

User Manual  
For  
Amron International, Inc.

**Model 2830R/24/XX  
Three Diver Rack Mount Communicator**

S/N \_\_\_\_\_



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# TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION AND SPECIFICATIONS .....</b>	<b>1</b>
1.1	Introduction.....	1
1.2	Electrical Specifications .....	1
1.3	Mechanical Specifications.....	1
1.4	Amcom III Model 2830R/24 Diver Communicator.....	2
<b>2</b>	<b>WARRANTY AND SERVICE POLICY .....</b>	<b>3</b>
2.1	Limited Warranty .....	3
2.2	Service Policy.....	3
<b>3</b>	<b>OPTIONS AND ACCESSORIES.....</b>	<b>4</b>
3.1	Options .....	4
3.2	Accessories .....	4
<b>4</b>	<b>TENDER AND DIVER CONTROLS AND CONNECTIONS.....</b>	<b>7</b>
4.1	Tender Controls .....	7
4.2	Tender Connections.....	8
4.3	Diver Controls.....	9
4.4	Diver Connections.....	9
4.5	Other Connections .....	10
4.6	Option Controls: Call Indicator – 4002 .....	10
4.7	Option Controls: Helium Speech Unscrambler /26DSP3.....	11
4.8	Option Controls: Wireless Tender /28A Option.....	11
4.9	Drawing, 2-Wire Connections .....	13
4.10	Drawing, Full Duplex (4-Wire) Connections.....	14
4.11	Drawing, Push-To-Talk Microphone Connections .....	15
4.12	Drawing, Operator Connections, Headset .....	16
<b>5</b>	<b>INSTALLATION AND OPERATION.....</b>	<b>17</b>
5.1	Operation.....	17
5.2	AC Power .....	17
5.3	Modes Of Operation .....	17
5.4	Volume Controls – 2-Wire.....	19
5.5	Other Diver Controls – 2-Wire.....	20
5.6	Volume Controls 4-Wire .....	20
5.7	Other Tender Controls .....	21
5.8	Options .....	22
<b>6</b>	<b>MAINTENANCE AND TROUBLESHOOTING .....</b>	<b>24</b>
6.1	Diver Radio Communicator Check Procedures .....	24
6.2	General Maintenance.....	25
6.3	Recommended Maintenance Schedule .....	26
6.4	Troubleshooting .....	27
<b>7</b>	<b>FULL DUPLEX (4-WIRE) - WHAT, WHY AND HOW .....</b>	<b>31</b>
7.1	What Are 2-Wire And 4-Wire Modes?.....	31
7.2	What Is Full Duplex (4-Wire)? .....	32
7.3	Why Full Duplex (4-Wire)? .....	33
7.4	How Do You Use Full Duplex (4-Wire)? .....	33

<b>8</b>	<b>DRAWINGS AND SCHEMATICS.....</b>	<b>35</b>
8.1	Schematic 2830R/24.....	36
8.2	Schematic Option /26DSP3.....	37
8.3	Schematic 28A Wireless Tender Option.....	38
8.4	Schematic -4002 Chamber Lock Call Option.....	39
8.5	Parts Identifier, Front Panel Model 2830R/24.....	40
8.6	Parts Identifier, Options /26DSP3, /28A, -4002.....	41
<b>9</b>	<b>PARTS LIST GENERAL.....</b>	<b>42</b>
9.1	Amcom III Rackmount Model 2830R/24.....	43
9.2	Amcom III Rack Mount, Unscrambler 2830R/24/26DSP3.....	43
9.3	Amcom III Model – 4002 Option.....	43
9.4	Sub Assembly 2830R-400M, Front Panel Assembly.....	43
9.5	Sub Assembly 2830R/26-400M-DSP3, Front Panel Assembly.....	44
9.6	28XXR-FS-01 Spares Kit For 2830R/24.....	45
9.7	Optional Spares.....	45

## 1 INTRODUCTION AND SPECIFICATIONS

### 1.1 Introduction

The 2830R/24 AMCOM III Rack Mount Diver Communicator is a full featured, three-diver, hardwire communicator that uses state-of-the-art electronics to provide clear and reliable communications. The 2830R24 is designed for integration into a standard 19 inch equipment rack and all necessary connections can be made via the front panel jack or rear mounted MS connector.

For maximum safety and to enjoy all the features of the 2830R/24, it is important that the tender read and understand the entire manual, including all warnings, before first use.

### 1.2 Electrical Specifications

Input Impedance (Microphone Inputs) .....	250 Ohms
Frequency Response .....	300 – 10,000 Hz
Common Mode Rejection (minimum) .....	40 dB
Current Drain Maximum Full Volume .....	3 Amps
Typical Quiescent .....	250 mAmps
Minimum Load Impedance .....	2 Ohms
Input Voltage Range .....	90 – 264 VRMS
Input Voltage Frequency Range .....	47 – 440 Hz
Nominal Power Supply Voltage .....	12 V <sub>DC</sub>
Operational Supply Voltage .....	9 - 18 V <sub>DC</sub>
Sensitivity (Input) .....	1.6 mVRMS
Maximum Output Power (4 Ohm Load, 14 V <sub>DC</sub> ) .....	20 Watts
Battery Life (typical) .....	10 Hours

### 1.3 Mechanical Specifications

Panel .....	Anodized Brushed Aluminum
Enclosure .....	Black Anodized Aluminum

#### DIMENSIONS

Length .....	12.5 in. (31.8 cm)
Width .....	19.0 in. (48.2 cm)
Height .....	7.0 in. (17.7 cm)

#### WEIGHT WITH BATTERY

Weight with Battery.....	19.5 Lbs. (8.85 kg)
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**1.4 Amcom III Model 2830R/24 Diver Communicator**

The front panel contains all the controls and connections required to operate the communicator. It is intended that the divers will be connected to the communicator using the rear chassis MS connector but the front panel 5-way binding post allows for ad-hoc connections when required.



The rear chassis contains the AC power inlet, recorder output and an MS connector with all the tender and diver connections. This allows a clean installation by routing all the connections from the back in the rack. The rear tender connections allow for the installation of a separate, remote tender station located away from the rack.



## 2 WARRANTY AND SERVICE POLICY

### 2.1 Limited Warranty

AMRON INTERNATIONAL, INC., (Amron) warrants that its products are free from defects in material and workmanship under normal use and service for a period of 90 days from date of shipment as described in Amron literature covering this product. Amron's obligation under this warranty is limited to the repair of or replacement, at Amron's option, of defective material. This warranty shall not cover defects which are the result of misuse, negligence, accident, repair or alterations.

### 2.2 Service Policy

For technical assistance or to request a repair, please call (760) 208-6500, Monday – Friday, 8 a.m. to 5 p.m. PT. Have the model number and serial number handy and be prepared to offer as much information as possible about the problem.

Please do not return any product without obtaining a return authorization number. Detailed instructions will be provided at the time of request.

### 3 OPTIONS AND ACCESSORIES

The following options are available to customize the AMCOM communicator. Options have to be ordered at the time of purchase or the communicator has to be returned to AMRON for the option to be installed.

#### 3.1 Options

##### 3.1.1 Model /26DSP3 – Helium Speech Unscrambler

The AMRON's DSP3 Helium Speech Unscrambler uses state of the art Digital Signal Processor (DSP) technology to correct raw helium speech in clear, intelligible voice. The /26DSP3 option includes a complex noise reduction filter to improve communications in situations with high background noise levels.

##### 3.1.2 Model /28A – Wireless Tender Option

The communicator is equipped with a wireless module and includes a Model 2829-11 Wireless Tender Headset. The wireless headset allows the tender freedom to move around. It requires the divers are wired in 4-Wire mode.

##### 3.1.3 Model -4002 Chamber Call Lock Indicator

Chamber call lock indicator with annunciator.

#### 3.2 Accessories

The following accessories are available for the AMCOM communicator. Accessories can be ordered at any time.

##### 3.2.1 Model 2401-28 – Amron Heavy-Duty Headset

The Model 2401-28 is a heavy-duty headset with boom microphone. It comes equipped with color-coded, dual banana plugs that mate directly to AMCOM diver communicators. It includes a 6-foot (1.8-meter) cord.

##### 3.2.2 Model 2460-28 – Amron Standard Headset

The Model 2460-28 is a light and comfortable headset designed for extended wear at an economical price. It comes equipped with color-coded, dual banana plugs that mate directly to AMCOM diver communicators as well as a spiral cord that can be extended up to 8 feet (2.4 meters).

##### 3.2.3 Model 2405-28 – Amron Push-To-Talk Microphone

The Model 2405-28 is a hand-held, noise-canceling, push-to-talk microphone that provides excellent sound quality to the diver. It comes equipped with a spiral cord that can be extended up to 6 feet (1.8 meters).

**3.2.4 Model 2822-28 – Amron Remote Walk-And-Talk Module**

Designed for Full Duplex (4-Wire) applications, the Model 2822-28 provides the tender with mobility around the dive site while maintaining communications with the diver. It comes equipped with a small clip-on belt module that contains the connectors for the headset, and 25 feet (7.6 meters) of lightweight flexible cable. Custom cable lengths are available.

**3.2.5 Model 2821-28 – Amron Remote Push-To-Talk Module**

Designed for 2-Wire applications, the Model 2821-28 provides the tender with mobility around the dive site while maintaining communications with the diver. It comes equipped with a small clip-on belt module that contains a push-to-talk switch, connector for the headset, and 25 feet (7.6 meters) of lightweight flexible cable. Custom cable lengths are available.

**3.2.6 Model 2829-11 – Amron Wireless Tender Headset**

A heavy-duty headset combined with a wireless belt module that is compatible with the /28A option. One headset comes with communicators ordered with the /28A options but additional headset can be ordered to allow other crew member to monitor communications.

**3.2.7 Model 3110 – Amron Chamber Speaker**

The Model 3110 Chamber Speaker includes a push-to-talk switch along with a headset connector. When the occupant(s) want to talk to the operator, the push-to-talk switch on the chamber speaker must be pressed, even if the headset is in use.

**3.2.8 Model 3115 – Amron Chamber Speaker**

The Model 3115 Chamber Speaker allows the operator to monitor conversations within the chamber with the speaker wired in 2-WIRE mode. There is a speaker on/off switch that allows the occupants to turn off the speaker for private conversations. The operator can talk to the occupant(s) by using the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK. The Model 3115 also features a headset jack wired in Full-Duplex (4-Wire) mode that allows an occupant to use our standard 2460-31R or deluxe 2401-31R headset to talk to the chamber operator without the use of the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK. This speaker is approved for US Navy chambers.

**3.2.9 Model 3113 – Amron Chamber Speaker**

The Model 3113 Chamber Speaker has all the features of the Model 3115 except for the speaker on/off switch.

**3.2.10 Model 3125 – Amron Inner-Lock Combo Box**

The Model 3125 features a talk-back speaker with on/off switch and headset jack that operates in the same manner as the Model 3115. It also includes a sound-powered phone with bracket, chamber temperature probe, scrubber power circuit

wiring, chamber environmental conditioning unit wiring and electrical penetrator adaptor all together in a single pre-wired, pre-tested housing.

### 3.2.11 **Model 3126 – Amron Outer-Lock Combo Box**

The Model 3126 features a talk-back speaker with on/off switch and headset jack that operates in the same manner as the Model 3115. It also includes the sound-powered phone and bracket like the Model 3125 but does not have the additional chamber function wiring of the 3125.

## 4 TENDER AND DIVER CONTROLS AND CONNECTIONS

Before using the 2830R/24 diver communicator, the tender should be familiar with all the operating controls and connections. While reading this manual, you will find capitalized words such as PANEL SPEAKER. These words are to remind the reader that additional information can be found in this section of the manual.

### 4.1 Tender Controls

The following controls are located on the front panel of the 2830R/24 in the tender section.

