

Instruction Manual
For
Amron International, Inc.

**Model 2820A& 2825A
Two Diver Communicator**

S/N _____



1380 Aspen Way, Vista California 92081-8349
United States of America
Phone: (760) 208-6500
Fax (760) 599-3857
email: sales@amronintl.com
web: www.amronintl.com

This manual and the information contained herein are provided for use as an operation and maintenance guide. No license or rights to manufacture, reproduce, or sell either the manual or articles described herein are given. Amron International, Inc. reserves the right to change specifications without notice. *Copyright© 2013 Amron International, Inc.*

TABLE OF CONTENTS

1. INTRODUCTION AND SPECIFICATIONS	1
1.1 Introduction	1
1.2 ELECTRICAL Specifications	1
1.3 Mechanical SPECIFICATIONS.....	2
1.4 Drawing Front Panel Controls Model 2820A	3
1.5 Drawing Front Panel Controls Model 2825A	4
2. LIMITED WARRANTY AND SERVICE POLICY	5
2.1 Limited Warranty.....	5
2.2 Service Policy	5
3. OPTIONS AND ACCESSORIES	6
3.1 Options.....	6
3.2 Accessories.....	6
4. CONTROLS AND CONNECTIONS	8
4.1 Tender Controls	8
4.2 Tender Connections.....	9
4.3 Diver Controls	9
4.4 Diver Connections.....	9
4.5 Other Connections	10
4.6 Option Controls Helium Speech Unscrambler/26DSP2	10
4.7 Option Controls Wireless Tender /28A Option	11
4.8 Drawing 2-Wire Connections	13
4.9 Drawing, Full Duplex (4-Wire) Connections	14
4.10 Drawing, Operator Connections, P-T-T. Microphone	15
4.11 Drawing, Operator Connections, Headset.....	16
5. INSTALLATION AND OPERATION	17
5.1 Operation	17
5.2 Charging the Batteries: /23 and /24 Rechargeable Units	17
5.3 Battery Condition	18
5.4 Battery Installation: Standard and /23 Rechargeable Units.....	18
5.5 Battery Installation:/24 AC Powered Units.....	19
5.6 Modes of Operation	19
5.7 Volume Controls – 2-Wire.....	20
5.8 Other Diver Controls – (2-Wire).....	21
5.9 Volume Controls – 4-Wire (full duplex).....	21
5.10 Other Diver Controls (4-Wire Mode).....	22
5.11 Other Tender Controls	22
5.12 Wireless Options.....	24
6. MAINTENANCE AND TROUBLESHOOTING	26
6.1 Full duplex (4-wire) Check	26
6.2 2-wire check.....	26
6.3 General Maintenance.....	27
6.4 TROUBLESHOOTING.....	28

7.	FULL DUPLEX (4-WIRE) – WHAT, WHY AND HOW	33
7.1	What are 2-Wire and 4-Wire modes?	33
7.2	What is Full Duplex (4-Wire)?	34
7.3	Why Full Duplex (4-Wire)?	35
7.4	How Do You Use Full Duplex (4-Wire)?	35
8.	DRAWINGS AND SCHEMATICS	37
8.1	Schematic 2820A and 2820A/23	38
8.2	Schematic 2820A/24	39
8.3	Schematic 2825A and 2825A/23	40
8.4	Schematic 2825A/24	41
8.5	Schematic Option /26DSP2	42
8.6	Schematic Option 2828-100A	43
8.7	Parts Identifier Front Panel Model 2820A	44
8.8	Parts Identifier, Front Panel Model 2825A	45
8.9	Parts Identifier, Models /24, 224/26DSP2 & /24/28A Option	46
9.	PARTS LISTS	47
9.1	Amcom II Model 2820A	48
9.2	Amcom II Model 2820A/23	49
9.3	Amcom II Model 2820A/24	50
9.4	Amcom II Model 2825A	51
9.5	Amcom II Model 2825A/23	52
9.6	Amcom II MODEL 2825A/24	53
9.7	Amcom II Model 2825A/24/26DSP2	54
9.8	AMCOMM II MODEL 2825A/24/26DSP2 (continued)	55
9.9	Amcom II Model 2825A/23/28A	56
9.10	Amcom II Model 2825A/24/28A	57
9.11	AMCOM II MODEL 2825A/24/28A (continued)	58
9.12	2820-301 Case Assembly – AMCOM II	58
9.13	2820A-400M Front Panel Assembly	58
9.14	2825A-400M Front Panel Assembly	59
9.15	2820-500 Battery Box	60
9.16	2824-500B Battery Box Internal Charger	60
9.17	2823-603 External Charger Assembly	61
9.18	28xx-FS-01 Field Spares Kit for 2820A, 2825A	62
9.19	Optional Spares	62

1. INTRODUCTION AND SPECIFICATIONS

1.1 INTRODUCTION

The AMCOM II Series of diver communication systems are full featured hard-wired, two-diver communicators. The AMCOM II is offered in two basic versions; the units are identical except the Model 2825A has independent microphone and earphone volume controls for each diver and the tender. The Model 2820A has a single earphone volume control for diver's volume (down-link) and a single volume control for the tender (up-link).

All AMCOM II series have push-to-talk and separate isolated inputs for each diver. The AMCOM II Model 2820A and Model 2825A are portable two diver communication systems, delivering 20 Watts "voice power", operating from internal batteries or external 12 VDC power source.

Models with the /24 option can be operated from either a 110/220 VAC, external 12 VDC power source, or an internal 12 VDC battery.

The 2820A and 2825A have the capability of 2-wire and/or Full Duplex (4-wire) communication modes. 2-Wire and Full Duplex (4-wire) modes can be used simultaneously. Full Duplex is a communications system designed from the "ground-up" to take advantage of the current "state-of-the-art" in semiconductor technology and provide superior diver hard wire communication.

This portable diving radio has the ability to work with both dynamic and pre-amplified microphones in either 2-wire or 4-wire modes. The circuit detects the type of microphone that each diver is using then automatically switches from the preamp mode to dynamic mode, adjusting the specific diver's gain (volume). The tender's volume is set louder than the diver's volume. This allows the tender to hear the divers in a noisy environment while maintaining the diver's volume at a comfortable level.

1.2 ELECTRICAL SPECIFICATIONS

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
Power Supply Voltage.....	12 VDC Nominal (9 Volts Minimum - 18 Volts Maximum)
Sensitivity (Input).....	0.5 mV
Output Power (RMS @ 4 Ohm Load, 12 VDC).....	20 Watts Audio
Battery Life	
Model 2820A & 2825A	40 Hours
Model 282XA/23	30 Hours

Model 282XA/24	20 Hours
Operating Voltage	12 VDC
Model 282XA/24.....	90-264 Volts AC 47-440 Hz

1.3 MECHANICAL SPECIFICATIONS

Panel	Powder Coated Stainless Steel
Enclosure	High Impact Resistant Plastic
Enclosure Color.....	Bright International Yellow

Dimensions

Length	14.5 In. (36.8 Cm)
Width	9.0 In. (22.9 Cm)
Height	10.0 In. (25.4 Cm)

Weight with Batteries

Model 2820A	17.35 Lbs. (7.87 Kg)
Model 2820A/23 with External Charger	20.53 Lbs. (9.31 Kg)
Model 2820A/24	17.98 Lbs. (8.16 Kg)
Model 2825A	18.20 Lbs. (8.26 Kg)
Model 2825A/23	21.13 Lbs. (9.58 Kg)
Model 2825A/23/28A with Remote Wireless Tender Kit.....	25.88 Lbs. (11.74 Kg)
Model 2825A/24	18.53 Lbs. (8.40 Kg)
Model 2825A/24/26DSP2.....	19.18 Lbs. (8.70 Kg)
Model 2825A/24/28A with Remote Wireless Tender Kit.....	23.28 Lbs. (10.56 Kg)

1.4 AMCOM II MODEL 2820A DIVER COMMUNICATOR



The Model 2820A AMCOM II is a full featured, hardwire diver communicator. The 2820A features a single earphone volume control for the divers (downlink) and a volume control for the tender (uplink). Divers can be wired in either 2-Wire or 4-Wire mode for maximum flexibility. It can be ordered in the following configurations:

- Non-rechargeable lantern style batteries (2820A)
- Rechargeable batteries with external charger (2820A/23)
- Rechargeable batteries with internal charger (2820A/24 – Shown Above)

1.5 AMCOM II MODEL 2825A DIVER COMMUNICATOR



The Model 2825A AMCOM II is a deluxe hardwire diver communicator. The 2820A features individual earphone volume controls for each diver (downlink) as well as a volume control for the tender (uplink). Both divers and the tender have microphone volume controls. Divers can be wired in either 2-Wire or 4-Wire mode for maximum flexibility. It can be ordered in the following configurations:

- Non-rechargeable batteries (2825A)
- Rechargeable batteries with external charger (2825A/23)
- Rechargeable batteries with internal charger (2825A/24 – Shown Above)
- Rechargeable batteries with internal charger and Wireless Tender Option (2825A/24/28A)
- Rechargeable batteries with internal charger and Helium Speech Unscrambler (2825A/24/26DSP2)

2. LIMITED 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, 6 a.m. - 5 p.m. PST. Please do not return any product without an authorization number. After obtaining a return authorization number, wrap and pack the item securely and ship to the following address. We suggest that you use a carrier that provides tracking information and insure the item for full replacement value:

Amron International, Inc.
Attn: Repairs Department
1380 Aspen Way
Vista, CA. 92081

Be sure to reference the return authorization number on the outside of the shipment. For non-warrantable repairs, a minimum evaluation fee will be charged. A written evaluation and quote will be provided for approval before Amron proceeds with the repairs.

3. OPTIONS AND ACCESSORIES

3.1 OPTIONS

Amron offers the following options for the AMCOM II communicator:

- 3.1.1 Model /23 – External Battery Charger - The communicator is equipped with 4 gel-cell sealed lead-acid batteries and includes an external universal input (115/230 VAC) battery charger. Operating time is approximately 30 hours.
- 3.1.2 Model /24 – Internal Battery Charger - The communicator is equipped with an internal universal input (115/230 VAC) battery charger along with a rechargeable battery. Operating time is approximately 20 hours.
- 3.1.3 Model /26DSP2 - The communicator is equipped with Amron DSP2 Helium Speech Unscrambler (HSU). The DSP2 is an advanced, dual mode HSU with a range from surface to 2000 FSW (600 MSW). This option must be ordered with the /24 option and only on the 2825A.
- 3.1.4 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. This options is available on the 2825A only.

