User Manual
For
Amron International, Inc.

Model 2830A/24 and 2830A/24-MS
Three 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

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1 INTRODUCTION AND SPECIFICATIONS

1.1 INTRODUCTION

The AMCOM III series of diver communication systems are full-featured, hard wire, three-diver communicators. The AMCOM III has independent microphone and earphone volume controls for each diver and the tender.

All AMCOM III series have push-to-talk, and separate isolated inputs for each diver. The AMCOM III Model 2830A/24 is a portable three diver communication system, delivering 20 Watts of "voice power", operating from either a 110/220 V_{AC}, an external 12 V_{DC} power source, or an internal 12 V_{DC} backup battery.

The Model 2830A has 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 communicator has the ability to work with the Dynamic and Pre-Amplifier microphone in both 2-wire and 4-wire modes. This unique design has the ability to detect both pre-amp and dynamic diver microphones that are in use. This feature will automatically switch from a preamp mode to a dynamic mode and will adjust the specific diver gain (volume).

The Model 2830A's with 20 watts of power is the most powerful communicator on the market. The untouched volume and clarity allows the tender's volume to be set at very high levels especially in noisy environments while the divers are at a comfortable listening level.

1.2 ELECTRICAL SPECIFICATIONS

Input Impedance (Each Input) ..... 250 Ohms
Frequency Response ..... 300 - 10000 Hz
Common Mode Rejection (minimum) .....40 dB
Current Drain Maximum Full Volume .....3 Amps
Typical Quiescent .....0.25 mAmps
Minimum Load Impedance .....2 ohm
Nominal Power Supply Voltage ..... 12 V_{DC}
Operational Supply Voltage .....90-264 Volts AC, 47-440 Hz
Sensitivity (Input) .....0.5 mVRMS
Maximum Output Power (4 Ohm Load, 14 V_{DC}) .....20 Watts
Battery Life (typical) ..... 15 Hours

1.3 MECHANICAL SPECIFICATIONS

Panel ..... Powder Coated Stainless Steel
Enclosure ..... High Impact Resistant Plastic

DIMENSIONS

Length ..... 14.5 in. (36.8cm)
Width ..... 9.0 in. (22.9cm)
Height ..... 10.0 in. (25.4cm)

WEIGHT WITH BATTERIES

2830A/24 ..... 18.73 Lbs. (8.50kg)
2830A/24-MS ..... 18.90 Lbs. (8.60kg)
2830A/24/26DSP3 ..... 19.28 Lbs. (8.74Kg)
2830A/24/26/DSP3-MS ..... 19.45 Lbs. (8.80Kg)
2830A/24/28A with Remote Wireless Tender Kit ..... 23.48 Lbs. (10.65Kg)
2830A/24/28A-MS with Remote Wireless Tender Kit ..... 23.63 Lbs. (10.27Kg)

1.4 AMCOM III MODEL 2830A DIVER COMMUNICATOR

The Model 203-A AMCOM II is a full-featured, hard wired diver communicator. It features individual earphone volume controls for the tender (uplink) and each diver (downlink) earphones along with individual microphone level controls for maximum flexibility. Divers can be individually wired in either 2-Wire or 4-Wire mode. The 2830A diver microphone inputs automatically detect if a pre-amplified microphone is being used and adjusts the system gain. This allows mix use of pre-amplified and dynamic microphones. It can be ordered in the following configurations:

- Standard model (2830A/24 - shown above)
- With MS connectors for military umbilical lines (2830A/24-MS)
- With Wireless Tender Option (2830A/24/28A)
- With Wireless Tender Option and MS connectors (2830A/24/28A-MS)
- With Helium Speech Unscrambler DSP3 (2830A/24/26DSP3)
- With Helium Speech Unscrambler and MS connectors (2830A/24/26DSP3-MS)

2 WARRANTY AND SERVICE POLICY

2.1 LIMITED WARRANTY

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

2.2 SERVICE POLICY

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

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

3 OPTIONS AND ACCESSORIES

3.1 OPTIONS

Amron produces this communicator with a series of options.

3.1.1 -MS

The communicator is equipped with MS connectors for the diver microphone and earphone. These are compatible with standard US Navy diver umbilical. This option can be ordered with /26DSP3 and /28A options.

3.1.2 MODEL /26DSP3 – HELIUM SPEECH UNSCRAMBLER (HSU)

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

3.1.3 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 to be wired in 4-Wire mode.