- 4.1.1 **Power Switch** – This switch controls power to the unit.
- 4.1.2 **Speaker Switch** – This switch allows the tender to turn off the speaker. If the tender is using a headset, it may be necessary to turn off the speaker in order to prevent acoustic feedback.
- 4.1.3 **Push-To-Talk All Divers Switch** – This switch allows the tender to talk to all of the divers when operating in the 2-Wire mode. It is not necessary to use this control in the Full Duplex (4-Wire) mode. When using Full Duplex mode, this control allows the tender to interrupt the diver by forcing the diver into listen only mode.
- 4.1.4 **Tender-To-Divers Volume** – This control sets the volume for the divers' earphone. Rotate this knob clockwise to increase the volume.
- 4.1.5 **Diver To Tender Volume** – This control sets the volume for the tender's earphone and/or panel speaker. Rotate this knob clockwise to increase the volume.
- 4.1.6 **Panel Speaker** – A waterproof, acoustic horn speaker that allows the tender to listen to the divers. The volume level is controlled by the EARPHONE VOLUME control and it can be turned off using the SPEAKER SWITCH.
- 4.1.7 **Battery Condition Indicator** – A steady GREEN light indicates battery charge level is good. Blinking GREEN light indicates battery charge level is at a low level with less than 3 hours of running time available. Steady RED light indicates battery charge level is below the level necessary to guarantee proper operation.

**WARNING: When BATTERY CONDITION INDICATOR is steady RED light, the batteries should be recharged immediately.**

- 4.1.8 **Panel Microphone** – A water-resistant condenser microphone that allows the tender to talk to the divers using the PUSH-TO-TALK BUTTONS. On the 2830R/24, the volume level is controlled by the MICROPHONE VOLUME control. The PANEL MICROPHONE is muted when the SPEAKER SWITCH is turned off.

**WARNING: Do not plug or cover the PANEL MICROPHONE hole. This may dampen the tender-to-diver communications or damage the microphone requiring replacement.**

## 4.2 Tender Connections

- 4.2.1 **Tender Headset Jack** – This is the dual banana jack (color-coded black) that functions as both an output (earphone) and input (microphone) for the tender as controlled by the PUSH-TO-TALK BUTTON and PUSH-TO-TALK JACK. Using this connection, the tender can be wired in either 2-Wire or Full Duplex (4-Wire) mode regardless of the mode used for the diver.

To connect the tender in the Full Duplex (4-Wire) mode, connect the earphone (black) banana plug of the headset to this jack and the microphone (red) to the TENDER MICROPHONE jack (red) as shown in the wiring diagram in section 4.10. In this mode, the tender does not have to use the PUSH-TO-TALK BUTTON to communicate with a diver who is also connected in the Full Duplex (4-Wire) mode. This configuration can be used even if the diver is connected in 2-Wire mode. In that situation, the tender is required to use the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK.

The headset microphone is always active, which means that there can be acoustic feedback between the PANEL SPEAKER and the microphone if the tender is near the communicator. To prevent this, the PANEL SPEAKER can be turned off using the SPEAKER SWITCH. Another option is to move the tender away from the communicator by using the Amron Model 2822-28 Walk-and-Talk Module accessory. This allows the tender to communicate while other members of the surface crew listen using the PANEL SPEAKER. This module comes with 25 feet (7.6 meters) of cable (custom cable lengths are available).

The tender can also be connected in 2-Wire mode by stacking both the earphone (black) and microphone (red) banana plugs into this jack as shown in the wiring diagram in section 4.9. The diver does not have to be connected in 2-Wire mode if the tender is in 2-Wire mode. In order to talk to the diver, the tender must use either the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK. Since the headset microphone is not active until one of the push-to-talk methods is used, there is no chance for acoustic feedback to occur and surface conversation or noise is not transmitted to diver and the PANEL SPEAKER can be left on. This may, for some situations, make for a better overall diving experience. If the tender requires more mobility at the dive site, the Amron Model 2821-28 Remote Push-to-Talk Module can be used to extend the headset cable. It includes a push-to-talk button on a clip-on belt module and comes standard with 25 feet (7.6 meters) of cable (custom cable lengths are available).

The tender may also use the optional Amron Model 2405-28 Push-to-Talk Microphone. This microphone comes with two color-coded banana plugs. The black plug goes into the TENDER HEADSET jack and the yellow plug goes in the PUSH-TO-TALK JACK as shown in the wiring diagram in section 4.11. To communicate with the diver, the tender presses the button on the side of the microphone. There is no chance of acoustic feedback since the PANEL SPEAKER is cut off when the tender uses the microphone. When using the Push-to-Talk Microphone, the SPEAKER SWITCH must be turned on in order to hear the diver.

- 4.2.2 **Tender Microphone Jack** – This is a dual banana jack (color-coded red) that functions as the microphone input from the tender's headset. It is only used if the tender is in Full Duplex (4-Wire) mode. On the 2830R/24, the TENDER MICROPHONE VOLUME control adjusts the sensitivity of the input.
- 4.2.3 **Push-To-Talk Jack** – This is a dual banana jack (color-coded yellow) that allows for remote keying of the push-to-talk function of the 2830R/24. The difference between using the PUSH-TO-TALK JACK and PUSH-TO-TALK BUTTON is that the button allows the tender to communicate using the PANEL MICROPHONE.

### 4.3 Diver Controls

The following controls are located on the front panel in the individual diver sections.

- 4.3.1 **Diver Microphone Volume** – The 2830R/24 has a separate microphone volume control for each diver. This sets the gain for the diver's microphone amplifier and controls the diver's volume level to the tender and other diver.
- 4.3.2 **Diver Earphone Volume** – The 2830R/24 has individual earphone volume controls for each diver. This allows the tender to set the best volume level for each diver.
- 4.3.3 **Push To Talk Diver** – There is a separate PUSH-TO-TALK momentary switch for each diver. Normally used in 2-Wire mode, this control allows the tender to talk to only one of the divers. The diver selected will hear both the tender and the other divers. It can be used in Full Duplex (4-Wire) mode to cut off the microphone of an individual diver.
- 4.3.4 **Crosstalk** – There is a separate CROSSTALK momentary switch for each diver. Normally used in 2-Wire mode, this control allows the selected diver to talk to the other divers while the tender monitors the conversation.

### 4.4 Diver Connections

- 4.4.1 **Diver Microphone** – This is a dual 5-way binding post jack (color-coded red) that functions as both an output (earphone) and input (microphone) for the diver as controlled by the PUSH-TO-TALK BUTTON and PUSH-TO-TALK JACK. Using this connection, the diver can be wired in either 2-Wire or Full Duplex (4-Wire) mode regardless of the mode used for the diver.

To connect the diver in Full Duplex (4-Wire) mode, connect the diver microphone to this jack and the diver earphone the DIVER EARPHONE jack as shown in the wiring diagram in section 4.9. The diver can use this mode even if the tender is wired in 2-Wire mode.

To connect the diver in 2-Wire mode, connect both the diver microphone and earphone to this jack. If the diver umbilical uses banana plugs, simply stack both plugs into this jack as shown in the wiring diagram in section 4.8. In this mode, the diver microphone will be active and heard on tender headset and/or PANEL

SPEAKER unless the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK is activated.

- 4.4.2 **Diver Earphone** – This is a dual 5-way binding post jack (color-coded black) that functions as the output for the diver’s earphone. It is only used when the diver is in Full Duplex (4-Wire) mode.

**4.5 Other Connections**

- 4.5.1 **External Power Connector** – The 2830R/24 uses a standard IEC C14 power inlet located on the rear of the chassis. The communicator has a universal input with a voltage range of 90-264 VRMS and a frequency range of 47-440 Hz. No user adjustment is required.
- 4.5.2 **Recorder Output** – This is a single RCA Phono jack (color-coded black) located on the rear of the chassis. It provides a transformer isolated signal of both the diver and tender communications. It is designed to drive the standard line-level inputs of audio or video recorders with input impedances as low as 600 Ohms.
- 4.5.3 **MS Connector** – A Military Series (MS) connector is located on the rear of the chassis providing connections for both the Tender and Divers. This allows connection without running wires to the front panel. The mating connector part number is MS-3106A-28-16P. The pin functions are shown in the following table:

MS CONNECTOR PIN OUT IDENTIFICATIONS	
PIN NUMBER	FUNCTION
A & B	DIVER 1 MICROPHONE
G & E	DIVER 1 EARPHONE
L & M	DIVER 2 MICROPHONE
H & F	DIVER 2 HEADPHONE
S & K	DIVER 3 MICROPHONE
U & V	DIVER 3 EARPHONE
J & T	TENDER MICROPHONE
Q & P	TENDER EARPHONE
D & N	RECORDER OUTPUT
R	PUSH-TO-TALK
C	COMMON

**4.6 Option Controls: Call Indicator – 4002**

The call indicator lights are located in the STATUS panel on the far right side of the front panel. This option can be purchased with HSU and Wireless Tender Options.

- 4.6.1 **Lock Indicator** – LED Lamp indicates a call originating from a lock. Lamps are provided for each lock.
- 4.6.2 **Call Annunciator** – Alerts the operator of a call.

#### 4.7 Option Controls: Helium Speech Unscrambler /26DSP3

The controls for the DSP3 Helium Speech Unscrambler (HSU) are located in the section immediately right of the DIVER 3 controls on the front panel.

- 4.7.1 **On/Off Switch** – Allows the selection of air (OFF) or helium (ON) operation. In the OFF position, the divers' microphone signal bypasses the HSU. In the ON position, the microphone signals are routed to the HSU and the tender can adjust the controls as necessary.
- 4.7.2 **Treble Boost** – Selects the amount of gain added to the High Frequency (HF) portion of the divers' microphone signals. This compensates for the HF drop-off in the sensitivity of most microphones. The TREBLE BOOST feature allows for optimum frequency enhancement and improved intelligible speech from the diver's voice.
- 4.7.3 **Depth Control** – Selects the amount of frequency correction performed by the HSU to produce intelligible speech. This control uses a multi-turn potentiometer and is equipped with a turn counting knob and lock. Once the desired setting is reached, the lock can be used to prevent accidental changes to this control.
- 4.7.4 **Noise Reduction Filter** – The Noise Reduction Filter (NRF) uses a complex Digital Signal Processor algorithm based on a statistical-model of human voice activity to capture the background noise and reduce it without affecting the divers' speech. The noise level can be reduced by up to 17 dB.

#### 4.8 Option Controls: Wireless Tender /28A Option

The controls for the Wireless Tender Option are located in the section immediately right of the DIVER 3 controls on the front panel. The Wireless Tender Option is for four-wire (Full Duplex) operation only. System comes standard with a remote wireless tender module.