3.2 ACCESSORIES

Amron produces a series of accessories designed to operate with the entire line of AMCOM communicators.

- 3.2.1 Amron Heavy-Duty Headset - Model 2401-28 - 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 six foot (1.8 meter) cord.
- 3.2.2 Amron Standard Headset - Model 2460-28 - 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 Amron Push-to-Talk Microphone - Model 2405-28 - 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 Amron Remote Walk-and-Talk Module - Model 2822-28 - 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 Amron Remote Push-to-Talk Module - Model 2821-28 - 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 Amron Wireless Tender Headset – Model 2829-11 - 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.

4. CONTROLS AND CONNECTIONS

Before using the AMCOM II series diver communications 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. We also recommend reading the FULL DUPLEX description located in the Operation Section of this manual, for an explanation of advantages and "How to Implement" your AMCOM II Communications System.

4.1 TENDER CONTROLS

- 4.1.1 POWER SWITCH - Applies power to the unit from internal batteries or from external source.
- 4.1.2 SPEAKER SWITCH - Turns panel speaker and microphone on/off. It may be necessary to turn speaker off when using a headset to prevent feedback.
- 4.1.3 PUSH-TO-TALK ALL DIVERS SWITCH – This Switch allows tender to divers communication in 2-wire mode. (No push-to-talk required when operating in Full Duplex, 4-wire mode). In Full Duplex mode this switch allows the tender to interrupt divers with a priority message; all divers will be listening.
- 4.1.4 EARPHONE VOLUME - Controls panel speaker and/or tender headset volume. Use as master volume control, clockwise increases volume.
- 4.1.5 MICROPHONE VOLUME (Model 2825A only) - Controls tender microphone volume. Use as master volume control, clockwise increases volume.
- 4.1.6 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 guarantee proper operation.

WARNING!

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

- 4.1.7 PANEL SPEAKER - Acoustic horn speaker; operates when Speaker Switch is ON.
- 4.1.8 PANEL MICROPHONE - Condenser microphone to pick up tender voice, it operates when Speaker Switch is ON and PTT Switch is depressed.

WARNING!

Do not place any objects in the Panel Microphone hole or damage can occur. Do not cover or plug the Panel Microphone hole with any debris or improper performance will occur.

4.2 TENDER CONNECTIONS

- 4.2.1 HEADSET JACK (output/input) - Is a dual banana jack (color coded black) connection for headset earphones. 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, conversations (up-link & down-link) are switched automatically when push-to-talk switch is actuated. In Full Duplex mode this jack is an earphone only, both up-link & down-link conversations are heard.
- 4.2.2 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.
- 4.2.3 PUSH-TO-TALK JACK Is a dual banana jack (color coded yellow) connection for remote keying of PUSH-TO-TALK switch. It is used by the Push-To-Talk Microphone (Amron Model 2405-28) and the Remote Walk-And-Talk Module (Amron Model 2822-28..)

4.3 DIVER CONTROLS

- 4.3.1 Diver Volume Model 2820A – Controls both divers 1 & 2 earphone volumes.
- 4.3.2 MICROPHONE Volume Model 2825A (Divers 1 & 2) - Controls amplification of diver's microphone signal, therefore control diver's volume to tender and to all divers. Each diver circuit has its own volume control.
- 4.3.3 EARPHONE Volume Model 2825A (Divers 1 & 2) - Controls diver's earphone signal, therefore controls diver's hearing volume from tender and to all divers. Each diver circuit has its own volume control.
- 4.3.4 PUSH-TO-TALK- (Diver 1 & 2) - Momentary switch which allows a specific diver to hear tender and all divers (diver switches to listening mode) as long as switch is depressed, used in the two-wire mode.

4.4 DIVER CONNECTIONS

- 4.4.1 MICROPHONE (input/output) (Applies to Divers 1 & 2) - This connector is a dual 5-Way Binding Post Jack (color coded red). It functions as a microphone (input) and as an earphone (output) when PTT switch is depressed (used in both 2 & 4-wire mode).

In the 2 wire mode of operation, both diver microphone and earphone banana plugs are stacked into the umbilical microphone jack (red binding posts). Conversations (up-link & down-link) are switched automatically when push-to-talk switch is actuated. When a pre-amp microphone is used in the 2-wire mode setup, it is required to have special speakers supplied only by Amron.

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

- 4.4.2 EARPHONE Jack (output) – 4 Wire, (Diver 1 & 2) - 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 Full Duplex mode (4-wire).

4.5 OTHER CONNECTIONS

- 4.5.1 EXTERNAL BATTERY - (Input) - External 12 VDC power input to operate the unit from an external battery or power source. Power requirements are 12 volts DC (nominal), not less than 9.5 or more than 18 volts. Source must be able to supply a peak current of three amps for proper operation. With the model /23 Option these jacks are used for charging the internal batteries.

It is highly recommended to use an Amron External Charger Model 2823-603 as external power supply. The Amron External Charger was specifically designed for use with all Amron communicators and has a high degree of insulation between the primary and secondary circuits for diver protection and safety.

WARNING!

The EXTERNAL BATTERY input can be used to recharge the 2820A & 2825A rechargeable sealed lead acid battery. It is strongly advised to use the provided Amron External Charger, Model 2823-603, to charge or operate the communicator. This charger has been designed with the necessary electrical isolation to prevent dangerous currents from the AC lines from reaching the diver.

If you use an external power supply, the maximum voltage needs to be limited to 15 Volts if the rechargeable battery is in the unit. If a higher voltage is to be used, it is advised that the battery be disconnected or removed from the communicator to prevent possible damage to the battery.

- 4.5.2 TAPE RECORDER – provides an isolated output, of both diver and tender conversations (balanced), suitable to drive a audio recorder or audio input of a DVR. This feature allows recording of conversations between diver and tender.
- 4.5.3 AC POWER – AC power cord is mounted in the option panel located on right side of the communicator front panel. The option panel has an AC power indicator to identify the presence of AC power.

Communicator operates with both 110V and 220V (50 or 60 Hz). There is no manual switch to select the supplied voltage as it switches automatically inside the power supply. Also this internal power supply regulates the voltage to 14 VDC to supply the amplifier card and charges the internal batteries at the same time.

4.6 OPTION CONTROLS HELIUM SPEECH UNSCRAMBLER/26DSP2

- 4.6.1 The /26DSP2 option is located in the option section of the front panel assembly.
- 4.6.2 ON/OFF SWITCH: Allows the selection of air or helium operation. In the "OFF" position the audio bypasses the Unscrambler. In the "ON" position the audio is processed by the Unscrambler, allowing for the correction of the helium speech.

- 4.6.3 **TREBLE BOOST:** This control allows the high frequency response of the unit to compensate for high frequency fall-off of the diver microphone. The Treble Boost control has five selections ranging 1-5. The treble boost feature allows for optimum frequency enhancement and improved intelligible speech from the diver's voice.
- 4.6.4 **DEPTH CONTROL:** Selects the amount of frequency shift required to process the diver voice back to an intelligible level. The frequency shifting algorithm changes the amount of correction to the raw helium speech.
- 4.6.5 **MODE SWITCH:** This switch performs two functions, Mode A/B and Noise Reduction Filter.
- 4.6.5.1 **MODE A/B:** Selects two different processing modes for the correction of raw helium speech. Mode A is typically used for shallow depths with lower concentrations of helium, while Mode B is used for deeper depths requiring higher concentrations of helium. There is no specific depth limit for either mode; both are capable of operating to the maximum depth of 2000 FSW. Based on the mode setting, the frequency shifting algorithm's function will automatically change as well.
- 4.6.5.2 **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 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 NRF has four adjustment levels for the reduction of background noise in both depth modes A & B. When in mode A, simply toggle the Mode Switch from A to B and back to A. In mode B, simply toggle the Mode Switch from B to A and back to B. Each time a toggle cycle is completed, the filter will advance to the next level. Based on the filter level, the operator will hear a number of beeping tones from 1-4 that corresponds with the blue LED indicators.
- 4.6.6 **NRF INDICATOR:** There are four blue LED indicators that correspond to the present setting of the noise reduction filter ranging 1-4.

4.7 OPTION CONTROLS WIRELESS TENDER /28A OPTION

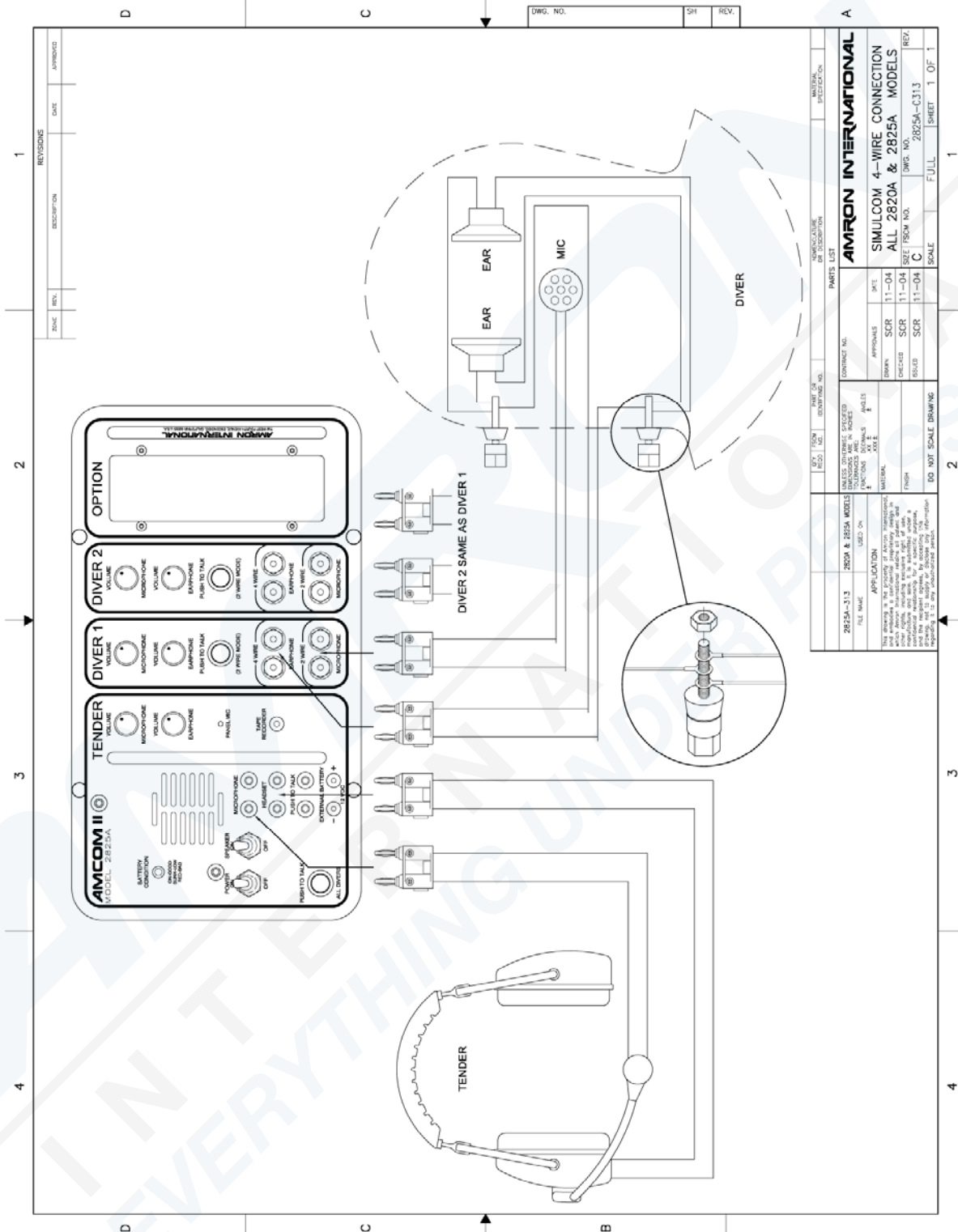
This option is mounted in the right hand side of the front panel. This Wireless Tender Option is for four-wire (Full Duplex) operation only. System comes standard with a remote wireless tender module.