3.2 ACCESSORIES

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

3.2.1 MODEL 2401-28 – AMRON HEAVY-DUTY HEADSET

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

3.2.2 MODEL 2460-28 – AMRON STANDARD HEADSET

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

3.2.3 MODEL 2405-28 – AMRON PUSH-TO-TALK MICROPHONE

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

3.2.4 MODEL 2822-28 – AMRON REMOTE WALK-AND-TALK MODULE

Designed for Full Duplex (4-Wire) applications, the Model 2822-28 provides the tender with mobility around the dive site while maintaining communications with the

diver. It comes equipped with a small clip-on belt module that contains the connectors for the headset, and 25 feet (7.6 meters) of lightweight flexible cable. Custom cable lengths are available.

3.2.5 MODEL 2821-28 – AMRON REMOTE PUSH-TO-TALK MODULE

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

3.2.6 MODEL 2829-11 – AMRON WIRELESS TENDER HEADSET

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

4 TENDER AND DIVER CONTROLS AND CONNECTIONS

Before using the AMCOM III 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 strongly recommend the tender read FULL DUPLEX (4-WIRE) – WHAT, WHY AND HOW located in section 7 of this manual.

4.1 TENDER AND DIVER CONTROLS

4.1.1 POWER SWITCH – This switch controls power to the unit.

4.1.2 SPEAKER SWITCH – This switch allows the tender to turn off the speaker. If the tender is using a headset, it may be necessary to turn off the speaker in order to prevent acoustic feedback.

4.1.3 PUSH-TO-TALK BUTTON – This button allows the tender to talk to the diver when operating in the 2-Wire mode. It is not necessary to use this control in the Full Duplex (4-Wire) mode. When using Full Duplex mode, this control allows the tender to interrupt the diver by forcing the diver into listen only mode.

4.1.4 TENDER TO DIVER VOLUME – This control sets the volume for the diver's earphone. Rotate this knob clockwise to increase the volume.

4.1.5 DIVER TO TENDER VOLUME – This control sets the volume for the tender's earphone and/or panel speaker. Rotate this knob clockwise to increase the volume.

4.1.6 PANEL SPEAKER – A waterproof, acoustic horn speaker that allows the tender to listen to the divers. The volume level is controlled by the EARPHONE VOLUME control and it can be turned off using the SPEAKER SWITCH.

4.1.7 BATTERY CONDITION INDICATOR – A steady GREEN light indicates battery charge level is good. Blinking GREEN light indicates battery charge level is at a low level with less than 3 hours of running time available. Steady RED light indicates battery charge level is below the level necessary to guarantee proper operation.

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

4.2 TENDER CONNECTIONS

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

To connect the tender in the Full Duplex (4-Wire) mode, connect the earphone (black) banana plug of the headset to this jack and the microphone (red) to the TENDER MICROPHONE jack (red) as shown in the wiring diagram in section 4.9. In this mode, the tender does not have to use the PUSH-TO-TALK BUTTON to communicate with a diver who is also connected in the Full Duplex (4-Wire) mode. This configuration can be used even if the diver is connected in 2-Wire mode. In

that situation, the tender is required to use the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK.

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

The tender can also be connected in 2-Wire mode by stacking both the earphone (black) and microphone (red) banana plugs into this jack as shown in the wiring diagram in section 4.8. The diver does not have to be connected in 2-Wire mode if the tender is in 2-Wire mode. In order to talk to the diver, the tender must use either the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK. Since the headset microphone is not active until one of the push-to-talk methods is used, there is no chance for acoustic feedback to occur and surface conversation or noise is not transmitted to diver and the PANEL SPEAKER can be left on. This may, for some situations, make for a better overall diving experience. If the tender requires more mobility at the dive site, the Amron Model 2821-28 Remote Push-to-Talk Module can be used to extend the headset cable. It includes a push-to-talk button on a clip-on belt module and comes standard with 25 feet (7.6 meters) of cable (custom cable lengths are available).

The tender may also use the optional Amron Model 2405-28 Push-to-Talk Microphone. This microphone comes with two color-coded banana plugs. The black plug goes into the TENDER HEADSET jack and the yellow plug goes in the PUSH-TO-TALK JACK as shown in the wiring diagram in section 4.10. To communicate with the diver, the tender presses the button on the side of the microphone. There is no chance of acoustic feedback since the PANEL SPEAKER is cut off when the tender uses the microphone. When using the Push-to-Talk Microphone, the SPEAKER SWITCH must be turned on in order to hear the diver.

4.2.2 TENDER MICROPHONE JACK – This is a dual banana jack (color-coded red) that functions as the microphone input from the tender's headset. It is only used if the tender is in Full Duplex (4-Wire) mode.