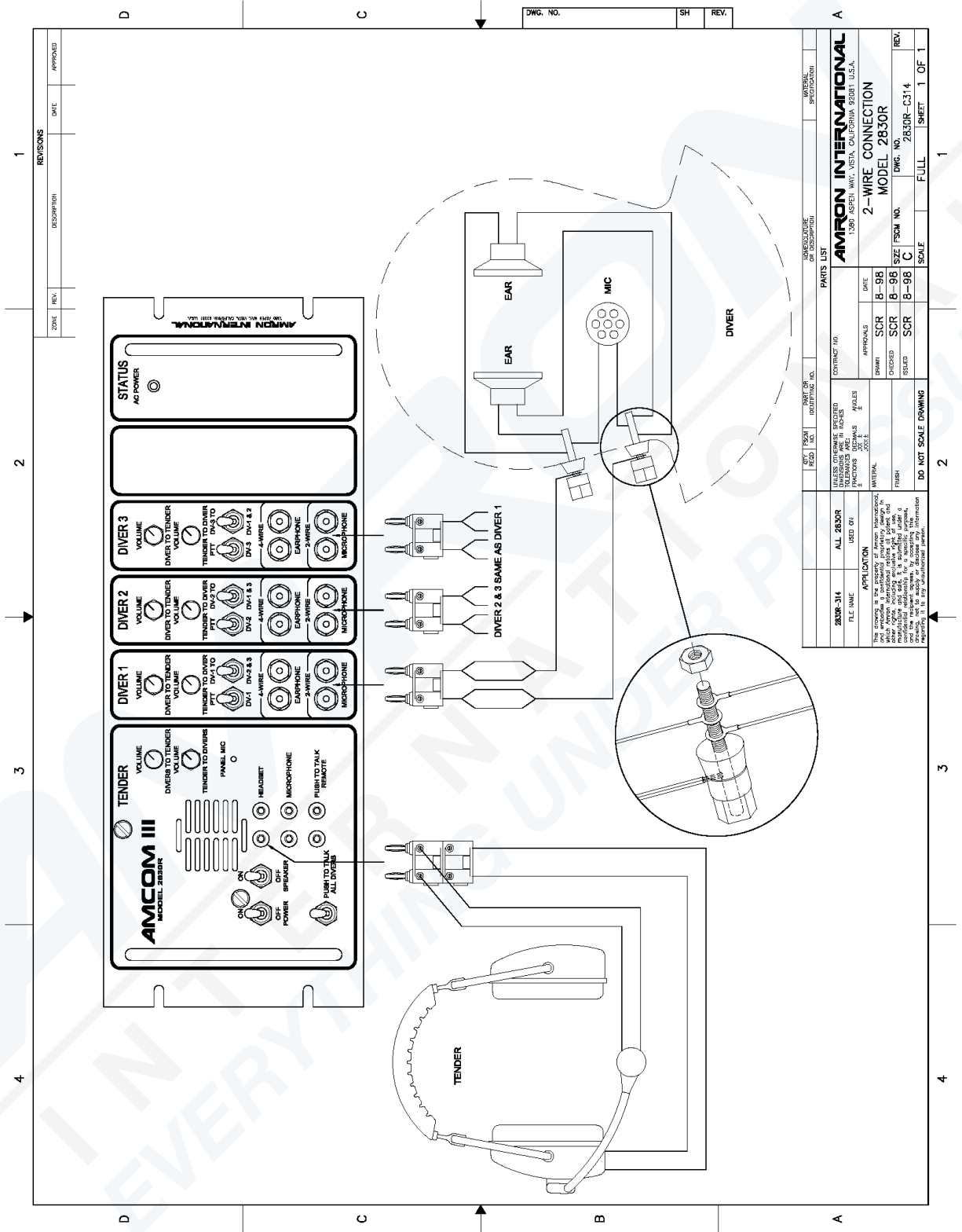
- 4.8.1 **Wireless Option Panel** – Comes standard with antenna and power on/off switch. The "ON/OFF" switch powers the wireless PC card inside the communicator. The antenna has a swivel and tilt that allows the antenna to be folded down during shipment. For operation, the antenna should be pointing upwards. For installations where the Diver Communicator is located inside a structure, there is an optional Remote Antenna kit available. This kit allows the antenna to be located outside the structure for maximum effective range.

**IMPORTANT:** When the wireless option is not used, turn the option panel switch to "OFF". When option panel switch is turned "ON", the wireless remote should be "ON". Otherwise a static noise may be heard through the communicator's panel speaker as it scans for available Remote Wireless Tender.

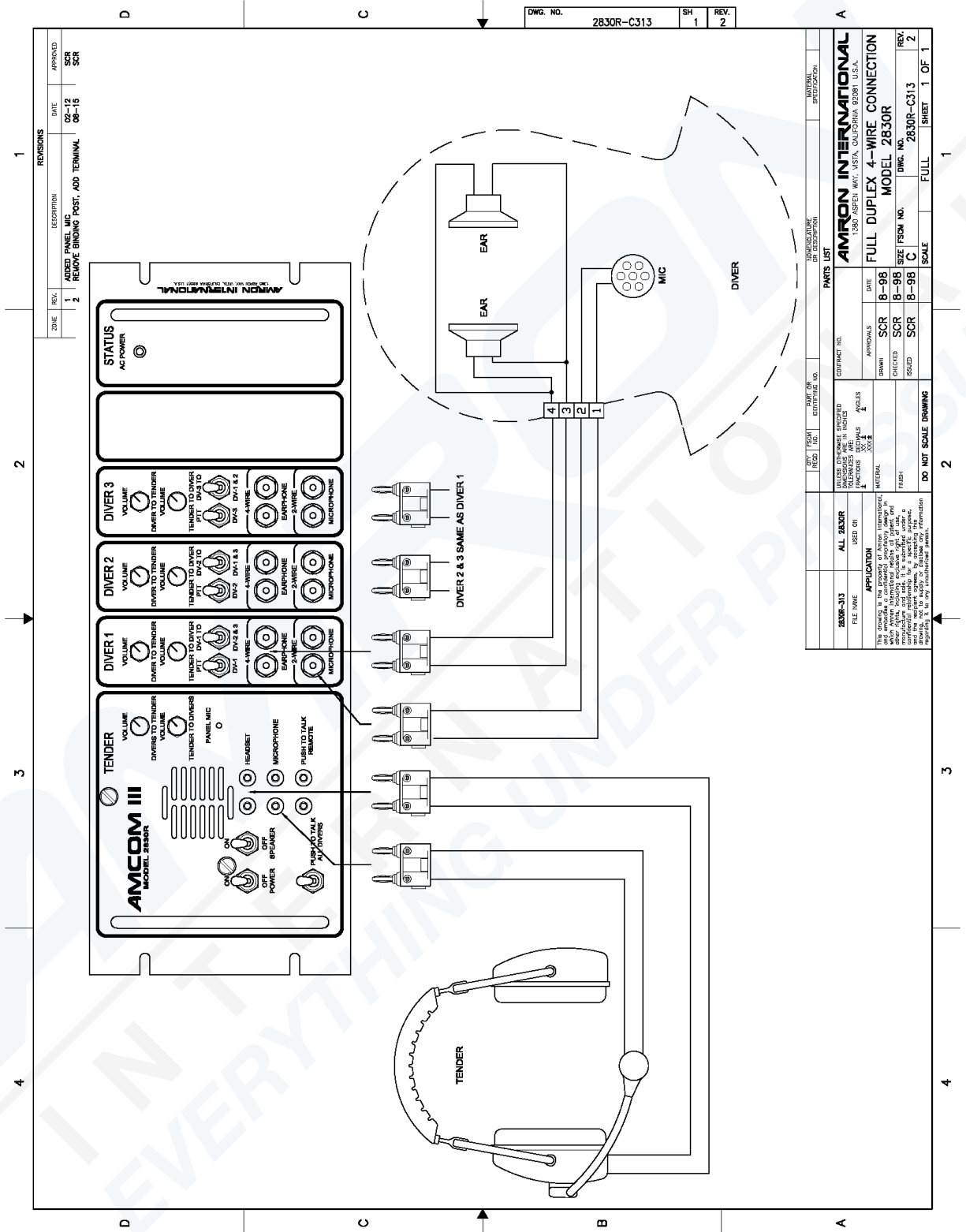
- 4.8.2 **Remote Wireless Tender Module** – This module comes standard with an internal rechargeable battery. Headset and external 110V charger jacks are located on remote module.

- 4.8.3 **On/Off-Volume Control** – Adjusts the listening volume and turns the unit “OFF” when it is turned completely upwards.
- 4.8.4 **Talk Push Button** – This button is located on the top of the unit and is labeled TALK. When it’s first turned on, the Remote Wireless Tender Module is in Standby Mode (listen only) as indicated by the LED closest to the button being red. When the button is pressed, the Remote Wireless Tender Module is in “Talk Mode” (listen and talk, full duplex) and the LED is green. Pressing the TALK button toggles between the two modes. Multiple Remote Wireless Tender Modules can be in the Standby (listen only) mode at the same time. Only one module can be in the talk mode.
- 4.8.5 **Headset Jack** – Located on the side opposite the ON/OFF-Volume Control. Plug the remote wireless headset to this jack.
- 4.8.6 **Charge Jack** – Located on the side next to the ON/OFF-Volume Control. Plug the remote wireless charger to this jack.

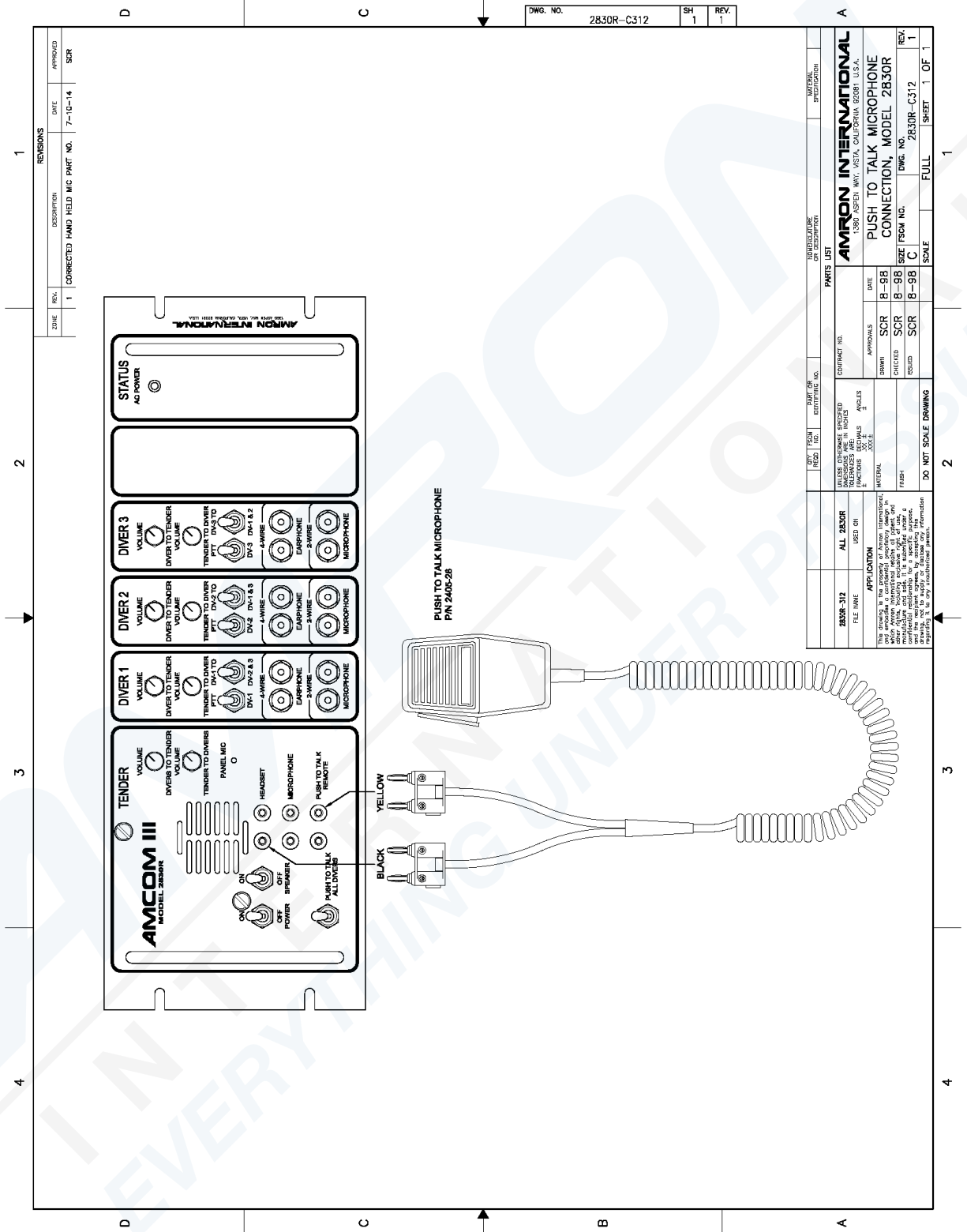
4.9 Drawing, 2-Wire Connections



**4.10 Drawing, Full Duplex (4-Wire) Connections**



4.11 Drawing, Push-To-Talk Microphone Connections



DWG. NO. 2830R-C312		SH 1	REV. 1
REVISIONS		APPROVED	
DATE	DESCRIPTION	DATE	APPROVED
7-10-14	CORRECTED HAND HELD MIC PART NO.	SCR	SCR
PARTS LIST			
QTY	PSM NO.	DESCRIPTION	MATERIAL
1	8-98	SCR	AMRON INTERNATIONAL
1	8-98	SCR	1390 ASPEN WAY, WSTA, CALIFORNIA 92091 U.S.A.
1	8-98	SCR	PUSH TO TALK MICROPHONE
1	8-98	SCR	CONNECTION, MODEL 2830R
1	8-98	SCR	SIZE PSM NO.
1	8-98	SCR	DWG. NO. 2830R-C312
1	8-98	SCR	REV.
1	8-98	SCR	REV.