- 4.7.1 **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.

- 4.7.2 **REMOTE WIRELESS TENDER MODULE:** This module comes standard with an internal rechargeable battery. Headset and external 110V charger jacks are located on remote module.
- 4.7.3 **ON/OFF-VOLUME CONTROL:** Adjusts the listening volume and turns the unit “OFF” when it is turned completely upwards.
- 4.7.4 **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 is in the Standby Mode (listen only) as indicated by the LED closest to the button being red. When button is pressed, the remote wireless is in the “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.
- 4.7.5 **HEADSET JACK:** Located on the side opposite to the ON/OFF-Volume Control. Plug the remote wireless headset to this Jack.
- 4.7.6 **CHARGE JACK:** Located on the side next to the ON/OFF-Volume Control. Plug the remote wireless charger to this jack.

4.9 DRAWING, FULL DUPLEX (4-WIRE) CONNECTIONS

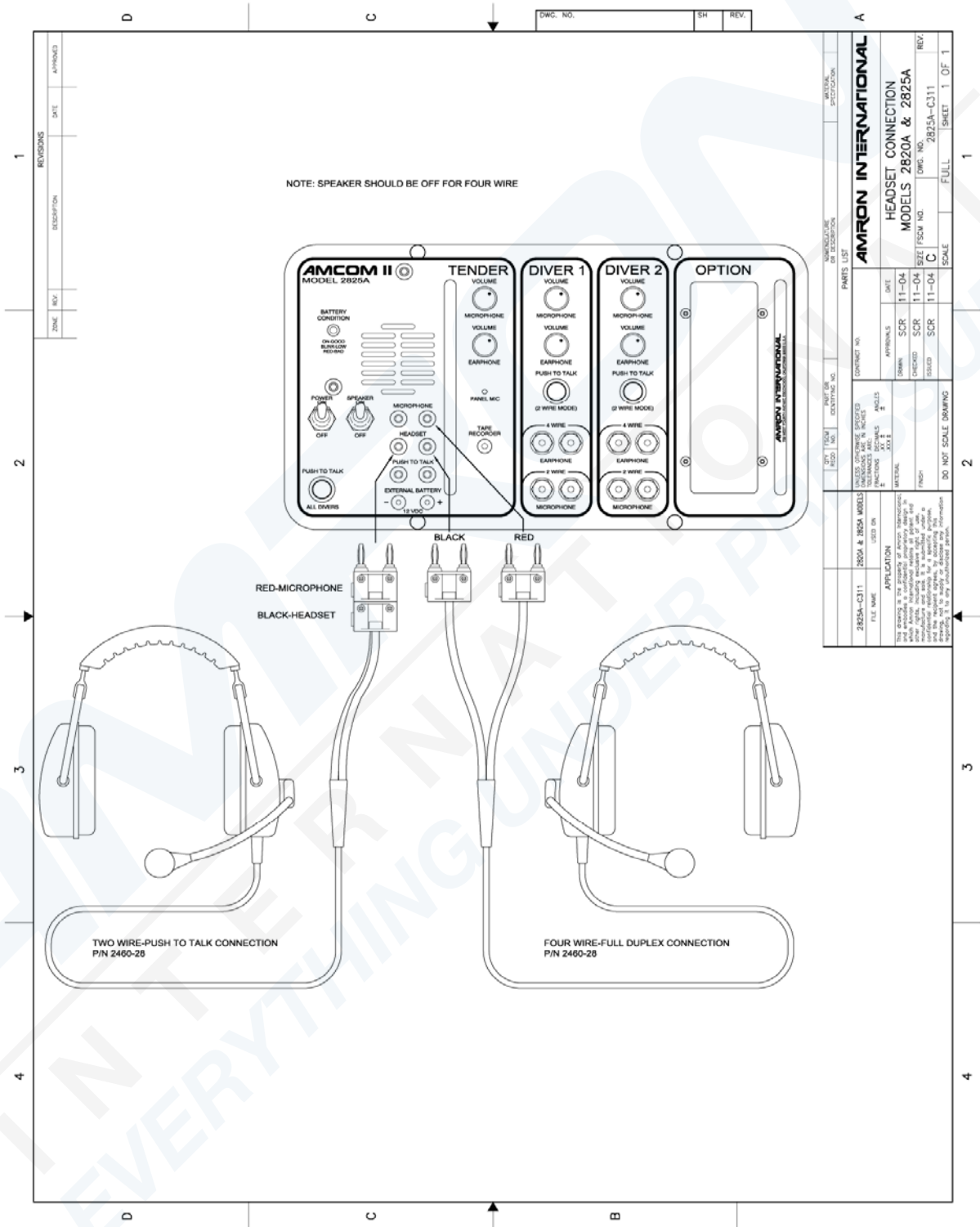


REV.	FROM	DATE	DESCRIPTION	APPROVALS	DATE
1					

DWG. NO.		SH	REV.												
<table border="1"> <tr> <th>REV.</th> <th>FROM</th> <th>DATE</th> <th>DESCRIPTION</th> <th>APPROVALS</th> <th>DATE</th> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				REV.	FROM	DATE	DESCRIPTION	APPROVALS	DATE	1					
REV.	FROM	DATE	DESCRIPTION	APPROVALS	DATE										
1															

AMRON INTERNATIONAL SIMULCOM 4-WIRE CONNECTION ALL 2820A & 2825A MODELS	
CONTRACT NO.	DWG. NO.
DATE	REV.
SCALE	SHEET 1 OF 1

4.11 DRAWING, OPERATOR CONNECTIONS, HEADSET



5. INSTALLATION AND OPERATION

5.1 OPERATION

The AMCOM II portable diver communicators are supplied in a yellow enclosure. To open the enclosure, release the two latches on the front of the unit and raise the lid. The lid of the communicator can be removed by sliding the lid to the side.

The AMCOM II 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.

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 Amron Model 2823-603 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. Amron cannot guarantee that non-Amron power supplies meet the same high standards and strongly advises against using any such device to power your diver communicator

5.2 CHARGING THE BATTERIES: /23 AND /24 RECHARGEABLE UNITS

With the /23 option to charge the batteries after using, connect the battery charger to the external battery jacks on the front panel of the unit then connect the charger to a 110/220 VAC outlet. When operating from 220 VAC, the charger will automatically sense the input voltage and adjust appropriately. The customer will have to use a power cord approved for the country of use.

It is recommended the unit be placed on charge and left on charge until the unit is to be used again. This ensures the unit will always be ready to use, and the batteries are fully charged. The charger is designed not to damage the batteries when left on continuous charge. Full charge will occur in ten hours (depending on the battery age and the surrounding temperature). If the unit is in constant use (daily) it is recommended the unit be left on charge during the weekend to top off the batteries. Batteries must be recharged periodically, a minimum of at least once every six months.

With the /24 option The AMCOM II is designed to operate from AC voltage (110/220 VAC 60/50 Hz). This option includes 1 ea. 12 V gel-cell battery 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 12 volt battery is maintained at full charge while the unit is operating from AC power. AC power indicator on the optional panel confirms the presence of AC power.

Operating time for the rechargeable 12V battery depends upon the age of the batteries. Gel-cell batteries have a life of 300 cycles, or 3 years. Gel-cell batteries do not have memory; therefore they can be placed on charge at any time.

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 BATTERY CONDITION

5.3.1 Power On – Battery Check

- Turn power switch “ON” and observe the battery condition indicator. The battery indicator will display the condition of the battery.
- A steady green light indicates the battery has sufficient voltage to operate the unit.
- A blinking green light indicates the battery is low and will need charging shortly, two hours of operating time remain.
- A steady red light indicates the battery voltage is too low to operate the unit. Communication should stop.

NOTE: Batteries which have not been used for a period of time will display a higher voltage state when initially turned on, this will rapidly dissipate. This condition is known as a surface charge, when the battery is placed under a load the voltage will fall rapidly. It is a good idea to leave the unit on for five minutes before relying upon the battery condition indicator.

5.4 BATTERY INSTALLATION: STANDARD AND /23 RECHARGEABLE UNITS

The standard and /23 rechargeable units are supplied with four spring-top dry cell or gel-cell batteries. To install the batteries, remove the four brass thumb screws from the front panel and lift unit out of the case. Set brass screws aside in a safe place where they won't be lost.

1. Stand unit on end (end opposite of speaker), and release the two stainless steel latches on the sides of the unit. Lift battery cover and move to one side. Notice the contact side of the battery cover. The battery contact card is designed to make contact with a spring top battery in any of the four rotational positions. This design facilitates the easy installation of batteries, with no wires to connect, and a very positive connection. There is a second battery contact card located in the bottom of the battery enclosure.
2. To install the batteries, slide two batteries into the case, spring terminals down. Install the second two batteries with the spring terminals up. Replace battery cover plate, battery contact side toward batteries, push down on the battery cover and latch in place. When replacing expended batteries, remove and discard all four batteries and replace with four new fresh batteries. Place unit back in case and secure with the four brass thumbscrews.