4.2.3 PUSH-TO-TALK JACK – This is a dual banana jack (color-coded yellow) that allows for remote keying of the push-to-talk function of the communicator. It is use by the Push-To-Talk Microphone (Amron Model 2405-28) and the Remote Walk-And-Talk Module (Amron Model 2822-28).

The difference between using the PUSH-TO-TALK JACK and PUSH-TO-TALK SWITCH is that the switch allows the tender to communicate using the PANEL MICROPHONE. If both are used at the same time, the PANEL MICROPHONE is active. This allows another crew member to talk to the diver using the PANEL MICROPHONE even if the tender is away from the communicator using the Remote Push-to-Talk Module in 2-Wire mode.

4.3 DIVER CONNECTIONS

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

To connect the diver in 2-Wire mode, connect both the diver microphone and earphone to this jack. If the diver umbilical uses banana plugs, simply stack both plugs into this jack as shown in the wiring diagram in section 4.8. In this mode, the diver microphone will be active and heard on tender headset and/or PANEL SPEAKER unless the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK is used. When a pre-amp microphone is used in the 2-Wire mode setup, it is required to have special speakers supplied only by Amron. Contact Amron for more information.

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

4.3.2 DIVER EARPHONE - 4 Wire, (Diver 1, 2 & 3) – This is a dual 5-way binding post jack (color-coded black) that functions as the output for the diver's earphone. It is only used when the diver is in Full Duplex (4-Wire) mode.

4.4 COMMUNICATOR MODEL 2830A-MS (MS CONNECTORS, 5 PIN)

UMBILICAL CONNECTORS

Each diver has one MS Connector. The MS Connector has 5 pins for contacts.

4.4.1 Pin A and Pin B (Input/Output) – 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 the microphone is connected into the Umbilical Connector Pin A & B; also the Earphone is connected into Umbilical Connector Pin A & B. Conversation's (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. Contact Amron for more information.

In Full Duplex (4-wire) mode, only the diver microphone is connected into umbilical connector pin A & B.

4.4.2 Pin C and Pin D (Output) – It is the connection point for the diver's earphone when operating in the Full Duplex mode (4-wire).

4.4.3 Pin E (Earth Ground) – Connected to communicator chassis and ground of AC cord. When communicator AC cord ground pin is contacted to Earth Ground, then Pin E of each diver MS Connector will become Earth Ground.)

4.5 OTHER CONNECTIONS

4.5.1 EXTERNAL BATTERY (INPUT) – External 12 V_{DC} 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 3 Amps for proper operation. 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: When using the EXTERNAL POWER SOURCE, it is required to use an isolated DC power supply that has very low ripple voltage. It has to be properly isolated from AC line for diver protection and safety. An improperly isolated power supply could cause diver electric shock.

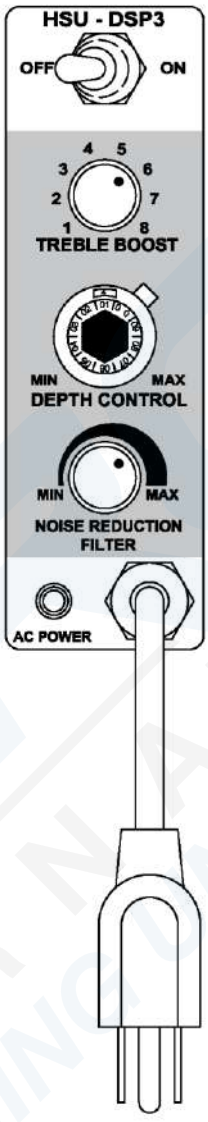
4.5.2 RECORDER OUTPUT – This is a single RCA Phono jack (color-coded black) that provides a transformer isolated signal of both the diver and tender communications. It is designed to drive the standard line-level inputs of audio or video recorders with input impedances as low as 600 Ohms.

4.5.3 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.

The communicator operates over a voltage range of 90-264 V_{AC} with a frequency range of 47-440 Hz. There is no user action requires as the power supply automatically adjusts to the input voltage provided.

4.6 OPTION CONTROLS: HELIUM SPEECH UNSCRAMBLER/26DSP3

The controls for the DSP3 Helium Speech Unscrambler (HSU) are located in the options panel on the right side of the front panel as shown below.



4.6.1 ON/OFF SWITCH – Allows the selection of air (OFF) or helium (ON) operation. In the OFF position, the divers' microphone signal bypasses the HSU. In the ON position, the microphone signals are routed to the HSU and the tender can adjust the controls as necessary.

4.6.2 TREBLE BOOST – Selects the amount of gain added to the High Frequency (HF) portion of the divers' microphone signals. This compensates for the HF drop-off in the sensitivity of most microphones. The TREBLE BOOST feature allows for optimum frequency enhancement and improved intelligible speech from the diver's voice.