## 5 INSTALLATION AND OPERATION

### 5.1 Operation

The Model 2830R/24 AMCOM III rack mount diver communicator is designed to mount in a standard electronic equipment rack, 19 inches wide. The unit has connections located on both the front and rear of the enclosure, to facilitate system wiring. For system installation all connections can be made to the rear of the unit, eliminating wires hanging from the front panel.

The AMCOM III panels are graphically divided into sections; Tender Controls, Diver Controls, and Options. Items within these areas are functions or controls relating to the Tender, Diver(s) or Optional items.

### 5.2 AC Power

When the unit is connected to AC power the LED power indicator on the STATUS section of the front panel will illuminate, confirming the presence of AC power.

The AMCOM III is designed to operate from AC voltage (110/220 VAC 60/50 Hz). This option includes two 6 volt gel cell batteries (connected in series for 12 VDC) for backup operation in the event of loss of AC power. The switch over to battery operation is completely automatic, and occurs whenever AC power is interrupted. The internal rechargeable battery is maintained at full charge while the unit is operating from AC power.

**CAUTION:** ALWAYS exercise extreme caution when operating AC powered equipment, especially when outdoors, where conditions are damp or wet, or when around other equipment. Never operate unit without earth-ground or without a working ground fault interrupter. When in doubt discontinue use immediately and have a qualified electrician inspect your equipment before using.

**WARNING:** *When operating your Amron Diver Communicator from AC mains, it is critical to use a Ground Fault Circuit Interrupter (GFCI) and/or isolation transformer for tender and diver safety. Surges and spikes are common on AC lines found onboard ships, from local generators, or at the end of a long extension lines. These spikes can exceed 1kV! Such spikes can be high enough to cause the input fuses on the internal battery charger to blow and, in extreme cases, actually damage the charger circuitry. Amron has designed this battery charger to isolate such faults to ensure that they will not cause a safety issue for the diver or tender.*

**NOTE:** Do not continue to operate rechargeable batteries below the low battery condition or permanent damage will occur. When the battery condition indicator turns to red color, shut unit off and charge batteries.

### 5.3 Modes Of Operation

The 2830R/24 has the ability to operate in either 2-Wire or Full Duplex (4-Wire). Both the diver and tender can be connected in either mode and a combination of modes can be used. If either the diver or the tender is wired in 2-Wire mode, the tender must use a push-to-talk, either the PUSH-TO-TALK ALL SWITCH or PUSH-TO-TALK JACK, when talking to the diver.

2-Wire communication is defined as a single communication path, normally the diver is the priority signal path – tender listens to diver. Signal reversing is accomplished by pushing the PUSH-TO-TALK BUTTON – diver hears tender. Often times a 4-conductor communication cable is used with two wires tied together as a pair for redundancy, this is still a 2-Wire system. Since only one person can talk at a time, there is a level of discipline that goes with using 2-Wire mode in order to obtain clear communication. One advantage of 2-Wire is that the tender's microphone is not active unless one of the two push-to-talk controls, PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK, are active. This eliminates any possible acoustic feedback between the tender's microphone and the PANEL SPEAKER. It also prevents noise from the surface reaching the diver and allows the tender to communicate with other members of the surface crew without involving the diver

Full Duplex (4-Wire) communication is defined as a dual communication path, a signal path (a pair of wires) for up-link and a signal path (a pair of wires) for down link. A common example of Full Duplex communication is the telephone. Full Duplex (4-Wire) has the advantage of natural communication without having to use the PUSH-TO-TALK BUTTON. This keeps the tender's hands free to perform other task. It does not require the same level of discipline to achieve clear communications that 2-Wire does. It has the advantage that neither the diver nor the tender are cut off when the other is talking. Because the diver's microphone is not connected in parallel with the earphone, the diver is louder and potentially clearer in Full Duplex (4-Wire) mode. More information on this mode can be found in Section 7, FULL DUPLEX (4-WIRE) - WHAT, WHY AND HOW.

### **5.3.1 2-Wire Operation**

To connect the diver in 2-Wire mode, connect the communication umbilical wires to the DIVER MICROPHONE binding post jack on the communicator as shown in the wiring drawing in section 4.8. If the umbilical uses a banana plug, simply insert the plug into the binding post jack. Verify that it is firmly and completely seated. This may require that the external plastic nut be tightened down. If the umbilical uses bare wires, loosen the external plastic nut of the binding post jack. Either insert the bare end of the wire into the hole in the metal shaft of the binding post or firmly wrap the wire around the shaft. Tighten the nut until the bare wire is firmly fastened by the nut. The nut should not be fastened on the insulation of the wire nor should any of the bare wires touch.

The earphone connection is not used by the divers. The earphone jacks can be used to operate a remote speaker. Both diver and tender conversations will be heard.

When the tender uses a headset or push-to-talk microphone, follow the connection instruction in section 4.2.1 and in the wiring diagram in sections 4.9 and 4.10. When using the Amron Model 2821-28 Push-to-Talk Microphone, the tender presses the push-to-talk button on the side of the microphone and speaks clearly at a distance of between 1 and 2 inches (25 to 51 mm). When done speaking, the tender releases the push-to-talk button to allow the diver to communicate.

In 2-wire mode the tender must press the Push-to-talk Switch to be heard. If you are using the Amron Remote Push-to-Talk, Model 2821-28, the tender may press the Push-to-talk Switch on the belt module.

### 5.3.2 4-Wire Operation

To connect the diver in Full Duplex (4-Wire) mode, connect the communication umbilical wires to the DIVER MICROPHONE and DIVER EARPHONE jacks as shown in wiring diagram in section 4.9. If the umbilical uses a banana plug, simply insert the plug into the correct binding post jack. Verify that it is firmly and completely seated. This may require that the external plastic nut be tightened. If the umbilical uses bare wire ends, loosen the external plastic nut of the binding post jack. Either insert the bare end of the wire into the hole in the metal shaft of the binding post or firmly wrap the wire around the shaft. Tighten the nut until the bare wire is firmly fastened by the nut. The nut should not be fastened on the insulation of the wire nor should any of the bare wires touch. The diver microphone will be louder in Full Duplex (4-Wire) mode than in 2-Wire mode. This can be a significant advantage when using longer dive umbilical cables.

To use Full Duplex (4-Wire) mode, the tender must use a headset and connect per the instructions in 4.9. The tender will have to use the PUSH-TO-TALK BUTTON to communicate if the diver is in 2-Wire mode. When the tender uses a headset, the SPEAKER SWITCH should be turned off to prevent acoustic feedback. Acoustic feedback can also be avoided by moving the tender away from the 2830R/24 by using the Amron Model 2822-28 Remote Walk-and-Talk Module. In this way, the PANEL SPEAKER can allow other members of the diving crew to monitor the dive operation or to communicate to the diver by pressing the PUSH-TO-TALK BUTTON and talking into the speaker.

**NOTE:**

- Diver microphone is louder in 4-wire than 2-wire operation.
- Tender earphone is louder than divers earphones for both 2-wire and 4-wire operation.
- Tender earphone is about four times louder than diver's earphone.

## 5.4 Volume Controls – 2-Wire

Turn power switch to ON, turn speaker switch to ON, and adjust both volume controls to mid-scale. Tender has to depress PUSH-TO-TALK BUTTON in order to talk to diver. Tender and Diver talk to each other during Tender adjusting volume controls as below:

**NOTE:** The upper row of volume controls, set the microphone volume, the lower row of volume controls, set the earphone volume. Tender controls are considered master controls. The optimum settings are when controls are closely matched, with differences compensating for differences in diver levels.

### 5.4.1 Tender To Diver

While tender is talking into the panel speaker and depressing PTT switch, tender adjusts this volume control to a comfortable diver hearing level.

### 5.4.2 Diver To Tender

While diver is talking, tender adjust this volume control to a comfortable hearing level.

## 5.5 Other Diver Controls – 2-Wire

### 5.5.1 PTT All Divers Switch

Push-to-talk to All Divers switch is located on the left bottom corner below Power ON/OFF switch. This switch allows all divers to hear the Tender, it change all divers to be listening and tender in talking mode.

### 5.5.2 Cross Talk Switches

The cross talk switches allow conversations from diver to diver in the two wire mode. Cross-talk between divers must be tender operated via the cross-talk switches. Cross-talk DV 1 to DV 2 allows diver 1 to speak to (but not hear) diver 2. Cross-talk DV 2 to DV 1 allows diver 2 to speak to (but not hear) diver 1. The tender will hear conversations on speaker or headset.

### 5.5.3 Diver On/Off Switches

Depressing the appropriate On/Off switch, located beside the cross-talk switch, will cut off that diver's microphone and earphone as long as it is depressed. The switch is spring loaded and will automatically reconnect when the switch is released.

## 5.6 Volume Controls 4-Wire

Turn power switch to ON; turn speaker switch to OFF; adjust both volume controls to mid-scale. Tender to use headset. Tender and Diver talk to each other during Tender adjusting volume controls as below:

**NOTE:** The upper row of volume controls, set the microphone volume, the lower row of volume controls, set the earphone volume. Tender controls are considered master controls. The optimum settings are when controls are closely matched, with differences compensating for differences in diver levels

#### TENDER TO DIVER

- While tender is talking, tender adjusts this volume control to a comfortable level for the diver. Tender talks and divers determine a comfortable listening level, having the tender adjust as needed.

#### DIVER TO TENDER

- While diver is talking, tender adjusts this volume control to a comfortable hearing level.

Connect diver 1's umbilical to the Diver 1 input. Repeat for diver 2.

Connect tender headset earphones to Headset (input), and headset microphone to Tender Microphone (input). Turn speaker off to avoid acoustic feedback. Operation with speaker is possible by extending tender's headset away from the speaker. Use Amron Model 2822-28 headset extension cable (25 foot).

Operating the PTT (push-to-talk) switch will establish a priority channel for communication. PTT cuts out the diver's microphone and prevents divers from talking.

This allows an important conversation to be carried on without interruption, or the ability to establish a clear channel of communication.

**NOTE:** When operating with a standby diver who does not have his hat/helmet on, acoustic feedback may occur. This can be avoided by turning his volume down Diver to Tender, which cuts off his microphone, yet will enable him to monitor the diver/tender conversation.

## 5.7 Other Tender Controls

### 5.7.1 Push-To-Talk Switch

Activation of this switch connects the tender to the diver, necessary for two wire conversations, optional for Full Duplex (4-wire) conversations. Always used when using the PANEL MICROPHONE for talking to the divers.

### 5.7.2 Microphone Jacks (Red)

Connection for headset microphone: plug red banana plug into these jack when operating in the Full Duplex mode.

### 5.7.3 Headset Jacks (Black)

Connection for headset earphones, external speaker: plug both headset banana plugs (red & black) into the black headset jacks, red & black when operating in the two wire mode. Plug in only the black headset banana plug when operating in the Full Duplex mode. Plug hand held microphone black banana plug into the black headset jacks.

### 5.7.4 Push-To-Talk Jacks (Yellow)

Connection for remote control of the push-to-talk function: plug the hand held microphone yellow banana plug into this jack. Operation of the hand held microphone is simple and straight forward, hold the microphone in your hand, place the microphone within one half inch of your mouth, depress lever on side of microphone and speak clearly and distinctly into the microphone.

The communicator has an automatic speaker disconnect relay which disconnects the front panel speaker when using the hand held microphone. This greatly reduces the background noise during transmissions to the divers. This feature is also functional when using an AMRON headset, and headset extender (Model 2821-28).

### 5.7.5 **Speaker On/Off Switch**

For normal operation the speaker switch is left on. When operating in noisy conditions, it may be advantageous to use a headset to cut out the background noise. In this case it will be desirable to shut off the speaker. There are other conditions when turning off the speaker is desirable, situations where the nature of the work requires a confidential handling of communications.