5.5 BATTERY INSTALLATION:/24 AC POWERED UNITS

The units with the /24 AC powered option are supplied with a single gel-cell, sealed lead, acid battery and an internal charger. To remove and install the battery, remove the four brass thumb screws from the front panel and lift unit out of the case. Set brass screws aside in a safe place where they won't be lost. Set unit on flat stable surface with front panel facing up. Remove the four screws located on the sides of the chassis. Lift out radio using the handles and set it on its right side (side away from speaker). The 12V battery is now accessible. Lift out battery and remove color-coded slide terminals. Install the battery and close unit in the reverse order.

5.6 MODES OF OPERATION

The Model 2820A and 2825A have the capability of 2-wire and/or Full Duplex (4 wire) communication modes. 2-Wire and Full Duplex can be used simultaneously (divers on Full Duplex, tender on 2-wire).

2-Wire communication is defined as a single communication path, normally the diver is the priority signal path, and tender listens to diver. Signal reversing is accomplished by pushing the push-to-talk switch, diver hears tender. Often times a 4-conductor (4 wires) communication cable is used with two wires tied together as a pair for redundancy, this is still a 2-wire system.

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. This permits the freedom of natural communication, lower system noise, and diver to diver communication without having to attempt Push-to-talk switching. For an in depth discussion on Full Duplex refer to "Full Duplex, What - Why - And - How!" located in the Theory of Operation Section of this manual.

5.6.1 2-Wire Operation

Connect the communications cable from the diver's umbilical (hat/helmet) to Diver 1 and/or Diver 2, microphone (input) under the words "2-wire". Wires should be well fastened to the binding posts and not touching each other.

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.

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

It is not recommended that two diver umbilicals be stacked on a single channel in 2-wire. This would not allow these two divers to communicate with each other.

5.6.2 4-Wire Operation

Connect the two wires from the diver's microphone to the Microphone (input) Diver 1. Connect the two wires from diver's earphones to the Earphone (inputs) Diver 1. Repeat the same 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 tenders headset away from the speaker. Use Amron Model 2822-28 headset extension cable (25-ft).

Up to three divers can be "stacked" onto a single diver channel. Connect the diver's microphones in parallel by stacking the banana plugs on the microphone jack and do the same with the diver's earphone plugs on the earphone jack. In this setup, all the divers will share the microphone and earphone volume controls. This can become a problem if the earphone or microphone for one diver is significantly weaker than the others. It is strongly advised that the setup be carefully tested before use.

5.7 VOLUME CONTROLS – 2-WIRE

Turn unit ON; adjust all volume controls to mid-scale. For 2-Wire Mode, Tender has to depress PTT Switches in order to talk to Divers. Tender and Divers talk to each other during Tender adjusting volume controls as below:

5.7.1 Model 2820A

- Tender - While diver is speaking, adjust Tender Volume Control to a comfortable level.
- Diver - Depress the push-to-talk switch and while talking into the panel microphone, adjust diver volume control to a comfortable level for the diver.

5.7.2 Model 2825A

NOTE: On the upper row of volume controls, set the microphone volume, on 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.

Set all volume controls at mid-scale.

Tender should don headset and talk to himself. If adjustments are required, increase or decrease volume (controls). This will establish a system volume level.

Tender

- Tender Earphone Volume: Divers talk while tender adjusts to a comfortable listening level.

- Tender Microphone Volume: Tender talks while depressing PTT 'All Divers Switch', divers determine a comfortable listening level, having the tender adjust as needed.

Diver 1

- Diver 1 Earphone Volume: Tender talks while depressing Diver 1 PTT Switch, diver 1 determines a comfortable listening level while having the tender adjust as needed.
- Diver 1 Microphone Volume: Diver 1 talks while tender adjusts to a comfortable listening level.

Diver 2

- Diver 2 Earphone Volume: Tender talks while depressing Diver 2 PTT Switch, diver 2 determines a comfortable listening level, having the tender adjust as needed.
- Diver 2 Microphone Volume: Diver 2 talks while tender adjusts to a comfortable listening level.

5.8 OTHER DIVER CONTROLS – (2-WIRE)**5.8.1 PTT all Divers Switches**

Push-to-talk switches are located below earphone volume control for each diver section. PTT will allow the specific diver to hear Tender and other divers, it changes the diver to be in listening mode and tender in talking mode.

5.9 VOLUME CONTROLS – 4-WIRE (FULL DUPLEX)

Turn unit on and adjust volume controls as follows:

5.9.1 Model 2820A

- Tender - Set at mid-scale. While diver is speaking, adjust to a comfortable listening level.
- Diver – Set at mid-scale. Talk to divers, and adjust until divers hear tender at a comfortable listening level.

5.9.2 Model 2825A

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.

Set all volume controls at mid-scale.

Tender should don headset and talk to himself. If adjustments are required, increase or decrease volume (controls). This will establish a system volume level.

Tender

- Earphone Volume - Divers talk, while tender adjusts to a comfortable listening level.
- Microphone Volume - Tender talks and divers determine a comfortable listening level, having the tender adjust as needed.

Diver 1

- Earphone Volume - Tender talks and diver 1 determines a comfortable listening level.
- Microphone Volume - Diver 1 talks, while tender adjusts to a comfortable listening level.

Diver 2

- Earphone Volume - Tender talks and diver 2 determines a comfortable listening level.
- Microphone Volume - Diver 2 talks, while tender adjusts to a comfortable listening level.

5.10 OTHER DIVER CONTROLS (4-WIRE MODE)

If conditions change as a group, the tender volume controls can be used as master volume control.

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 Model 2825A), which cuts off his microphone, yet will enable him to monitor the diver/tender conversation. On the Model 2820A you can disconnect his microphone circuit which will disable his microphone.

5.11 OTHER TENDER CONTROLS

5.11.1 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.

5.11.2 PUSH-TO-TALK SWITCH

Activation of this switch connects the tender to the diver which is necessary for 2-wire conversations and optional for Full Duplex (4-wire) conversations. Always used when using the speaker for talking to the divers.

5.11.3 MICROPHONE JACKS (RED)

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

5.11.4 HEADSET JACKS (BLACK)

Connection for headset earphones, external speaker: insert both headset banana plugs (red & black) into the black headset jacks, red & black when operating in the two wire mode. Insert in only the black headset banana plug when operating in the Full Duplex mode. Insert hand-held microphone black banana plug into the black headset jacks. Hand-held microphone is a standard item for the Model 2825A.

5.11.5 PUSH-TO-TALK JACKS (YELLOW)

Connection for remote control of the push-to-talk function: insert 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 Model 2825A 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).

5.11.6 TAPE RECORD JACK

Isolated audio output to drive an audio tape recorder or VCR. 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.

5.11.7 EXTERNAL BATTERY JACKS

The unit may be operated from an external 12-volt battery or power supply. Connect the positive side of the battery to the red jack and the negative side of the battery to the black jack. The jacks on the front panel are pin jacks; mating plugs are available from Amron or any electronic supply store. It is recommended the internal batteries be removed from the radio to prevent overcharging or charging of non-rechargeable batteries.

5.12 WIRELESS OPTIONS

5.12.1 Wireless Tender Option /28A

This option is installed in the right-hand section of the Diver Communicator's front panel. Amron's Full Duplex Wireless Tender is designed to allow the top-side tender to communicate to divers with hands-free operation. This allows the tender to check equipment and perform other tasks while still maintaining constant contact with the divers. This option can also be used in the 2-wire mode to listen to the diver-tender communications.

The Wireless Tender Option operates on one of 40 frequency channels. This allows multiple systems to operate in close proximity without interfering with each other. There is a master transceiver located inside the diver communicator. The channel is selected by setting a set of eight dip switches (located under the battery). Both the remote and master transceivers must have the same dip switch setting. The factory default setting is 1,1,1,1,0,0,0,1 (1 is ON). In order to change the channel of operation, it is required to apply changes to both units (master and remote). Amron recommends that the channel be changed by a trained technician.

Additionally, 2829-11 Wireless Headset and Transceiver Kits can be purchased for use with the Amcom as standby "listen only" devices. Only one transceiver can be used to talk and listen to the divers at any one time but any number of transceivers can be used in listen-only mode. The transceiver models operate at a frequency of 2.40 to 2.46 GHz using frequency modulation. They have a range of 120 yards (110 meters) with clear line-of-sight.

The remote unit (transmitter/receiver) is housed in a rugged plastic casing that can be clipped to a belt or slipped into a pocket. A single charge of the NiMH battery from the included AC adapter is capable of operating (transmitting and receiving) continually for up to 5 hours. In standby (listen only) mode, the battery will last for up to 8 hours. The standard headset is a tough over-the-ear single ear muff design with adjustable boom microphone.

Operation of the unit is automatic; speaking into the remote unit transmits a RF signal to the diver communicator. The diver communicator sends the signal down the umbilical to the diver. When the diver speaks, the signal is sent up the umbilical to the diver communicator. The signal is then transmitted as a RF signal to the remote module(s).

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 the available Remote Wireless Tender.

OPERATION: Turn option power switch to "ON", turn remote unit "ON/OFF" Volume to "ON", set remote unit to Talk Mode (press the Talk Button is once) and plug headset to remote unit.

5.12.2 Helium Speech Unscrambler Option /26DSP2

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 off the Helium Unscrambler.

The Unscrambler offers two modes of operation, Modes A and B. Mode A is typically used for shallow depths with lower concentrations of Helium, while Mode B is used for deeper depths requiring higher concentrations of Helium. Based on the mode setting, the frequency shifting algorithm's function will automatically change as well.

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 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 NRF has four adjustment levels for the reduction of background noise in both depth modes A & B. When in mode A, simply toggle the Mode Switch from A to B and back to A. In mode B, simply toggle the Mode Switch from B to A and back to B. Each time a toggle cycle is completed, the filter will advance to the next level. Based on the filter level, the operator will hear a number of beeping tones from 1-4 that corresponds with the blue LED indicators.

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.

Simplex and Full Duplex operations are possible with the Amcom Unscrambler. In Simplex 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 HeliOx speech is recommended to enhance intelligibility.

6. MAINTENANCE AND TROUBLESHOOTING

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

6.1 FULL DUPLEX (4-WIRE) CHECK

This procedure checks the communicator functions in the 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 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 EARPHONE (black) jack. Talk into the microphone. You should be able to hear yourself in the headset.
9. 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.

6.2 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 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.

