earphone plug from Microphone (input) Diver 2 to Earphone (output) Diver 2.
13. Talk into headset. There should be plenty of volume. This checks earphone output for diver 2 in the 4-wire mode

## **Tender's Speaker Downlink Check**

14. Unplug headset from Microphone (input) and turn Speaker on. Press Push-To-Talk switch and talk into speaker. You should hear yourself in headset earphones

**This verifies speaker section.**

15. Turn speaker off.

## **Diver 1 Up-link Check**

16. Place headset microphone into the Diver 1 Microphone jacks (input) and the headset earphone plug into the Tender Headset jacks (output).

17. Talk into headset. You should hear yourself in the headphones with plenty of volume.

**This verifies Diver 1, Microphone (input).**

## **Diver 2 Up-link Check**

18. Move headset microphone into Microphone (input) Diver 2.

19. Talk into headset. You should hear yourself in the headphones with plenty of volume.

This verifies Diver 2 Microphone (input).

# **Problems And Their Possible Causes**

## **Unit Not Operating**

Check to see that unit is turned on, (speaker and headset switch). Check that battery condition indicator is steady green (ok). Check to see that connections are proper, correct if necessary. Use diver radio field check procedure to determine if problem is within the unit or elsewhere within the communication system. Check to see that the P.C. Card connectors are properly seated, there should be no gap between the bottom of the connector housing and the connector header on the circuit card. Check that connectors are installed correctly, (headers are not offset left or right). Push connector down and recheck.

A great number of problems are very simple failures and can often be found by a very careful and close inspection of the unit or system. Logical deductions and equipment familiarity can often reduce the suspected area to just one component or circuit. Often upon examination, clues are revealed which can also aid in

## *Problems And Their Possible Causes*

locating and correcting the problem. Visual inspections should include checking all screws for tightness, all solder joints for correctness, broken parts, corrosion, electrolysis, foreign material, check connectors for proper insertion and alignment. Check to see that unit is turned on, speaker on.

Check that battery condition is ok, (battery condition indicator). Operate from line voltage or charge batteries, depending upon options.

Check to see that connections are proper, correct if necessary.

Check operating voltage, using a digital voltmeter or equivalent, measure the voltage across the yellow push to talk jacks on the front panel. The voltage must be greater than 9 volts D.C. for the unit to operate reliably.

### **Low Volume**

Check volume control settings, adjust if desired. Check diver connections, correct if bad. Use diver radio field check procedure. Check for low batteries.

### **Garbled Voice to Diver**

Tender volume to diver is set too high – reduce diver earphone volume. Divers earphones corroded or defective, replace same. Tender's microphone (speaker) defective or full of moisture, empty water out of speaker or replace tender headset. Check diver communication cable and connections.

### **Garbled Voice to Tender**

The diver volume to tender is set too high; reduce tender volume. Tender's headset is marginal, speaker has water in it, or diver's microphone is marginal, damaged communication cable or connections. Substitute with known good units to determine exact problem and correct.

### **Diver Cuts Out**

Check for intermittent connection, substitute system components with known good units to determine exact problem and correct fault.

### **Connections:**

Most diver communications problems are caused by bad connections. The time spent in making good connections will result in years of good communications.

All connections must be soldered to last for any period of time. Copper wire must be tinned as a minimum, it is strongly suggested that dual banana plugs be used for topside connections. This provides a convenient and secure connection which will last for several years if treated with a reasonable amount of care.

All cable splices must be soldered, splices should be staggered, covered with shrink tubing preferably shrink tubing with an adhesive sealant, and a general splice cover to protect the connections. Potting of splices is a very good and professional approach, however not necessary to create a reliable splice.

### **Push To Talk Does Not Function But Tender Hears Diver (2-Wire Mode)**

Check connection to tender headset microphone if used. Check battery condition indicator to be steady green. It could be a broken wire on the switch terminals or a bad connection with PC card.

### **Diver Hears Tender But Tender Cannot Hear Diver, Or Volume Is Very Low**

Check to see if diver is connected to microphone and not earphone. Check to see that volume levels are not turned down. Inspect diver connections, hat components.

### **Feedback in 4-Wire Mode**

Check orientation of cable wiring, earphone and microphone wire pairs should be opposing wires.

These situations may cause feedback, tender's speaker on while headset is connected, unused diver communications connected to system, damaged communications cable or connections, (open or shorted wires or connections). Resistance for a new cable should be in excess of 10 Meg ohms.

In a situation where the communication cable is damaged, reduce volume to diver as low as possible (reduce side-tone), or go to 2-wire operation until cable can be repaired.