### 5.7.6 **Record Jack (Rear Panel)**

Isolated audio output to drive a recorder. Use standard RCA type audio cable to connect the diver radio to the audio recorder. Test record audio, checking both tender to diver conversation and diver to tender conversation for proper record levels.

## 5.8 **Options**

### 5.8.1 **Helium Speech Unscrambler Option /26DSP3**

The Helium Unscrambler option is installed into the option panel located on right side of the communicator. A Communicator with this option accommodates a wide range of operating depths. This state-of-the-art digital design can accommodate a multitude of functions ranging from the correction of the diver's raw helium speech to normal intelligible voice levels, advance treble boost and complex noise reduction filters (NRF)

Diver radios configured with this option are only supplied with the AC power option. This is due to the power requirements of the Unscrambler option. The radio can be operated in the air mode by turning the HSU off.

Amron's advanced NOISE REDUCTION FILTER (NRF) incorporates a complex DSP algorithm which filters out background noise while allowing the diver's speech to be clear and intelligible. Amron's NRF automatically captures the frequency spectrum of applied background noise within the audio frequency bandwidth and reduces it without affecting the diver's speech.

The Treble Boost Control provides a means of adjustment to enhance the diver's microphone performance. The treble boost feature allows for optimum frequency enhancement and improved intelligible speech from the diver's voice.

The Depth Control is used to change the amount of shift in the frequency of the diver's voice. The depth control is advanced as the diver's depth increases. There is a certain amount of interaction between the controls, and also a difference between diver voices, therefore it is necessary to tune the unit to the diver. Intelligibility is the desired result; each operator will find a combination which works best. The frequency shifting algorithm changes the amount of correction to the raw helium speech. The Depth Control is a multi-turn control with a locking feature. This allows the tender to finely adjust the level necessary and lock the control to prevent accidental adjustments.

At power-up, all the controls should be in the minimum (far left) position. Have the diver speak and adjust the DEPTH CONTROL as necessary to achieve the best speech quality. Then adjust the TREBLE BOOST as necessary to improve the quality. There is some interaction between these controls so you may have to go back and adjust the DEPTH CONTROL. Once the best speech quality settings are found, the NOISE REDUCTION FILTER can be adjusted, if necessary, to reduce any background noise.

Operating in 2-Wire and Full Duplex (4-Wire) modes are possible with the HSU. In 2-Wire mode, the tender's push-to-talk switch interrupts signals from the diver. In Full Duplex mode, the tender will hear the diver at all times and tender must use a headset to talk to the divers without using the push-to-talk switch. Use of a headset to monitor helium speech is strongly recommended to enhance intelligibility.

## 6 MAINTENANCE AND TROUBLESHOOTING

The following section describes the procedures for checking the operation of your 2830R/24 diver communicator, general maintenance procedures, and how to troubleshoot common problems.

### 6.1 Diver Radio Communicator Check Procedures

The following are a series of step-by-step procedures to perform a functional check of your 2830R/24 series communicator using only a headset. These steps check all communication functions in both 2-Wire and Full Duplex (4-Wire) mode. If the communicator checks out using these procedures, then any communication problems are probably located somewhere else in the system.

#### 6.1.1 Full Duplex (4-Wire) Check

This procedure checks communicator functions in Full Duplex (4-Wire) mode.

1. Set all volume controls to the mid-scale (halfway) position.
2. Turn the SPEAKER SWITCH off to avoid acoustic feedback.
3. Turn on the communicator and verify the BATTERY CONDITION INDICATOR is on or blinking. If the LED does not come on at all, then replace or recharge the battery. If that does not resolve the problem, then go to the troubleshooting section to determine the cause.
4. Identify the microphone and headset leads. When using an Amron headset, the microphone is the red banana plug and the headset is the black banana plug.
5. Plug the microphone lead into the TENDER MICROPHONE (red) jack and the headset lead into the TENDER HEADSET (black) jack.
6. Don the headset and talk into the microphone. You should be able to hear yourself in the headset. Adjust the DIVER TO TENDER VOLUME control and verify the level can be adjusted to a comfortable level.
7. Move the headset microphone lead to the DIVER 1 MICROPHONE (red) jack. Talk into the microphone. You should be able to hear yourself in the headset. Adjust the DIVER TO TENDER VOLUME control and verify that the level can be adjusted to a comfortable level.
8. Move the headset lead to the DIVER 1 EARPHONE (black) jack. Talk into the microphone. You should be able to hear yourself in the headset.
9. Repeat steps 7 and 8 for the remaining diver channels.

This completes the check of the Full Duplex (4-Wire) function of the communicator. If at any point in the test you were not able to hear yourself in the headset as indicated by the test, refer to the troubleshooting section to determine the cause.

### 6.1.2 2-Wire Check

This procedure checks the communicator functions in the 2-Wire mode.

1. Set all the volume controls to the mid-scale (halfway) position.
2. Turn the SPEAKER SWITCH off to avoid acoustic feedback.
3. Turn on the communicator and verify the BATTERY CONDITION INDICATOR is on or blinking. If the LED does not come on at all, then replace or recharge the battery. If that does not resolve the problem, then go to the troubleshooting section to determine the cause.
4. Identify the microphone and headset leads. When using an Amron headset, the microphone is the red banana plug and the headset is the black banana plug.
5. Plug the microphone lead into the TENDER HEADSET (black) jack and the headset lead into the DIVER MICROPHONE (red) jack.
6. Don the headset. Talk into the microphone while pressing the PUSH-TO-TALK BUTTON. You should be able to hear yourself in the headset. Adjust the TENDER TO DIVER VOLUME control and verify that the level can be adjusted to a comfortable level.
7. Unplug the microphone lead. Turn on the SPEAKER SWITCH. Press the PUSH-TO-TALK BUTTON while speaking into the PANEL SPEAKER. You should be able to hear yourself in the headset. Adjust the TENDER TO DIVER VOLUME if necessary and verify that the level can be adjusted to a comfortable level.
8. Plug the microphone lead into the TENDER HEADSET (black) jack. Short the PUSH-TO-TALK JACK (yellow) with a short piece of wire. Talk into the microphone and verify that you hear yourself in the headset. Remove the short. Turn off the SPEAKER SWITCH.
9. Move the microphone lead to the DIVER 1 MICROPHONE (red) jack and move the headset lead to the TENDER HEADSET jack.
10. Talk into the microphone and verify you can hear yourself in the headset. The PUSH-TO-TALK BUTTON should not be pressed. Adjust the DIVER TO TENDER VOLUME control and verify that the level can be adjusted to a comfortable level.
11. Repeat steps 9 and 10 for the remaining diver channels.

This completes the check of the 2-Wire function of the communicator. If at any point in the test you were not able to hear yourself in the headset as indicated by the test, refer to the troubleshooting section to determine the cause.

## 6.2 General Maintenance

The 2830R/24 diver communicator is designed to provide years of continuous, failure-free service when properly used and maintained. There are a few important things that the user can do to extend the life of their equipment. Handle the diver communicator with care when not installed in the rack.

1. If operating as a standalone unit (not in a rack), select a proper location where the communicator will be safe from hits or falls. The wires connection to it should be routed to avoid possible tripping of personnel.
2. Clean the communicator after use or when needed. If the equipment is on an extended work program, have the tender clean the equipment during slow work periods.

### **6.3 Recommended Maintenance Schedule**

The following sections outline the recommended scheduled maintenance for the 2830R/24.

#### **6.3.1 Daily Maintenance**

Wipe off any accumulated dirt and dust on the front panel or connectors using a clean, damp cloth. Pay particular attention to where the various front panel components attach to the panel.

#### **6.3.2 Weekly Maintenance**

Wipe off any accumulated dirt and dust on the front panel or connectors using a clean, damp cloth. Pay particular attention to where the various front panel components attach to the panel. Inspect the switches, binding posts and volume controls for smooth operation.

#### **6.3.3 6-Month Check**

Wipe off any accumulated dirt and dust on the front panel or connectors using a clean, damp cloth. Pay particular attention to where the various front panel components attach to the panel.

- 1 Inspect the switches, binding posts and volume controls for smooth operation.
- 2 Connect to AC power to recharge the battery
- 3 Perform the 2-Wire and Full Duplex (4-Wire) system checks as described in section 6.1.

#### **6.3.4 Yearly Check**

For maximum service life, it is recommended that the diver communicator be sent back to Amron for a yearly check.

#### **6.3.5 Long Term Storage**

If the diver communicator is to be stored for a period greater than 30 days, it is recommended that it be stored in a cool dry location. Make sure that the POWER SWITCH is turned off during storage. The 2830R/24 communicator should be stored connected to AC power. This ensures that the communicator will be fully charged and ready to use when needed.

## 6.4 Troubleshooting

Most problems are usually simple issues that can often be found by careful inspection of the diver communicator, diving umbilical, and diver helmet wiring. The following section will describe the troubleshooting procedure for several common issues. If these sections do not cover your particular issue, it is recommended that the diving umbilical be disconnected from the diver communicator and the check-out procedures in section 6.1 be conducted. If the diver communicator passes the check-out procedures then the issue is most likely in the umbilical connections, the umbilical itself, or the wiring of the diver's hat/helmet

### 6.4.1 Connection Issues

Most diver communicator problems are caused by bad connections. Making good connections will result in years of good communications. For longer life, all connections should be soldered and copper wire must be tinned. It is strongly suggested that dual banana plugs be used topside to provide convenient and secure connections.

All cable splices must be soldered. Splices should be staggered and covered with shrink tubing (preferably shrink tubing with an adhesive sealant) and a general splice cover to protect the connections. Potting the splices to create a reliable splice is preferred but not necessary to create a reliable splice. 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 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.

### 6.4.2 Low Battery Indication

The BATTERY CONDITION INDICATOR indicates the battery level or state-of-charge by monitoring the battery voltage. It is recommended that the 2830R/24 be recharged for at least 10 hours if the BATTERY CONDITION INDICATOR is low or bad. If the BATTERY CONDITION INDICATOR indicates a low (blinking LED) or bad (off LED) after charging, then either the battery is bad and needs to be replaced or the charger has malfunctioned.

### 6.4.3 Unit Not Operating

The most common reason that a diver communicator appears to be dead when the POWER SWITCH and SPEAKER SWITCH are turned on is a bad battery or loose AC connection.

If the battery and AC connections appear good and the communicator fails the check-out procedure, then remove the screws holding the lid. Verify that the connectors on the Printed Circuit Assembly (PCA) are firmly seated. Check that the wire harnesses are soldered to the various connectors, controls, and speaker. There should be no loose wires in the system. Remove the fuse from the PCA. It is

marked FH1 and is a cylindrical component. Verify that the fuse is good by checking the continuity with a multi-meter. If the fuse is open, replace with the same type: 3.15 Amp, 250V, Fast Acting. Close the lid; re-install the screws and re-test the communicator. If the communicator still appears dead, contact Amron per section 3.2 for further assistance.

#### 6.4.4 **Low Volume**

Check the volume control settings and adjust if necessary. Check the diver connections and verify that the diver and tender are connected as intended. Verify the wires and connector are clean and tight (see section 5.3.1 for additional information). Check the BATTERY CONDITION INDICATOR and/or AC power connection. If the problem persists, disconnect the diver umbilical and perform the communicator check out procedure per section 6.1. If the communicator fails the check-out procedure, contact Amron per section 2.2 for further assistance.

If the communicator checks out, then the problem is likely in either the diver umbilical communication cable, the wiring of the diving hat/helmet or the diver's microphone/earphone.