6.3 GENERAL MAINTENANCE

The MODEL NUMBER OR AMCOM # 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

1. Handle the diver communicator with care. Do not throw it around or drop it. Select a work area where the communicator and wire connecting to it are out of everyone's way so it does not get knocked over.
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. Rinse off salt deposits with fresh water. Clean the diver connections with a mild vinegar and water solution using a soft brush. Rinse off the connectors with water after cleaning.

6.3.1 RECOMMENDED MAINTENANCE SCHEDULE

The following sections outline the recommended scheduled maintenance for the communicator and communicator-.

6.3.2 DAILY MAINTENANCE

Wipe off any accumulated salt or salt spray 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 outer case for any damage.

6.3.3 WEEKLY MAINTENANCE

Wipe off any accumulated salt or salt spray 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 outer case for any damage.

- Inspect the PUSH-TO-TALK BUTTON, binding posts and volume controls for smooth operation.
- Inspect the case lid O-ring for any damage and replace if necessary.

6.3.4 6 MONTH CHECK

Wipe off any accumulated salt or salt spray 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 outer case for any damage.

- Inspect the PUSH-TO-TALK BUTTON, binding posts and volume controls for smooth operation.
- Inspect the case lid O-ring for any damage and replace if necessary.
- Inspect the front panel gasket for any damage and replace if necessary.
- On the communicator - recharge the battery using the Amron 2823-603 Battery Charger.
- Perform the 2-Wire and Full Duplex (4-Wire) system checks as described in section 5.2.

6.3.5 YEARLY CHECK

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

6.3.6 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 communicator should be stored connected to the 2823-603 Battery Charger to ensure 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 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 5.1 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.

6.4.2 Low Battery Indication

The BATTERY CONDITION INDICATOR indicates the battery level or state-of-charge by monitoring the battery voltage. The battery voltage can be measured independently using a Voltmeter by measuring the voltage across the EXTERNAL BATTERY JACK. The voltage has to be 9 Volts or greater for the communicator with rechargeable battery to operate. It is recommended that the communicator be recharged for at least 10 hours if the measured voltage is less than 12 Volts (depending on the age of the battery and the surrounding temperature). 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.

The voltage has to be greater than 6.5 Volts for the 2810E-1 with alkaline batteries to operate. It is recommended that the battery be replaced if the voltage is below 10 Volts.

Before replacing either battery, the battery connections should be checked by opening the battery compartment and inspecting the wires. Verify that the wires are firmly attached and that the RED wire is connected to the positive terminal and that the BLACK wire is connected to the negative terminal.

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 or loose battery. Check the battery per section 5.3.2. If the battery is good, then disconnect any diving umbilical and perform the communicator check out procedure per section 5.1.

If the battery and battery connections appear good and the communicator fails the check-out procedure, then remove the screws holding the front panel. Lift the front panel up carefully as the panel components are connected to a Printed Circuit Assembly (PCA) by a wire harness. Verify that the connectors on the 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 front panel; re-install the screws and re-test the communicator. If the communicator still appears dead, contact Amron per section 2.2 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 test the battery per section 5.3.2 if necessary. If the problem persists, disconnect the diver umbilical and perform the communicator check out procedure per section 5.1. 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 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 5.1. 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 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 5.1. 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 communicator: 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 communicator. If the tender wants to operate with the headset and leave the PANEL SPEAKER on, Amron recommends the tender move away from the communicator 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 communicator.

Feedback 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 5.3.3. 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.

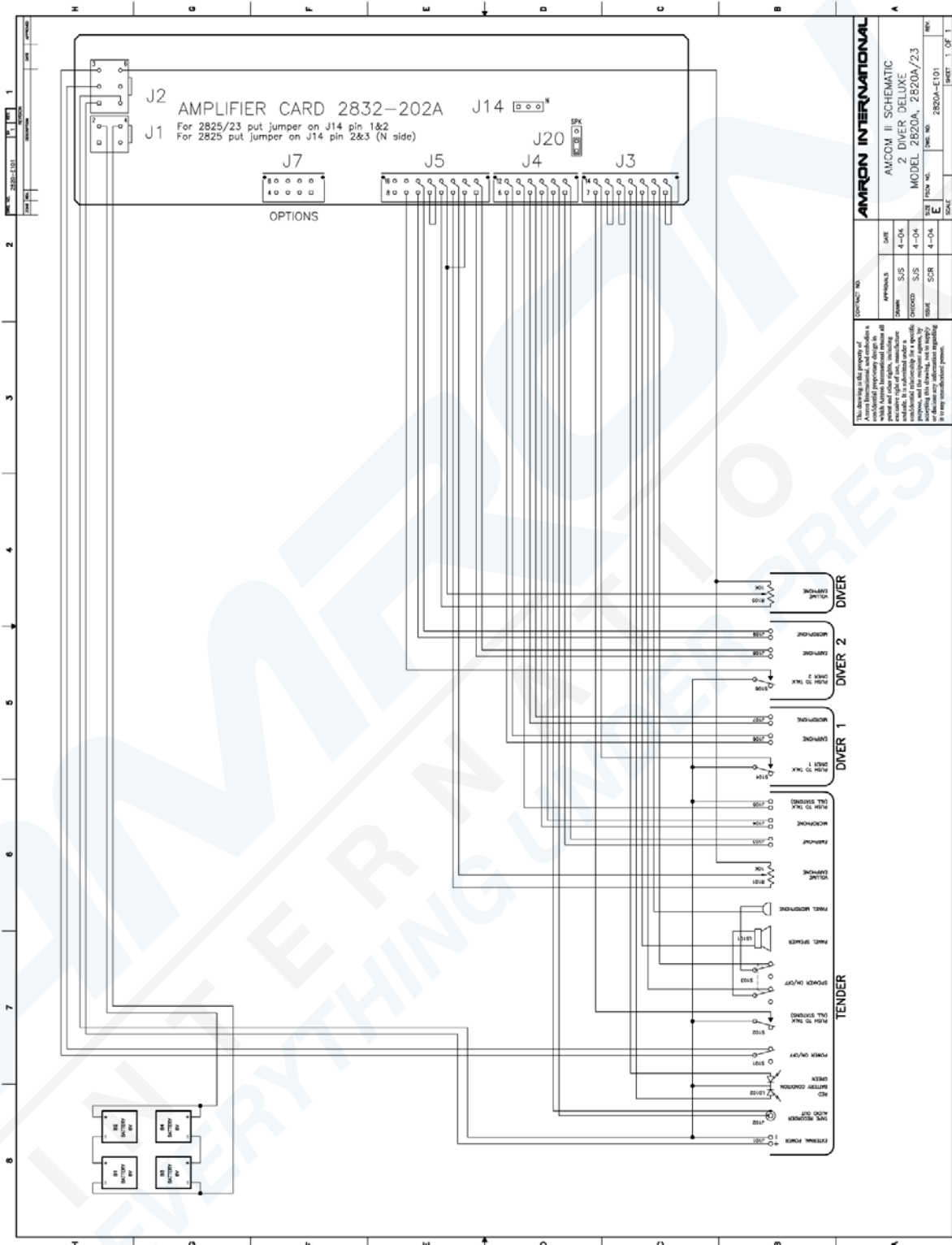
When using AMCOM diver communicators with multiple diver capacity, each diver can be wired in either 2-Wire or Full Duplex (4-Wire) mode. All divers do not have to operate in the same mode.

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.

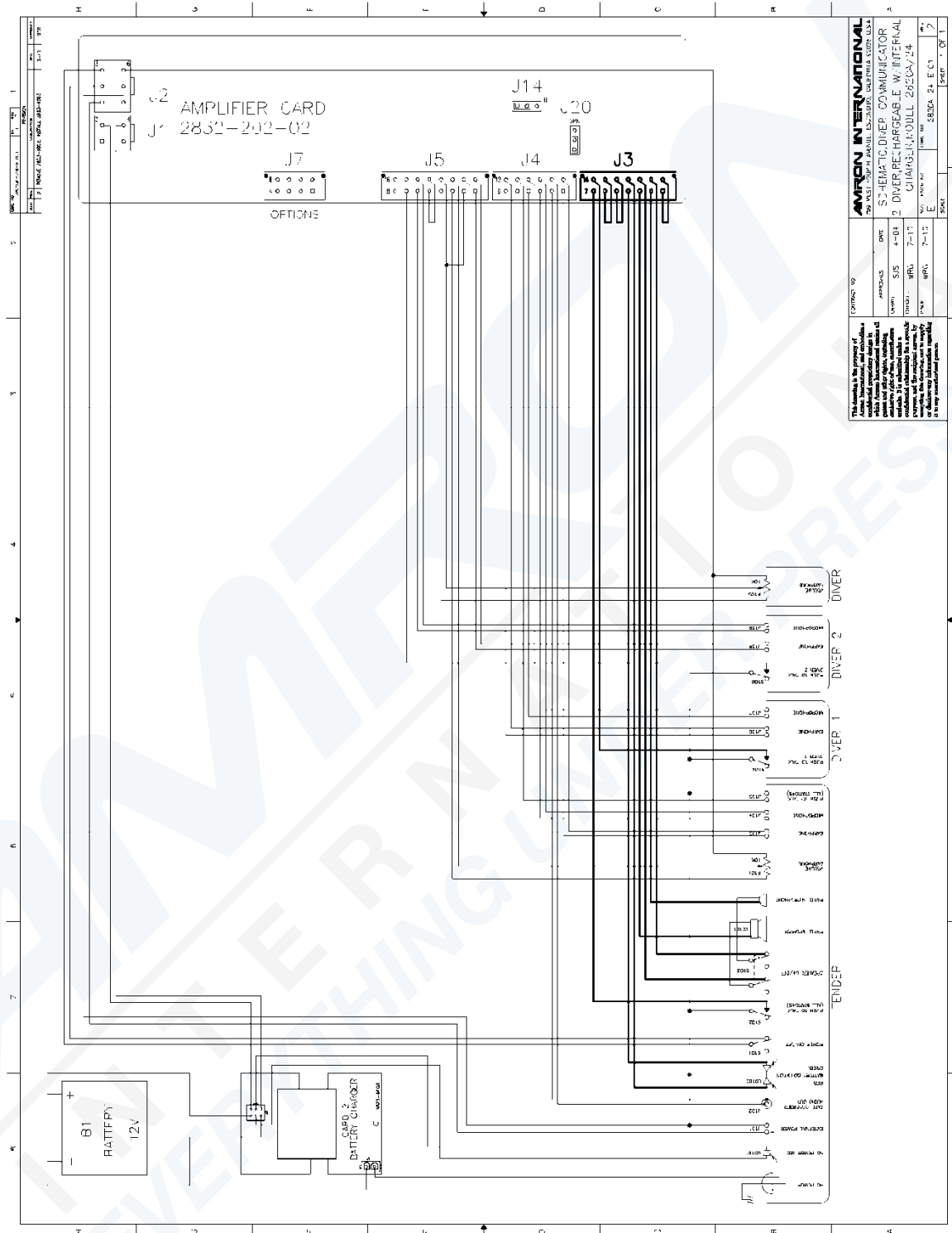
8. DRAWINGS AND SCHEMATICS

The following drawings illustrate the electrical and mechanical details of the AMCOM II 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 2820A AND 2820A/23