4.6.3 DEPTH CONTROL – Selects the amount of frequency correction performed by the HSU to produce intelligible speech. This control uses a multi-turn potentiometer and is equipped with a turn counting knob and lock. Once the desired setting is reached, the lock can be used to prevent accidental changes to this control.

4.6.4 NOISE REDUCTION FILTER – The Noise Reduction Filter (NRF) uses a complex Digital Signal Processor algorithm based on a statistical-model of human voice activity to capture the background noise and reduce it without affecting the divers' speech. The noise level can be reduced by up to 17 dB.

4.7 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.

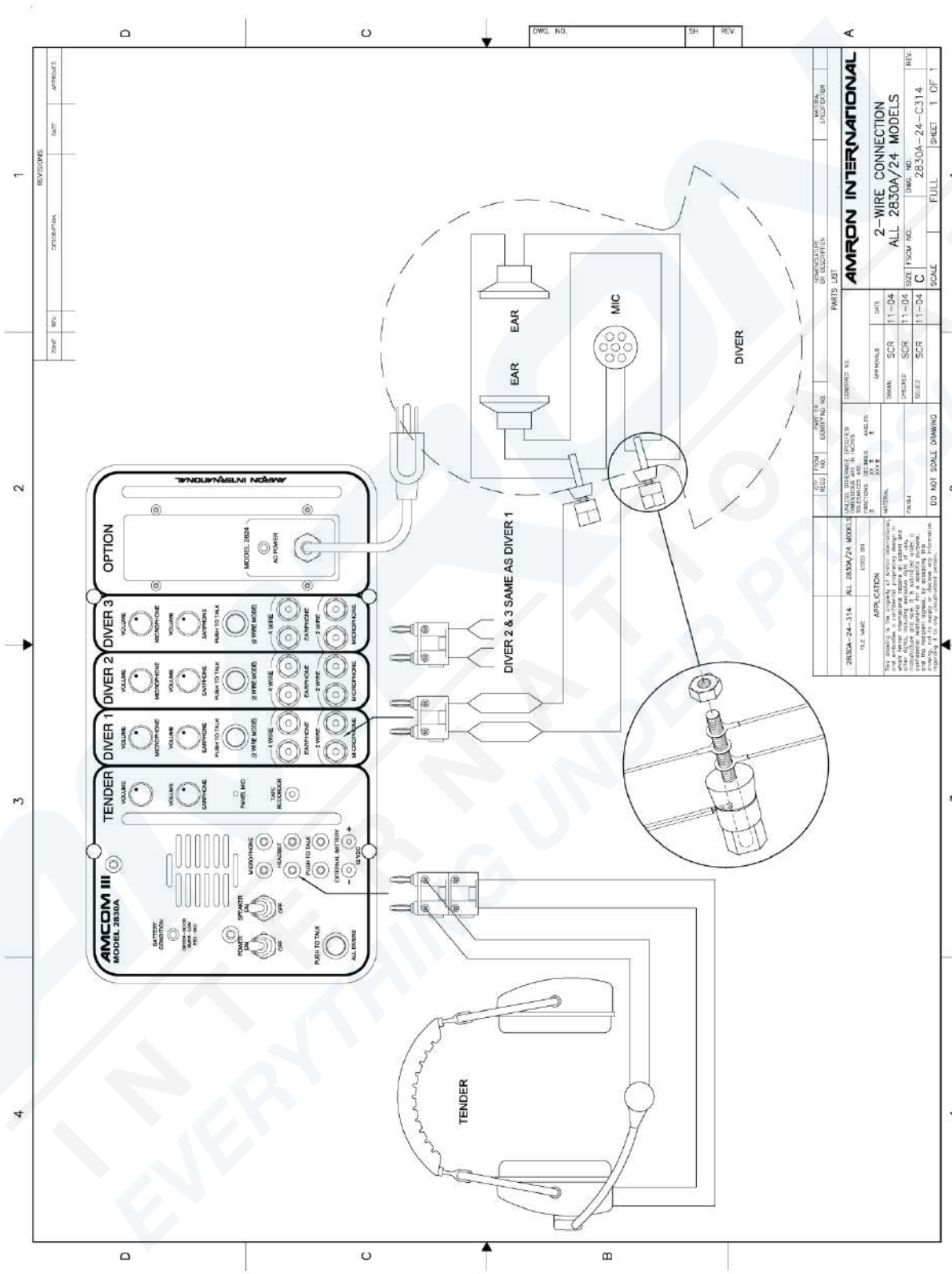
4.7.3 ON/OFF-VOLUME CONTROL – Adjusts the listening volume and turns the unit "OFF" when it is turned completely upwards.