#### 6.4.5 **Garbled Voice To The Diver**

The TENDER TO DIVER VOLUME control is set too high. Reduce this control until the voice signal clears. If this does not solve the problem, check the diver's earphone for corrosion or other defect. Replace if necessary. If the tender is using a headset, remove the headset and communicate to the diver by pressing the PUSH-TO-TALK BUTTON and talking into the PANEL SPEAKER. If this solves the problem then the tender headset may be wet or defective. If the tender is using the PANEL SPEAKER to talk to the diver, check the speaker for any accumulated water. Drain the speaker if necessary. If these steps do not solve the problem then disconnect the diver umbilical and perform the communicator check out procedure per section 6.1. If the communicator fails the check-out procedure, contact Amron per section 2.2 for further assistance. If the communicator checks out, then the problem is likely in the diver umbilical communication cable. If possible, substitute a known good cable to verify

#### 6.4.6 **Garbled Voice To The Tender**

The DIVER TO TENDER VOLUME control is set too high. Reduce this control until the voice signal clears. If this does not solve the problem, check the diver's microphone for corrosion or other defect. Replace if necessary. If the tender is using a headset, remove the headset and listen to the diver using the PANEL SPEAKER. If this solves the problem then the tender headset may be wet or defective. If the tender is using the PANEL SPEAKER to talk to the diver, check the speaker for any accumulated water. Drain the speaker if necessary. If these steps have not solved the problem, then disconnect the diver umbilical and perform the communicator check out procedure per section 6.1. If the communicator fails the check-out procedure, contact Amron per section 2.2 for further assistance. If the communicator checks out, then the problem is likely in the diver umbilical communication cable. If possible, substitute a known good cable to verify.

#### 6.4.7 **Diver Cuts Off**

This is usually caused by an intermittent connection between either the umbilical and the diver communicator or the umbilical and the diver's hat/helmet. The intermittent connection could also be inside the diver's hat/helmet. Check all connections to verify that they are clean and tight. If the problem continues, substitute the communication cable with a known good cable. If this solves the issue, then the communication cable in the original umbilical is damaged and needs to be replaced or repaired. If none of these solutions fixes the problem, contact Amron per section 2.2 for further assistance.

#### 6.4.8 **Feedback, Full-Duplex (4-Wire) Mode**

There are two forms of feedback that can affect the 2830R/24: acoustic feedback and cable crosstalk. Acoustic feedback occurs when an active microphone is close enough to pick up and amplify the signal from a speaker or earphone. The required distance between the microphone and speaker/earphone is dependent on the volume setting and the amount of acoustic isolation. For example, a tender headset left sitting on a work table may cause acoustic feedback. When the tender dons the headset at the same volume level, the acoustic feedback will no longer occur. The tender's head provides acoustic isolation between the microphone and earphone of the headset. The same is true for the diver's microphone and earphone.

To troubleshoot acoustic feedback issues first determine the source. One way to quickly determine the source of the acoustic feedback is to cover each active microphone with your hand, one at a time. Another method is to adjust the volume controls one at a time. The volume control that stops the feedback indicates the source. For example if the TENDER TO DIVER VOLUME control stops the feedback, then the problem is likely in the diver's hat/helmet. Common sources are feedback between the tender's headset microphone and the PANEL SPEAKER of the 2830R/24. If the tender wants to operate with the headset and leave the PANEL SPEAKER on, Amron recommends the tender move away from the 2830R/24 by using the Amron Model 2822-28 Remote Walk-and-Talk Module. This module provides an "extension" cord for the tender headset allowing the tender to operate away from the 2830R/24.

Crosstalk is caused by signal leakage between the microphone and earphone wires in the umbilical cable. In a good cable with all the wires open (not connected) the resistance between any two wires should be greater than 10 Meg-Ohms. Over time, the cable can be damaged and this resistance drops to the point that crosstalk can occur. When this occurs, the communication cable in the umbilical should be replaced. For a temporary solution, you can try swapping the position of the diver earphone wires on the DIVER EARPHONE jack. If you are using a banana plug, simply unplug the diver earphone and rotate by 180 degrees before reconnecting. If this does not solve the problem and the umbilical cannot be immediately replaced, then operate in 2-Wire mode until a replacement umbilical can be used. Amron strongly recommends the use of the Amron CC1 communication cable. It has been specially designed for clear communications and long service life.

#### 6.4.9 **Push-To-Talk Does Not Work**

If used, check the connection to the handheld microphone. A common issue is that the yellow banana plug is not properly seated in the PUSH-TO-TALK JACK. If the tender is using the PANEL SPEAKER as the microphone with the PUSH-TO-TALK BUTTON, make sure the SPEAKER SWITCH is turned on. If neither of these solves the problem, there could be a broken wire inside the diver communicator. Open the front panel and inspect as described in section 7.3. If that does not resolve the problem then contact Amron per section 2.2 for further assistance.

## 7 FULL DUPLEX (4-WIRE) - WHAT, WHY AND HOW

Amron has designed the AMCOM Full Duplex (4-WIRE) mode from the ground up, taking advantage of state-of-the-art electronics technology to provide a superior hard wire communication experience. Full Duplex (4-Wire) mode has the following advantages:

- Up to 285% more signal strength from the diver microphone over the 2-Wire mode using standard 8-Ohm microphones.
- No push-to-talk required leaving the tender's hands free for other tasks.
- The diver and tender can hear themselves talk providing a more natural communication experience.

These advantages produce superior communications and the system is easier to operate by eliminating the need for using a push-to-talk switch. Another advantage is that the system is easy to troubleshoot. In fact it is easier to troubleshoot than 2-Wire system once you understand what is happening. Full Duplex (4-Wire) mode pays off in better communications, something that many of our competitors have yet to achieve. Better communications means higher diver production, safer dive conditions and less down time.

### 7.1 What Are 2-Wire And 4-Wire Modes?

#### 7.1.1 2-Wire Mode

2-Wire mode is the most commonly used communication mode in the commercial diving industry. Technically it is defined as a single communication path using a minimum of 2 wires in a communication cable. Being a single path, there can only be one talker at a time. Commonly the diver has the priority and the tender listens as the diver talks. In order for the tender to talk to the diver, this communication path has to be reversed. This is done by the tender pressing a push-to-talk switch. This switch activates a set of relays that switch the diver connection to the output side of an audio power amplifier and the tender connection to the input side. This allows the tender to talk while the diver listens.

Most diver communication cables, such as the "Army surplus Comm-Cable," have four wires. These four wires are often separated into two sets of twisted-wire pairs. In many diving operations, these two sets of twisted-pairs are connected in parallel for redundancy. A breakage in a single wire in the cable does not cause a loss of communication, as each wire has a parallel wire to take over. This arrangement is still a 2-Wire mode even though 4 wires are being used.

#### 7.1.2 4-Wire Mode

4-Wire mode uses two communication paths: an uplink from the diver to the tender and a downlink from the tender to the diver. This allows voice communications to go in both directions at the same time. An example of this type of communication system is the telephone. Another example is called Round Robin communications. Amron's Full Duplex (4-Wire) is not the same as Round Robin.

## 7.2 What Is Full Duplex (4-Wire)?

It is a 4-Wire dual communication path system that uses special audio amplifiers on the microphone and earphone connection to eliminate the issues associated with Round Robin systems. It allows everyone on the communicator to talk to each other just as if they were on a telephone.

### 7.2.1 Why Are Special Amplifiers Needed?

When developing a 4-Wire communication system, the biggest problem facing the designer is oscillation caused by feedback. This can occur in two ways. The most common is acoustic feedback, also called the Larsen effect, which occurs when the microphone picks up the sound from the speaker and feeds it back into the amplifier. This signal is amplified and sent out the speaker at a higher level. Given the right conditions, this process repeats until the amplifier reaches maximum signal level. The result is usually a high pitch, howling sound commonly heard in public address systems when the volume is turned up too high.

The solution for acoustic feedback is to turn down the amplifier volume and to isolate the speaker from the microphone. In a dive helmet, the diver's head makes a good acoustic isolator. On the surface, a tender using a headset may get some acoustic feedback via the PANEL SPEAKER. The solution is to put some distance between the tender and the PANEL SPEAKER by using the Amron Model 2822-28 Walk-and-Talk Module accessory. Alternatively, the PANEL SPEAKER can be turned off using the SPEAKER SWITCH located on the front panel.

There exists a second, more difficult to avoid feedback path that can also cause oscillation. In 4-Wire mode, there are two sets of wire pairs. One pair carries the signal from the diver microphone to the communicator microphone input. This is an extremely low level signal, typically in the range of about 1mVRMS. The second carries the output signal from the communicator power amplifier to the diver's earphone. This signal can be as high as 4VRMS. The earphone signal is typically about 1000 times greater than the microphone signal and can be as much as 4000 times greater. If the signal on the earphone wire pair were to couple to the microphone wire pair, the result would be a feedback path that can lead to oscillation. To prevent such coupling, the dive cables are constructed using two individual twisted wire pairs and in high quality cables, such as Amron's CC1 communication cable, each pair can be shielded to provide additional protection. Shielding does decrease the amount of coupling between the wire pairs but without special amplifiers, the full capability of using twisted wire pairs is lost.

Amron Diver Communicators are designed with a special balanced circuit, differential input and output amplifiers. In a balanced circuit, each wire in the twisted pair carries an equal and opposite signal. Each wire generates an electromagnetic field that is in opposition with the field of other wire. The net result is that strength of the radiated electromagnetic field is significantly reduced if not totally eliminated. In addition, any external fields, either from the other wire pair or an external noise source, will be coupled to both wires equally creating a common-mode signal. The differential microphone amplifier in Amron Diver Communicators cancels the common-mode signal while amplifying the signal from the microphone.

Communicators without both differential input and output amplifiers cannot match the performance of Amron Diving Communicators. This is an extreme simplification of the common-mode coupling effect and common-mode signal rejection but shows the power of Amron's Full Duplex (4-Wire) mode of operation.

### **7.2.2 Isn't Round Robin The Same Thing?**

In Round Robin communication systems, each diver is connected using a 4-Wire cable like the Amron Full Duplex (4-Wire) mode. This is where the similarities end. In Round Robin systems all the microphones are connected together in parallel and connected to the microphone input of the communicator. All the earphones are also connected in parallel and connected to the earphone output of the communicator. Each microphone is loaded by all the other microphones in the system causing lower output. In a two diver setup where the diver microphones have a typical impedance of 8 Ohms and the tender's microphone has an impedance of 150 Ohm, the diver microphone output level will be reduced by about 50% while the tender's microphone is attenuated by out 95%. On the earphone side, the diver earphones commonly have an impedance of 8 Ohms while the typical tender earphone impedance is around 175 Ohms. These two factors combine to create a serious volume imbalance which requires higher volume settings resulting in more noise and less system stability.

### **7.3 Why Full Duplex (4-Wire)?**

Amron Diver Communicator uses an independent microphone amplifier for each diver circuit as well as for the tender. This allows Amron Diver Communicators to use the power of common-mode rejection to cancel any coupled noise for each microphone as well as providing less loading of the microphone than in 2-Wire mode. In 2-Wire mode, the diver microphone is wired in parallel with the diver earphones. Assuming that the impedance of the microphone is the same as the earphones, the signal from the microphone is attenuated by 65%. By separating the microphone from the earphones, the output signal from the microphone increases by 285%. With more signal, the volume level can be decreased resulting in less noise and improved system stability for a significant improvement in overall clarity.

### **7.4 How Do You Use Full Duplex (4-Wire)?**

In order to use Amron's Full Duplex (4-Wire) mode, you need the following items:

- An AMCOM series diver communicator
- A good quality dive communication cable with four wires (two twisted wire pairs) like Amron's CC1
- A dive hat/helmet with connection for 4 wires such as a Marsh Marine connector

To connect the system together, refer to appropriate section of the operating manual for AMCOM diver communicator. In general it involves three steps (using the Amron CC1 cable):

1. Install male Marsh-Marine 4-pin connector in hat/helmet. Attach black and white wires to binding post and both speakers. Attach red and green wires to leads from microphone. It doesn't matter which color goes to which lead. Use 8-32 x 1/4 SS screw and nuts, cover each with tape or shrink tubing. You are now finished with the diving hat/helmet.
2. Install 4-pin female Marsh-Marine connector on diver's end of communication cable. Connect red and green wires to the light colored pair of communication cable wires; black and white wires to black pair of communication-cable wires. You are now finished with this step.
3. Install black dual banana plug to black pair of wires on tender end of diver communication-cable and attach red dual banana plug to lighter color pair of wires. If you don't have red dual banana plugs, red tape will serve to identify that pair as the microphone circuit. **YOU ARE FINISHED!**

To setup and check-out the communication link:

1. Attach hat/helmet to umbilical.
2. Attach communication cable to AMCOM diver communicator. Connect the red banana plug to DIVER MICROPHONE (red) jack and the black banana plug to DIVER EARPHONE (black) jack.
3. Set the volume controls to mid-range on the communicator. Turn on the communicator. There may be some acoustic feedback, if that occurs then reduce the volume until it feedback stops.
4. Don the hat/helmet and start talking. You should hear yourself in earphones. Adjust the volume as necessary for clear communications.