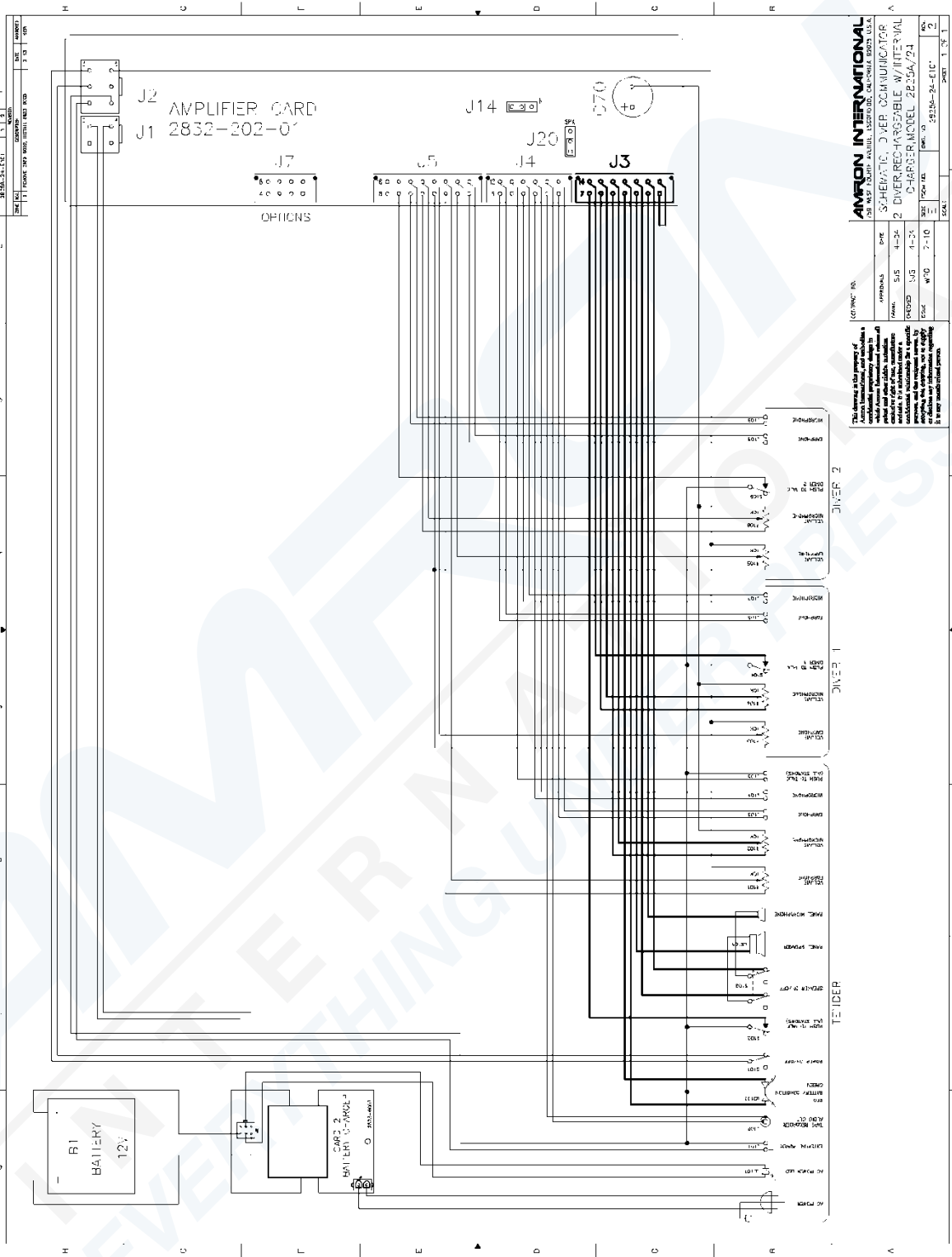


8.2 SCHEMATIC 2820A/24

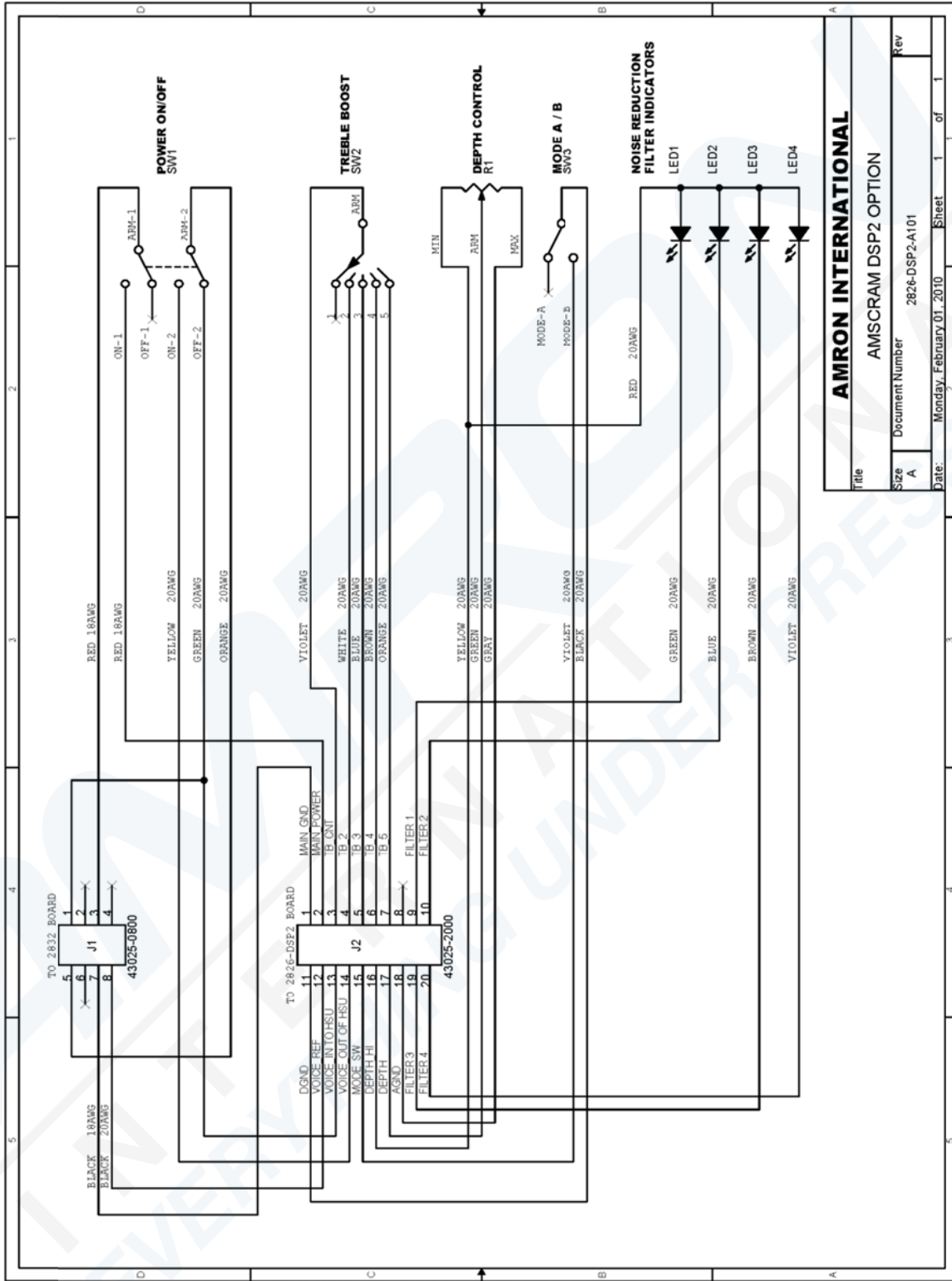


<p>AMRON INTERNATIONAL 750 W. 150th St. Portland, Oregon 97203, U.S.A.</p>	
<p>CONTINENT NO.</p>	<p>2820A/24</p>
<p>APPENDIX</p>	<p>DIVE</p>
<p>SYSTEM</p>	<p>SJS 4-04</p>
<p>ITEM NO.</p>	<p>2820A/24</p>
<p>REV.</p>	<p>2-13</p>
<p>DATE</p>	<p>28DEC 84 E.C.</p>
<p>BY</p>	<p>1</p>
<p>CHKD.</p>	<p>7</p>

8.4 SCHEMATIC 2825A/24



8.5 SCHEMATIC OPTION /26DSP2



AMRON INTERNATIONAL	
Title: AMSCRAM DSP2 OPTION	
Size: A	Document Number: 2826-DSP2-A101
Date: Monday, February 01, 2010	Sheet 1 of 1

9. PARTS LISTS

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
Web: 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 II MODEL 2820A

REF	PART #	DESCRIPTION
N/S	2832-202-02	PC CARD ASSEMBLY AMCOM II STD
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2820A-400	FRONT PANEL ASSY WIRED
N/S	2820-500	CARD AND BATTERY BOX ASSY
N/S	2890-03	BATTERY 6V SPRING TERMINAL
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	2820-007	PANEL OPT. BLANK AMCOM II
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	39-01-2040	RECEPTACLE 4 PIN MINI-FIT
N/S	39-00-0039	TERMINAL FEMALE CRIMPMINI-FIT
N/S	1710-8-32A-24	ST/OFF 1/4IN 8-32 2.25IN ALUM
N/S	TAT-3/16	HEAT SHRINK TUBING 3/16IN BLACK
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.2 AMCOM II MODEL 2820A/23

REF	PART #	DESCRIPTION
N/S	2832-202-02	PC CARD ASSEMBLY AMCOM II STD
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2820A-400	FRONT PANEL ASSY WIRED
N/S	2820-500	CARD AND BATTERY BOX ASSY
N/S	2890-04	BATTERY RECHARGE 6V GEL 5AMP
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	2820-007	PANEL OPT. BLANK AMCOM II
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	39-01-2040	RECEPTACLE 4 PIN MINI-FIT
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
N/S	2823-603	CHARGER ASSEMBLY EXTERNAL
N/S	1710-8-32A-24	ST/OFF 1/4IN 8-32 2.25IN ALUM
N/S	TAT-3/16	HEAT SHRINK TUBING 3/16IN BLACK
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.3 AMCOM II MODEL 2820A/24