Feedback can be caused by leakage between the microphone and earphone wires in the umbilical better know as a cross coupling signal between umbilical wires. Adjust the diver volume to determine which umbilical has cross coupling signal between wires. Rotate the earphone banana plug (black) 180 degrees on the

## *Problems And Their Possible Causes*

communicator as this it may stop the feedback. NOTE: Amron's CC1 communication cable has been specially designed and tested for this communicator.

### **Distortion**

This can be caused by several conditions – Volume is adjusted too high, system is on the verge of feedback, marginal components (earphones or microphone). Check by substitution, replace defective component. Note: when operating with a standby diver who does not have his hat/helmet on, acoustic feedback or distortion may occur. Correct by turning his volume down or disconnecting his communication cable (at least his microphone, which will reduce overall system noise).

### **⚠ CAUTION**

**Should it become necessary to replace the 12V battery, be sure to connect the RED wire to the Positive terminal and the BLACK wire to the Negative terminal. There is a fuse F1 in the amplifier card. When reversing internal battery terminals, this fuse will blow to protect the electronic circuits and wiring from being damaged. F1 fuse is replaceable with 3.15A-250V Slow Blow Micro Fuse**

### **Low Battery Indication**

If battery voltage is low, then charge battery for a minimum of 24 hours. Battery will charge anytime the unit is plugged by external DC power supply. The preferred method to charge the battery is with power off. The charger circuit is designed to maintain the battery at full charge during normal operation, and power can be left on without damage to the battery.

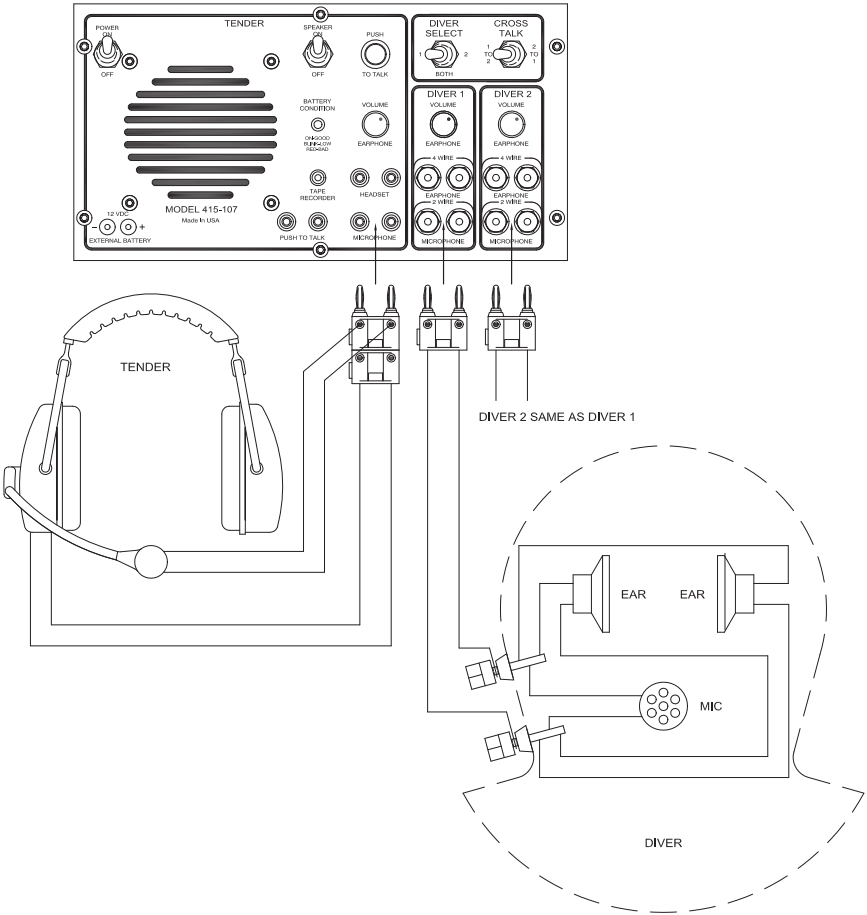
The battery voltage can be checked by measuring across the yellow jacks on the front panel. Turn the unit on and disconnect external DC power supply.

The voltage at full charge with the external DC power is on should be between 13.4 and 14.5 volts. With the external DC power is off, a fully charged battery should be between 11.75 and 12.75 volts. The battery voltage of a discharged battery is 10.0 volts; the battery should not be operated below this point as permanent damage will occur.