To revert back to 2-Wire mode, simply remove black banana plug from DIVER EARPHONE (black) jack and plug it on top of DIVER MICROPHONE (red) plug.

Things to keep in mind when using Amron's AMCOM diver communicators:

With the AMCOM diver communicators you can mix 2-Wire and Full Duplex (4-Wire) modes of operation. For example, the diver can operate on Full Duplex (4-Wire) mode while the tender operates in 2-Wire mode. The tender can use the panel speaker to listen to the diver and talk to the diver by pressing the push-to-talk button and using the panel speaker as a microphone.

When using AMCOM diver communicators with multiple diver capacity, each diver can be wired in either 2-Wire or Full Duplex (4-Wire) mode. All divers do not have to operate in the same mode.

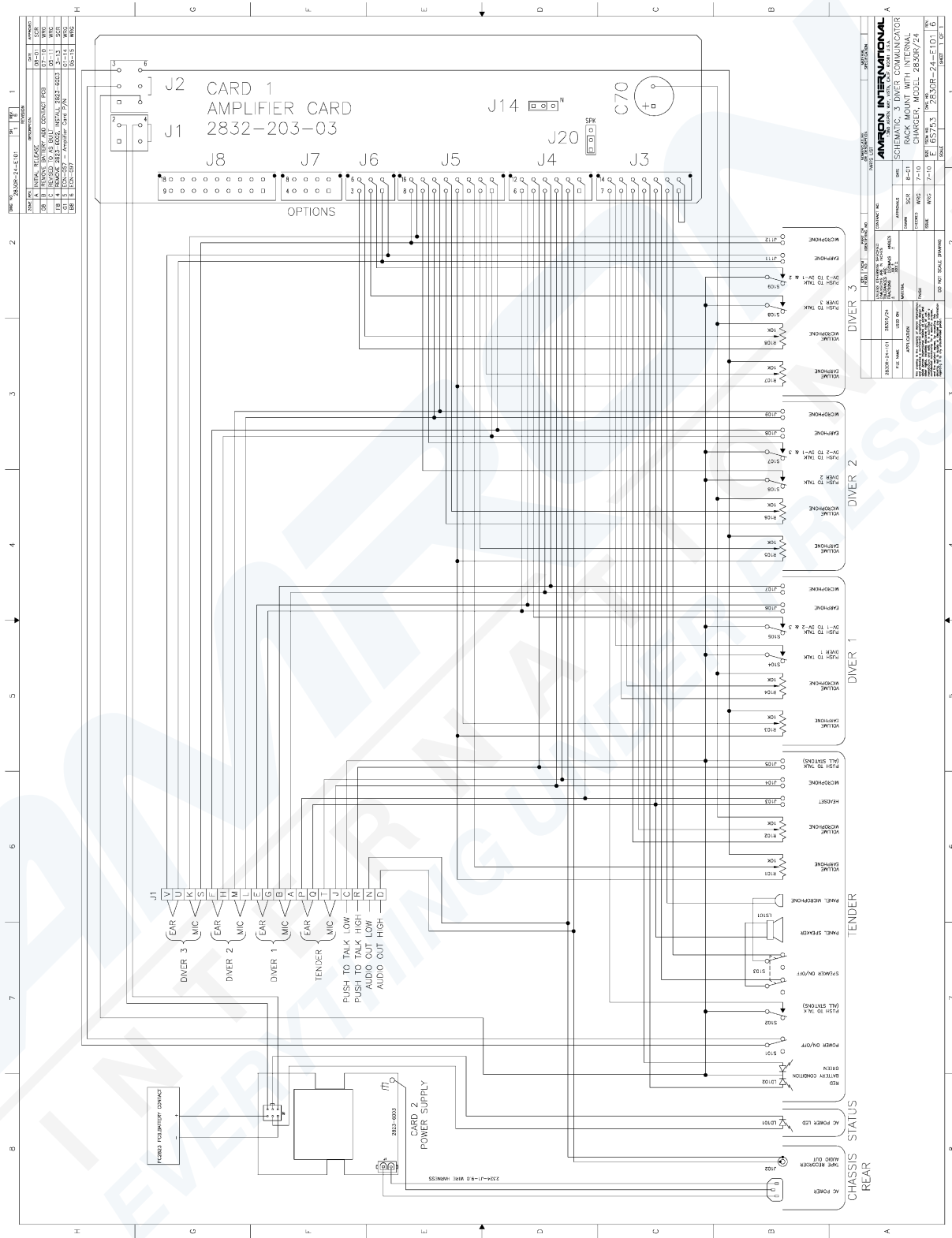
The push-to-talk button overrides the diver conversation by forcing all divers into listen only mode. This occurs whether the diver is wired in 2-Wire or Full Duplex (4-Wire) mode.

## 8 DRAWINGS AND SCHEMATICS

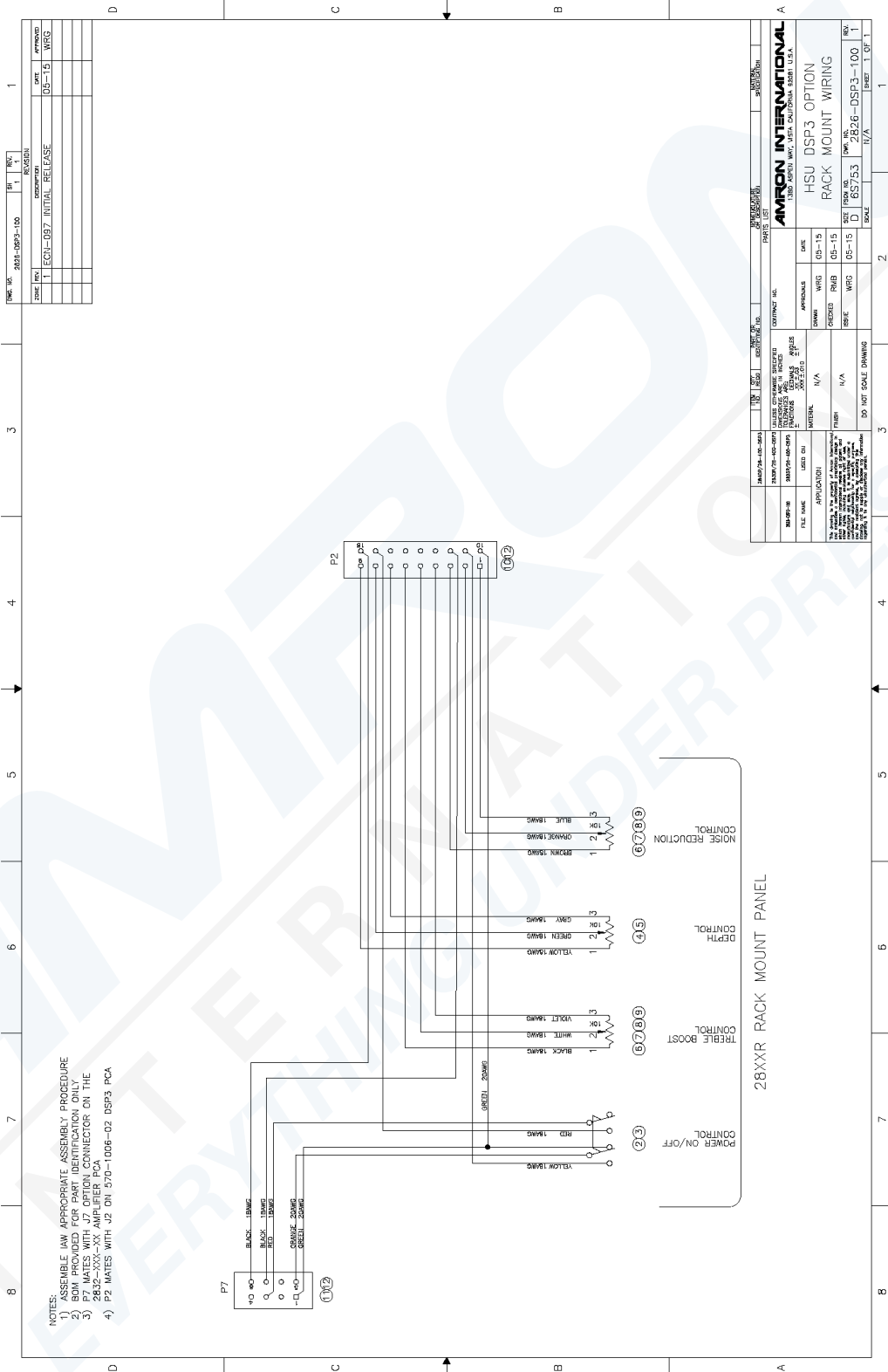
The following drawings illustrate the electrical and mechanical details of the AMCOM III Diver Communications. The corresponding parts lists for each drawing are detailed in the parts lists section, or are included as part of the drawing.