REF	PART #	DESCRIPTION
N/S	2832-202-02	PC CARD ASSEMBLY AMCOM II STD
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2820A-400	FRONT PANEL ASSY WIRED
N/S	2824-500B	BATTERY BOX-INTERNAL CHARGER
N/S	2890-05	BATTERY RECHARGE 12V GEL 7.2 AMP
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	3500	CABLE TIE NY 3/32IN X 3.5IN
N/S	8-32X3/8SSPHP	SCREW 8-32 3/8IN SS PH PHILL
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	1-480698-0	CONNECTOR 2 CIRCUIT PLUG
N/S	350550-3	CONTACT SOCKET 20-14 AWG
N/S	2-520194-2	SLIDE TERM(18/22).032 X .187
N/S	2824-007	OPTION PANEL 2824
20	P-2392	CORDAC EURO 3 COND (7421.072)
32	3207	GROMMET.114-.250 DIA. HOLE
29	LEDGREEN	LEDGREEN BRITE
16	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	8NUTSSL	NUT LOCKING 8-32 S/S
N/S	8/18-22	TERMINAL RING, NO 8 STUD/18GA
N/S	2324-J2	J2 CABLE ASSY, RECHARGEABLE
N/S	39-01-2040	RECEPTACLE 4 PIN MINI-FIT
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
N/S	8511-30-00	CLIP CORD WHITE STYLE C2A
N/S	TAT-1/8	HEAT SHRINK TUBING1/8INBLACK
N/S	GEE62F-C0	GROMMET EDGING BLACK
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.4 AMCOM II MODEL 2825A

REF	PART #	DESCRIPTION
N/S	2832-202-01	PC CARD ASSEMBLY AMCOM II DELUXE
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2825A-400	FRONT PANEL ASSY WIRED
N/S	2820-500	CARD AND BATTERY BOX ASSY
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-03	BATTERY 6V SPRING TERMINAL
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	2820-007	PANEL OPT. BLANK AMCOM II
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	39-01-2040	RECEPTACLE 4 PIN MINI-FIT
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
N/S	2823-603	CHARGER ASSEMBLY EXTERNAL
N/S	1710-8-32A-24	ST/OFF 1/4IN 8-32 2.25IN ALUM
N/S	TAT-3/16	HEAT SHRINK TUBING 3/16IN BLACK
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.5 AMCOM II MODEL 2825A/23

REF	PART #	DESCRIPTION
N/S	2832-202-01	PC CARD ASSEMBLY AMCOM II DELUXE
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2825A-400	FRONT PANEL ASSY WIRED
N/S	2820-500	CARD AND BATTERY BOX ASSY
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-04	BATTERY RECHARGE 6V GEL 5AMP
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	2820-007	PANEL OPT. BLANK AMCOM II
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	39-01-2040	RECEPTACLE 4 PIN MINI-FIT
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
N/S	2823-603	CHARGER ASSEMBLY EXTERNAL
N/S	1710-8-32A-24	ST/OFF 1/4IN 8-32 2.25IN ALUM
N/S	TAT-3/16	HEAT SHRINK TUBING 3/16IN BLACK
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.6 AMCOM II MODEL 2825A/24

REF	PART #	DESCRIPTION
N/S	2832-202-02	PC CARD ASSEMBLY AMCOM II DELUXE
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2825A-400	FRONT PANEL ASSY WIRED
N/S	2824-500B	BATTERY BOX-INTERNAL CHARGER
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-05	BATTERY RECHARGE 12V GEL 7.2A
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	3500	CABLE TIE NY 3/32IN X 3.5IN
N/S	8-32X3/8SSPHP	SCREW 8-32 3/8IN SS PH PHILL
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	1-480698-0	CONNECTOR 2 CIRCUIT PLUG
N/S	350550-3	CONTACT SOCKET 20-14 AWG
N/S	2-520194-2	SLIDE TERM(18/22).032 X .187
N/S	*NOT AVAILABLE FOR SALE	OPTION PANEL 2824
20	P-2392	CORDAC EURO 3 COND (7421.072)
32	3207	GROMMET.114-.250 DIA. HOLE
29	LEDGREEN	LEDGREEN BRITE
16	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	8NUTSSL	NUT LOCKING 8-32 S/S
N/S	8/18-22	TERMINAL RING, NO 8 STUD/18GA
N/S	2324-J2	J2 CABLE ASSY, RECHARGEABLE
N/S	39-01-2040	RECEPTACLE 4 PIN MINI-FIT
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
N/S	GEE62F-C0	GROMMET EDGING BLACK
N/S	TAT-1/8	HEAT SHRINK TUBING1/8INBLACK
N/S	8511-30-00	CLIP CORD WHITE STYLE C2A
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.7 AMCOM II MODEL 2825A/24/26DSP2

REF	PART #	DESCRIPTION
N/S	2832-202-01	PC CARD ASSEMBLY AMCOM II DELUXE
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2825A-400	FRONT PANEL ASSY WIRED
N/S	2824-500B	BATTERY BOX-INTERNAL CHARGER
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-05	BATTERY RECHARGE 12V GEL 7.2A
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	3500	CABLE TIE NY 3/32IN X 3.5IN
N/S	8-32X3/8SSPHP	SCREW 8-32 3/8IN SS PH PHILL
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	1-480698-0	CONNECTOR 2 CIRCUIT PLUG
N/S	350550-3	CONTACT SOCKET 20-14 AWG
N/S	2-520194-2	SLIDE TERM(18/22).032 X .187
N/S	*NOT AVAILABLE FOR SALE	PANEL OPTION HSU DSP2
20	P-2392	CORDAC EURO 3 COND (7421.072)
32	3207	GROMMET.114-.250 DIA. HOLE
29	LEDGREEN	LEDGREEN BRITE
16	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	8NUTSSL	NUT LOCKING 8-32 S/S
N/S	8/18-22	TERMINAL RING, NO 8 STUD/18GA
N/S	43025-0800	RECEPTACLE 8PIN MICRO-FIT
N/S	43025-2000	RECEPTACLE 20PIN MICRO-FIT
N/S	2324-J2	J2 CABLE ASSY, RECHAREABLE
N/S	TAT-1/8	HEAT SHRINK TUBING1/8INBLACK
N/S	TAT-3/16	HEAT SHRINK TUBING 3/16INBLACK
N/S	39-01-2040	RECEPTACLE 4PIN MINI-FIT
N/S	43030-0007	CONTACT 3.0mm FEMALE SOCKET
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
34	SW-201	SWITCH TOGGLE ON/OFF DPDT
37	SWB-0001	BOOT TOGGLE SOFT GRAY
4	P16NP-10K	POTENTIOMETER 10K OHM W/KNOB

9.8 AMCOMM II MODEL 2825A/24/26DSP2 (CONTINUED)

REF	PART #	DESCRIPTION
35	MRA112-A-RO	SWITCH ROTARY SP2-12 POS BLACK
36	LEDBLUE-3MM	LED BLUE 3MM PANEL MOUNT INCL
N/S	8511-30-00	CLIPCORD WHITE STYLE C2A
N/S	2826-DSP2-200	PC CARD ASSEMBLY UNSCRAMBLER
N/S	2836	SHORTY BUSHING.750 HOLE
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.9 AMCOM II MODEL 2825A/23/28A

REF	PART #	DESCRIPTION
N/S	2832-202-01	PC CARD ASSEMBLY AMCOM II DELUXE
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2820A-400	FRONT PANEL ASSY WIRED
N/S	2820-500	CARD AND BATTERY BOX ASSY
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-04	BATTERY RECHARGE 6V GEL 5AMP
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	3500	CABLE TIE NY 3/32IN X 3.5IN
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	*NOT AVAILABLE FOR SALE	OPTION PANEL WIRELESS
13	190-0000-01	ANTENNA 2.4GHZ
N/S	180-1001-00	CABLE, RG315 SMA
N/S	*NOT AVAILABLE FOR SALE	OPTION PANEL 2824
3	7580K6	SWITCH TOGGLE SPST
8	5168	SEAL HALF BOOT TOGGLE GREY
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	2829-11	REMOTE WIRELESS KIT W/CASE
N/S	570-1002-00	PC CARD ASSEMBLY WIRELESS
N/S	8-32X1SSPHP	SCREW 8-32 1IN SS PH PHILL
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	8NUTSS	NUT 8-32 S/S
N/S	TAT-1/8	HEAT SHRINK TUBING1/8INBLACK
N/S	43025-0800	RECEPTACLE 8PIN MICRO-FIT
N/S	43030-0007	CONTACT3.0mmFEMALE SOCKET
N/S	39-01-2040	RECEPTACLE 4PIN MINI-FIT
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
N/S	8511-30-00	CLIPCORD WHITE STYLE C2A
N/S	2823-603	CHARGER ASSEMBLY EXTERNAL
N/S	1710-8-32A-24	ST/OFF1/4IN 8-32 2.25IN ALUM
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.10 AMCOM II MODEL 2825A/24/28A

REF	PART #	DESCRIPTION
N/S	2832-202-01	PC CARD ASSEMBLY AMCOM II DELUXE
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2825A-400	FRONT PANEL ASSY WIRED
N/S	2824-500B	BATTERY BOX-INTERNAL CHARGER
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-05	BATTERY RECHARGE 12V GEL 7.2A
23	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO10 S/S
N/S	10-32X1/2SSPHP	SCREW 10-32X1/2IN SS PH PL
N/S	3500	CABLE TIE NY 3/32IN X 3.5IN
N/S	8-32X3/8SSPHP	SCREW 8-32 3/8IN SS PH PHILL
N/S	8-32X5/16SSPHP	SCREW 8-32 5/16IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	1-480698-0	CONNECTOR 2 CIRCUIT PLUG
N/S	350550-3	CONTACT SOCKET 20-14 AWG
N/S	2-520194-2	SLIDE TERM(18/22).032 X .187
N/S	GEE62F-C0	GROMMET EDGING BLACK
N/S	8/18-22	TERMINAL RING, NO 8 STUD/18GA
N/S	8NUTSSL	NUT LOCKING 8-32 S/S
N/S	*NOT AVAILABLE FOR SALE	OPTION PANEL AC WIRELESS
13	190-0000-01	ANTENNA 2.4GHZ
20	P-2392	CORDAC EURO 3 COND (7421.072)
N/S	180-1001-00	CABLE, RG315 SMA
32	3207	GROMMET.114-.250 DIA. HOLE
3	7580K6	SWITCH TOGGLE SPST
20	P-2392	CORD AC EURO 3 COND (7421.072)
29	LEDGREEN	LEDGREEN BRITE
16	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
8	5168	SEAL HALF BOOT TOGGLE GREY
21	6-32X3/8HSBHC	SCREW 6-32 X 3/8IN S/S
22	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	2829-11	REMOTE WIRELESS KIT W/CASE
N/S	570-1002-00	PC CARD ASSEMBLY WIRELESS
N/S	8-32X1SSPHP	SCREW 8-32 1IN SS PH PHILL
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	8NUTSS	NUT 8-32 S/S