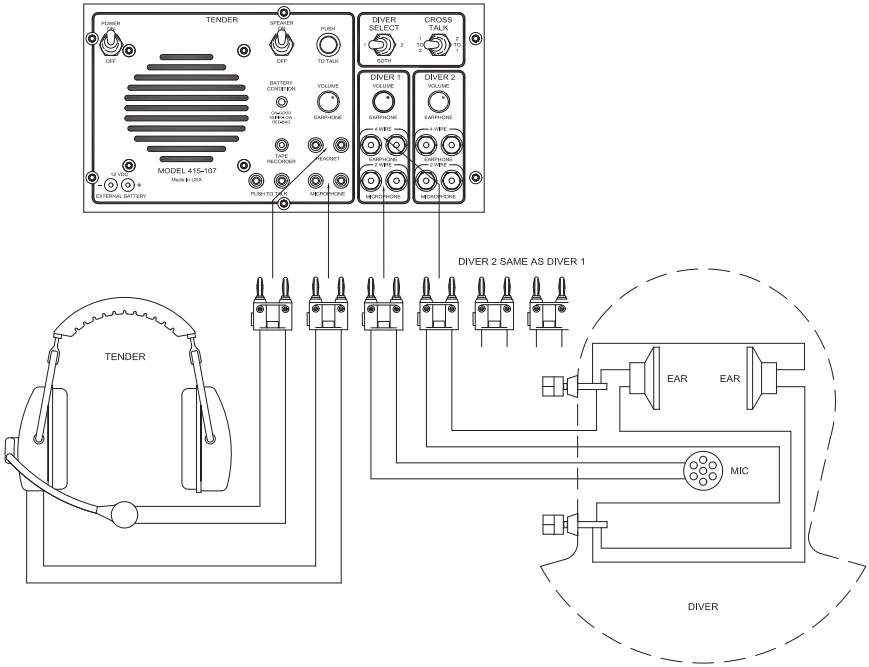
**Figure 2**  
2-Wire Mode

## 2-WIRE MODE



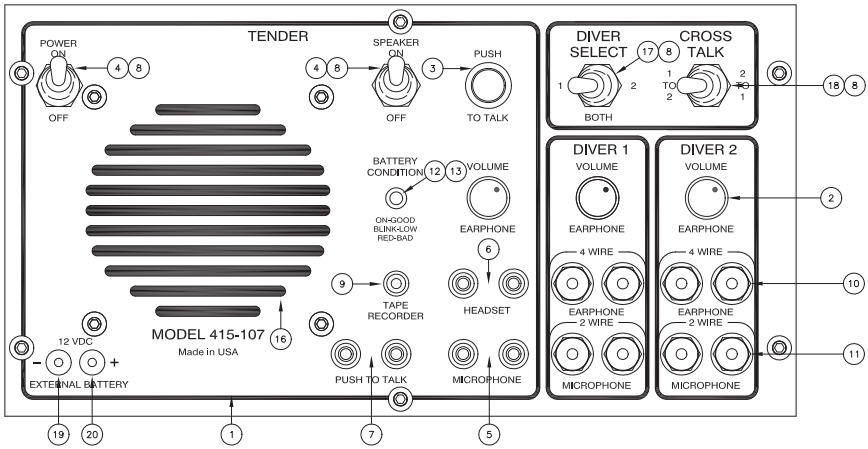
**Figure 3**  
4-Wire Mode

## 4-WIRE MODE



# Contact Amron For Parts

Figure 4  
Blowaparts/Parts List



The part numbers mentioned below refer to Amron International's part numbers and **NOT** KMDSI's part numbers. Please refer to Amron's website, [www.amronintl.com](http://www.amronintl.com) or contact through phone at 760-208-6500 for ordering information.

## 415-107 Communicator

Ref.	Qty.	Part No.	Description
n/a	1	2832-202-04	PC Card Assembly, Model 415-107
n/a	1	415-107-400	Front Panel Assembly with Wiring

## 415-107-400M Front Panel Assembly Parts List

Ref.	Qty.	Part No.	Description
1	1	415-107-001	Front Panel, Model 415-107
2	3	P16NP-10K	Potentiometer, 10K ohm
3	1	PBSWITCH	Switch, Push Button
4	2	7580K6	Switch, Toggle, SPST
5	2	1498-102	Jack, Banana, Red
6	2	1498-103	Jack, Banana, Black
7	2	1498-107	Jack, Banana, Yellow
8	4	5168	Seal, Toggle Switch
9	1	ME161-2003	Jack, Tape Recorder
10	4	14002B	5-Way Binding Post, Black
11	4	14002R	5-Way Binding Post, Red
12	1	579-80214	Clip, Panel Mount LED
13	1	LT2462-24-D51	LED, Bi-Color Red/Green
14	4	8-32X1/2HSBHC	Screw, 8-32 X 1/2 Button Head S/S
15	4	8NUTSSL	Nut, Locking, 8-32 S/S
16	1	JC5WI-PS	Speaker, 5", 8 ohm
17	1	9000-5068	Switch, Diver Select
18	1	6GM5L-73	Switch, Cross Talk
19	1	105-0602-001	Jack, Red External Power
20	1	105-0603-001	Jack, Black External Power