8.1 Schematic 2830R/24

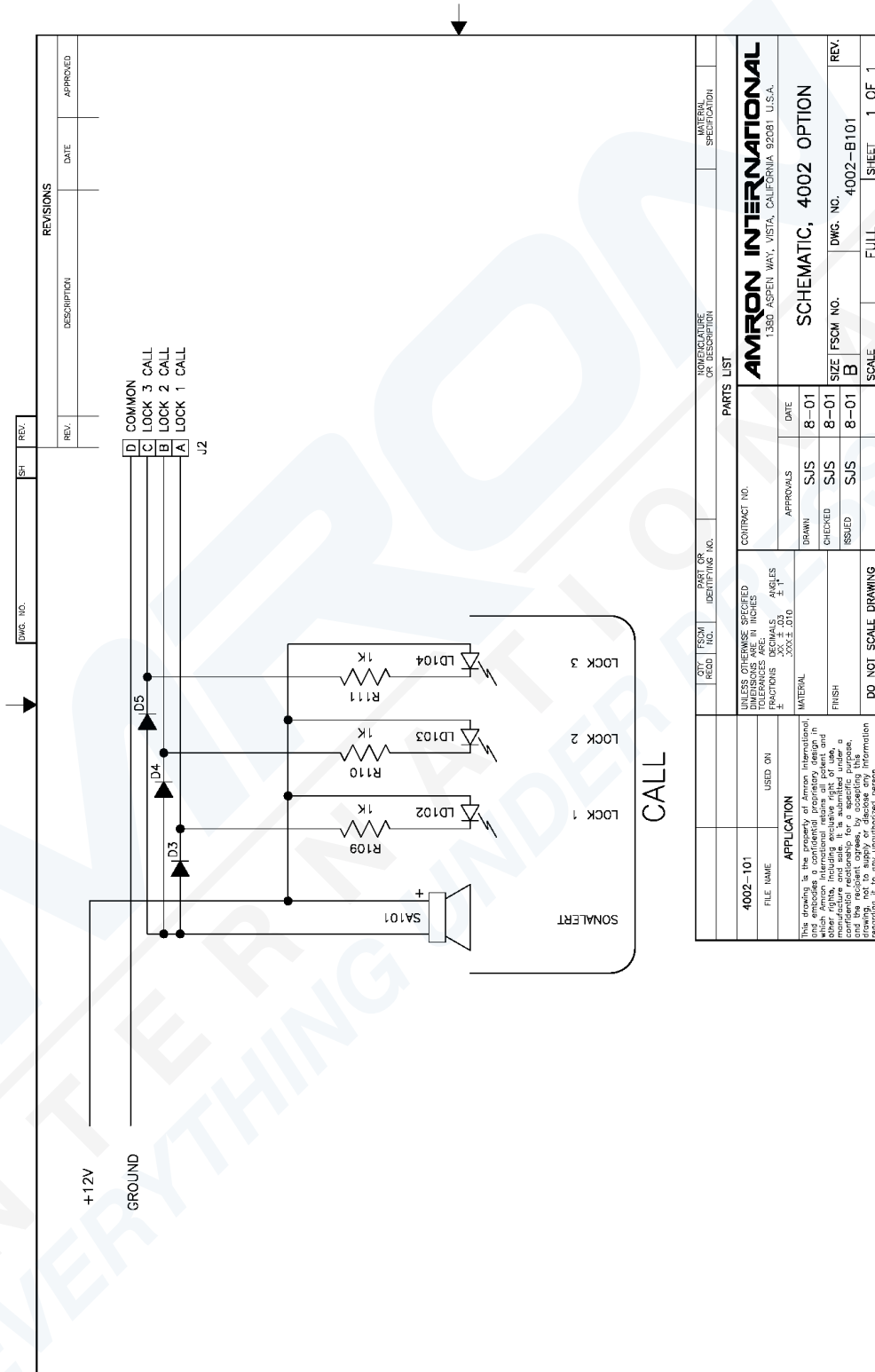


**8.2 Schematic Option /26DSP3**



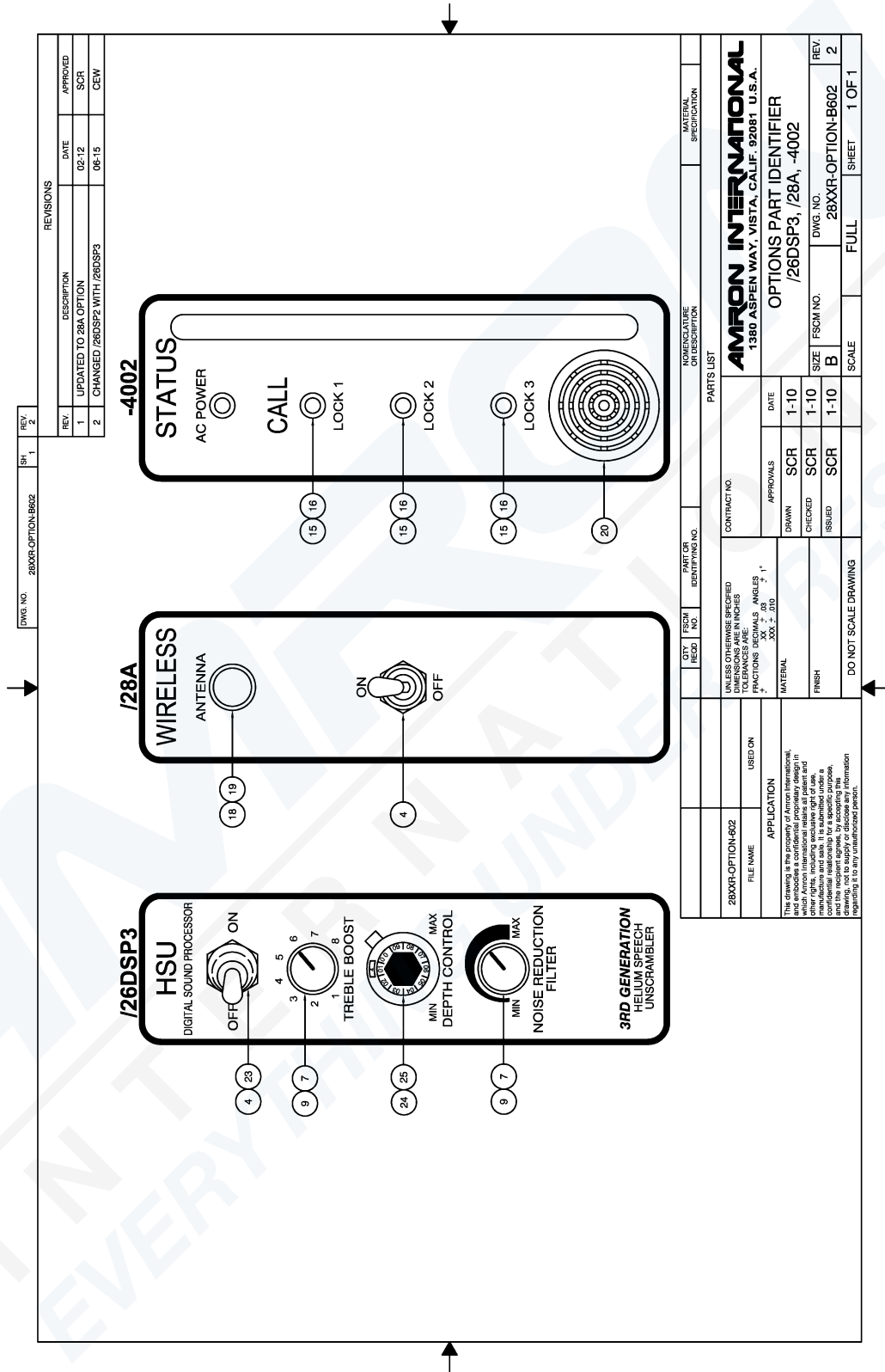


8.4 Schematic -4002 Chamber Lock Call Option





8.6 Parts Identifier, Options /26DSP3, /28A, -4002



## 9 PARTS LIST GENERAL

The parts lists include both mechanical and electrical parts. The following information will be useful in interpreting data which is not self-explanatory.

### REVISIONS

The parts lists in this manual are for the current model of diver communicator as of the printing date.

To Order Replacement Parts Contact:

Amron international, Inc.  
1380 Aspen Way, Vista, California, 92081 U.S.A.  
Telephone: (760) 208-6500 Fax: (760) 599-3857  
Email: [sales@amronintl.com](mailto:sales@amronintl.com)  
Web: [www.amronintl.com](http://www.amronintl.com)

When ordering replacement parts, you should give as much information as possible to enable us to supply the correct part. This information should include the part number, description, reference **designator, value, radio model number, and serial number. Failure to provide sufficient information may** hinder our ability to fill your parts orders promptly and correctly.

### 9.1 Amcom III Rackmount Model 2830R/24

REFERENCE	PART NUMBER	DESCRIPTION
N/S	2832-203-03	PC CARD ASSEMBLY AMCOM III
N/S	2830R-400	AMCOM III RM FRONT PANEL ASSBY
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-04	BATTERY RECHARGE 6V GEL 5AMP
N/S	MS-3106A-28-16P	MS CONN CABLE 20 PIN M
N/S	MS-3057-16A	MS CABLE CLAMP 24/28 SHELLS
N/S	2830R-UM	MANUAL FOR 2830R
N/S	P-2392	CORD AC EURO 3 COND

### 9.2 Amcom III Rack Mount, Unscrambler 2830R/24/26DSP3

REFERENCE	PART NUMBER	DESCRIPTION
N/S	2832-203-03	PC CARD ASSEMBLY AMCOM III
N/S	2830R/26-400M-DSP3	AMCOM III FRNT PANEL R/M /26
N/S	570-1006-02	PC CARD ASSEMBLY UNSCRAMBLER
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-04	BATTERY RECHARGE 6V GEL 5AMP
N/S	MS-3106A-28-16P	MS CONN CABLE 20 PIN M
N/S	MS-3057-16A	MS CABLE CLAMP 24/28 SHELLS
N/S	2830R-UM	MANUAL FOR 2830R
N/S	P-2392	CORD AC EURO 3 COND

### 9.3 Amcom III Model – 4002 Option

REFERENCE	PART NUMBER	DESCRIPTION
15	LEDGREEN	LEDGREEN BRITE
16	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
20	273-068	SONALERT 12 VDC 2900 HZ
N/S	MS-3102A-14S-2S	MS CONN BULKHEAD 4PIN F

### 9.4 Sub Assembly 2830R-400M, Front Panel Assembly

REFERENCE	PART NUMBER	DESCRIPTION
1	2830R/24-001	FRONT PANEL *** NOT FOR SALE ***
3	SA818	SPEAKER 8 OHM 15 WATT
4	SW-201	SWITCH TOGGLE DPDT
5	SW-208	SWITCH TOGGLE DPDT-MOM.
23	SWB-0001	BOOT TOGGLE SOFT GRAY
13	14002B	5-WAY BINDING POST (BLACK)

REFERENCE	PART NUMBER	DESCRIPTION
14	14002R	5-WAY BINDING POST (RED)
7	91A1AB24B15	POTENTIOMETER 10K LINEAR
10	1498-103	JACK BANANA BLACK
11	1498-102	JACK BANANA RED
12	1498-107	JACK BANANA YELLOW
9	KLN-500B-1/4	KNOB BLACK AL .5DIA .25INSHAFT
16	LEDGREEN	LEDGREEN BRITE
17	LT2462-24-D15	LED BI-COLOR RED/GREEN
15	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
26	14003-1	PANEL MIC
27	450-0002-01	MEMBRANE FOR PANEL MIC
28	M3CA0208	HOLDER FOR PANEL MIC
29	14003-SD	VINYL SEALING DISC FOR PANEL MIC

### 9.5 Sub Assembly 2830R/26-400M-DSP3, Front Panel Assembly

REFERENCE	PART NUMBER	DESCRIPTION
1	2830R/24/26DSP3-001	FRONT PANEL *** NOT FOR SALE ***
3	SA818	SPEAKER 8 OHM 15 WATT
4	SW-201	SWITCH TOGGLE DPDT
5	SW-208	SWITCH TOGGLE DPDT-MOM.
23	SWB-0001	BOOT TOGGLE SOFT GRAY
7	91A1AB24B15	POTENTIOMETER 10K LINEAR
15	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
17	LT2462-24-D15	LED BI-COLOR RED/GREEN
16	LEDGREEN	LEDGREEN BRITE
11	1498-102	JACK BANANA RED
10	1498-103	JACK BANANA BLACK
12	1498-107	JACK BANANA YELLOW
13	14002B	5-WAY BINDING POST (BLACK)
14	14002R	5-WAY BINDING POST (RED)
9	KLN-500B-1/4	KNOB BLACK AL .5DIA .25INSHAFT
24	113-10K0-05	POTENTIOMETER 10K OHM
25	190-0500-15	KNOB TURN COUNTING DIAL.
26	14003-1	PANEL MIC
27	450-0002-01	MEMBRANE FOR PANEL MIC
28	M3CA0208	HOLDER FOR PANEL MIC
29	14003-SD	VINYL SEALING DISC FOR PANEL MIC

**9.6 28XXR-FS-01 Spares Kit For 2830R/24**

QTY	PART #	DESCRIPTION
2	KLN-500B-1/4	KNOB BLACK AL .5DIA .25IN SHAFT
2	1498-102	JACK BANANA RED
2	1498-103	JACK BANANA BLACK
2	1498-107	JACK BANANA YELLOW
2	14002B	5-WAY BINDING POST (BLACK)
2	14002R	5-WAY BINDING POST (RED)
2	91A1AB24B15	POTENTIOMETER 10K LINEAR
2	M-2786	NUT A/B POTS P/N 34602
2	3/8ISW	WASHER, 3/8 INTERNAL STAR
2	SW-201	SWITCH TOGGLE DPDT
2	SW-208	SWITCH TOGGLE DPDT-MOM.
1	LEDGREEN	LED GREEN BRITE
1	LT2462-24-D51	LED BI-COLOR RED/GREEN
2	0034.6019	FUSE 3.15A/250V MICRO QUICK
2	0034.6617	FUSE 1.6A/250V SLOW MICRO
2	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
4	SWB-0001	BOOT, TOGGLE SOFT GREY
2	8-32X3/4KTSB	KNURLED THUMB BRASS 3/4

**9.7 Optional Spares**

REF	PART #	DESCRIPTION
N/S	2832-203-03	AMPLIFIER CARD ASSEMBLY
N/S	2823-6003	CHARGER CHASSIS ASSEMBLY
N/S	570-1006-02	PC CARD ASSEMBLY UNSCRAMBLER-DSP3
N/S	2405-28	MICROPHONE PUSH-TO-TALK
N/S	2890-04	BATTERY RECHARGE 6V GEL 5AMP
26	14003-1	PANEL MIC
27	450-0002-01	MEMBRANE FOR PANEL MIC
28	M3CA0208	HOLDER FOR PANEL MIC
29	14003-SD	VINYL SEALING DISC FOR PANEL MIC