9.11 AMCOM II MODEL 2825A/24/28A (CONTINUED)

REF	PART #	DESCRIPTION
N/S	TAT-1/8	HEAT SHRINK TUBING 1/8IN BLACK
N/S	43025-0800	RECEPTACLE 8PIN MICRO-FIT
N/S	43030-0007	CONTACT3.0mm FEMALE SOCKET
N/S	39-01-2040	RECEPTACLE 4PIN MINI-FIT
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
N/S	8511-30-00	CLIP CORD WHITE STYLE C2A
N/S	2820A-25A-UM	USER MANUAL FOR ALL 282XA

9.12 2820-301 CASE ASSEMBLY – AMCOM II

REF	PART #	DESCRIPTION
1	2820-301	CASE ASSEMBLY
2	2820-3006	GASKET, LID TO CASE
3	2820-3031	GASKET, PANEL

9.13 2820A-400M FRONT PANEL ASSEMBLY

REF	PART #	DESCRIPTION
1	*NOT AVAILABLE FOR SALE	PANEL FRONT AMCOM II STD
2	PBSWITCH	SWITCH PUSH BUTTON SEALED N.O
3	7580K6	SWITCH TOGGLE SPST
33	757-3522	SWITCH TOGGLE DPST ON-ON
5	1498-102	JACK, BANANA RED
6	1498-103	JACK, BANANA BLACK
7	1498-107	JACK, BANANA YELLOW
8	5168	SEAL HALF BOOT TOGGLE GREY
9	105-0602-001	JACK, TIP RED
10	105-0603-001	JACK, TIP BLACK
11	ME161-2003	JACK, PHONO W/NYL WSHRS NKL/BLK
14	14002B	5-WAY BINDING POST (BLACK)
15	14002R	5-WAY BINDING POST (RED)
18	SA818	SPEAKER 8 OHM 15 WATT
4	P16NP-10K	POTENTIOMETER 10K OHM W/KNOB
12	1/4-20X1.25HSBHC	SCREW 1/4-20 X 1.25IN S/S
13	1/4-20NUTSSL	NUT NYLOK1/4-20
N/S	1/4FWSS	WASHER FLAT 1/4304 S/S
16	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
17	LT2462-24-D51	LED, BI-COLOR RED/GREEN
25	24XX-MIC	MICROPHONE ASSY ELECTRET

9.14 2825A-400M FRONT PANEL ASSEMBLY

REF	PART #	DESCRIPTION
1	*NOT AVAILABLE FOR SALE	PANEL FRONT AMCOM II DELUXE
2	PBSWITCH	SWITCH PUSH BUTTON SEALED N.O
3	7580K6	SWITCH TOGGLE SPST
33	757-3522	SWITCH TOGGLE DPST ON-ON
5	1498-102	JACK, BANANA RED
6	1498-103	JACK, BANANA BLACK
7	1498-107	JACK, BANANA YELLOW
8	5168	SEAL HALF BOOT TOGGLE GREY
9	105-0602-001	JACK, TIP RED
10	105-0603-001	JACK, TIP BLACK
11	ME161-2003	JACK, PHONO W/NYL WSHRS NKL/BLK
14	14002B	5-WAY BINDING POST (BLACK)
15	14002R	5-WAY BINDING POST (RED)
18	SA818	SPEAKER 8 OHM 15 WATT
4	P16NP-10K	POTENTIOMETER 10K OHM W/KNOB
12	1/4-20X1.25HSBHC	SCREW 1/4-20 X 1.25IN S/S
13	1/4-20NUTSSL	NUT NYLOK1/4-20
N/S	1/4FWSS	WASHER FLAT 1/4304 S/S
16	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
17	LT2462-24-D51	LED, BI-COLOR RED/GREEN
25	24XX-MIC	MICROPHONE ASSY ELECTRET

9.15 2820-500 BATTERY BOX

REF	PART #	DESCRIPTION
N/S	*NOT AVAILABLE FOR SALE	BATTERY BOX QUICK CLIP STYLE
N/S	*NOT AVAILABLE FOR SALE	CHASSIS UNIVERSAL CARD
N/S	*NOT AVAILABLE FOR SALE	BRACKET SUPPORT RAIL
N/S	528-1017	BUSHING STRAIN RELIEF NYLON
N/S	GEE62F-C0	GROMMET EDGING BLACK
N/S	97-50-120-12	LATCH DRAW BATTERY S/S
N/S	*NOT AVAILABLE FOR SALE	END CAP
N/S	8-32X3/8SSPHP	SCREW 8-32 3/8IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	6-32X1/4SSPHP	SCREW 6-32X1/4IN SS PH PHILL
N/S	6NUTSSL	NUT LOCKING 6-32 S/S
N/S	2820-014	END CAP WITHOUT PEM NUTS
N/S	8-32X1SSPHP	SCREW 8-32 1IN SS PH PHILL
N/S	PC2823	PC-CARD BATTERY CONTACT
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	AD52ABS	RIVIT 5/32063-.125 GRIP RANGE
N/S	AD42ABS	RIVET POP.125 DIA .265IN L AL

9.16 2824-500B BATTERY BOX INTERNAL CHARGER

REF	PART #	DESCRIPTION
N/S	*NOT AVAILABLE FOR SALE	BRACKET SUPPORT RAIL
N/S	*NOT AVAILABLE FOR SALE	CHASSIS UNIVERSAL CARD
N/S	2823-6003	CHARGER CHASSIS ASSEMBLY
N/S	GEE62F-C0	GROMMET EDGING BLACK
N/S	8NUTSS	NUT 8-32 S/S
N/S	8-32X1/4SSPHP	SCREW 8-32 1/4IN SS PH PHILL
N/S	8ISW	WASHER NO 8 INTERNAL STAR S/S
N/S	8-32X5/8SSPHP	SCREW 8-32 5/8IN SS PH PHILL
N/S	8NUTSSL	NUT LOCKING 8-32 S/S
N/S	*NOT AVAILABLE FOR SALE	CHASSIS BATTERY BOX-UNIVERSAL
N/S	MFCCA-1/2	SPONGE 1/2 CC ADH BK

9.17 2823-603 EXTERNAL CHARGER ASSEMBLY

REF	PART #	DESCRIPTION
N/S	2823-6003	CHARGER CHASSIS ASSEMBLY
N/S	*NOT AVAILABLE FOR SALE	COVER MODEL 2823-603 CHARGER
N/S	LEDGREEN	LED GREEN BRITE
N/S	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED
N/S	530-105-0772-1	PLUG TIP RED
N/S	530-105-0773-1	PLUG TIP BLACK
N/S	528-1017	BUSHINGSTRAIN RELIEF NYLON
N/S	39-01-2060	RECEPTACLE 6PIN MINI-FIT JR
N/S	39-00-0039	TERMINAL FEMALE CRIMP MINI-FIT
N/S	1-480698-0	CONNECTOR 2 CIRCUIT PLUG
N/S	350550-3	CONTACT SOCKET 20-14 AWG
N/S	4300-0704	AC INLETSNAP-IN BLACK
N/S	TAT-3/16	HEAT SHRINK TUBING 3/16IN BLACK
N/S	TAT-1/8	HEAT SHRINK TUBING 1/8IN BLACK
N/S	WP-165	WIRE16 AWG 100% COPPER RED
N/S	WP-167	WIRE16 AWG 100% COPPER BLACK
N/S	8/18-22	TERMINAL RING NO 8 STUD/18GA
N/S	8NUTSSL	NUT LOCKING 8-32 S/S
N/S	4-24X1/4SSPHP	SCREW SELF-TAPPING NO4 TYPE AB
N/S	517-SJ-5003	RUBBER BUMPER(FOOT) STICK ON
N/S	P-2392	CORD AC EURO 3 COND (7421.072)

9.18 28XX-FS-01 FIELD SPARES KIT FOR 2820A, 2825A

REF	PART #	DESCRIPTION	QUAN
1	7580K6	SWITCH TOGGLE SPS	1
2	757-3522	SWITCH TOGGLE DPST ON-ON	1
3	PBSWITCH	SWITCH PUSH BUTTON SEALED N.O	2
4	8-32X3/4KTSB	SCREW KNURLED THUMB BRASS 3/4	2
5	P16NP-10K	POTENTIOMETER 10K OHM W/KNOB	2
6	105-0602-001	JACK, TIP RED	1
7	105-0603-001	JACK, TIP BLACK	1
8	5168	SEAL HALF BOOT TOGGLE GREY	2
9	1498-102	JACK, BANANA RED	2
10	1498-107	JACK, BANANA YELLOW	2
11	1498-103	JACK, BANANA BLACK	2
12	14002B	5-WAY BINDING POST (BLACK)	2
13	14002R	5-WAY BINDING POST (RED)	2
14	0034.6019	FUSE 3.15A/250V MICRO QUICK	2
15	0034.6617	FUSE 1.6A/250V SLOW	2
16	LEDHOLDER-BLK.25	MOUNTING CLIP FOR 5MM LED	2
17	LT2462-24-D51	LED; BI-COLOR RED/GREEN	2
18	LEDGREEN	LED GREEN BRITE	2

9.19 OPTIONAL SPARES

REF	PART #	DESCRIPTION	QUAN
1	2832-202-01	AMPLIFIER CARD ASSEMBLY	1
2	2832-202-02	AMPLIFIER CARD ASSEMBLY	1
3	2823-6003	CHARGER CHASSIS ASSEMBLY	1
4	2405-28	MICROPHONE PUSH TO TALK	1
5	2890-05	BATTERY 12VDC SLIDE TERM. GEL	1
6	2890-03	BATTERY 6VDC SPRING TOP	2