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 Tender Module is in Standby Mode (listen only) as indicated by the LED closest to the button being red. When the button is pressed, the Remote Wireless Tender Module is in "Talk Mode" (listen and talk, full duplex) and the LED is green. Pressing the TALK button toggles between the two modes. Multiple Remote Wireless Tender Modules can be in the Standby (listen only) mode at the same time. Only one module can be in the talk mode.

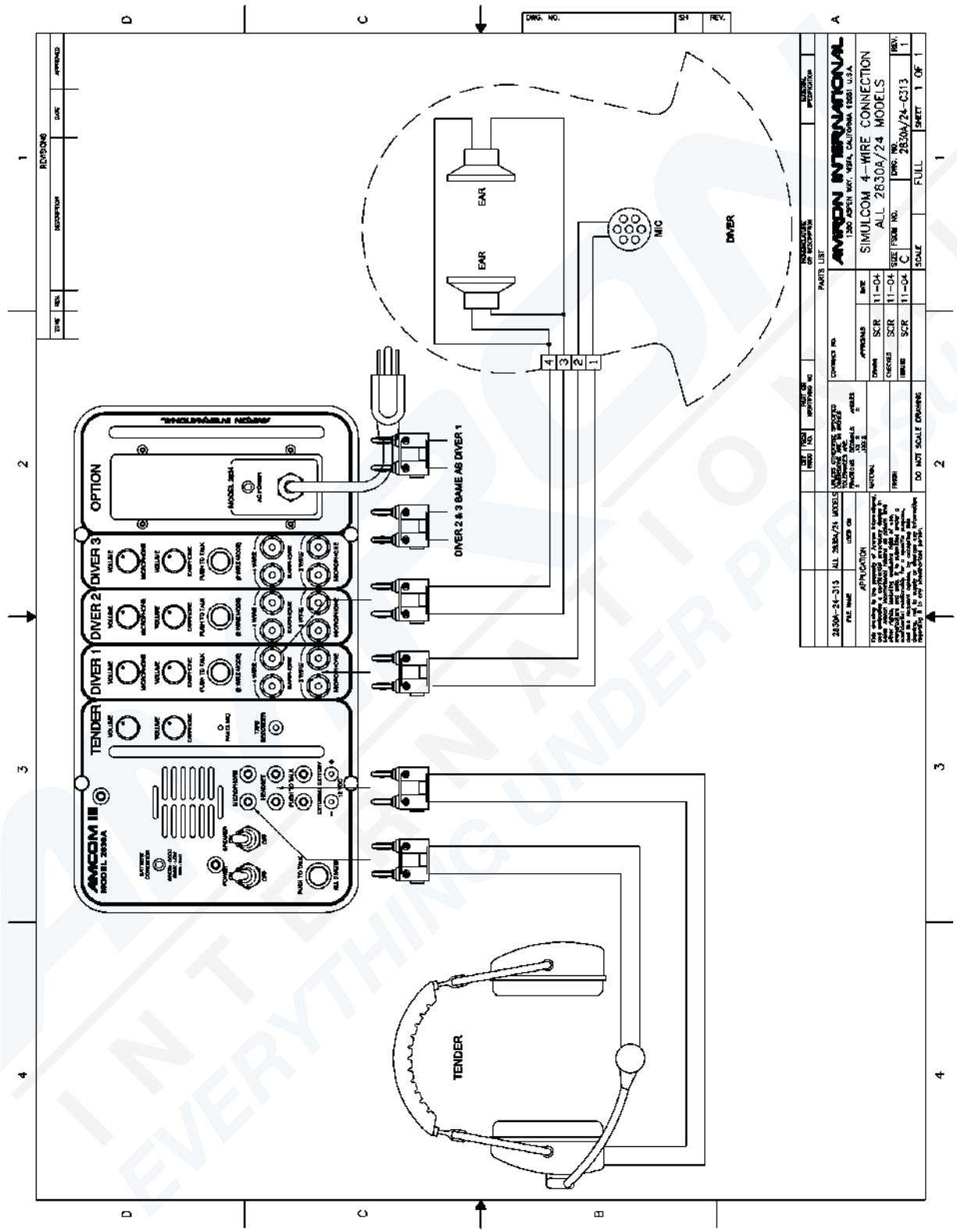
4.7.5 HEADSET JACK – Located on the side opposite to the ON/OFF-Volume Control. Plug the remote wireless headset to this Jack.

4.7.6 CHARGE JACK – Located on the side next to the ON/OFF-Volume Control. Plug the remote wireless charger to this jack.

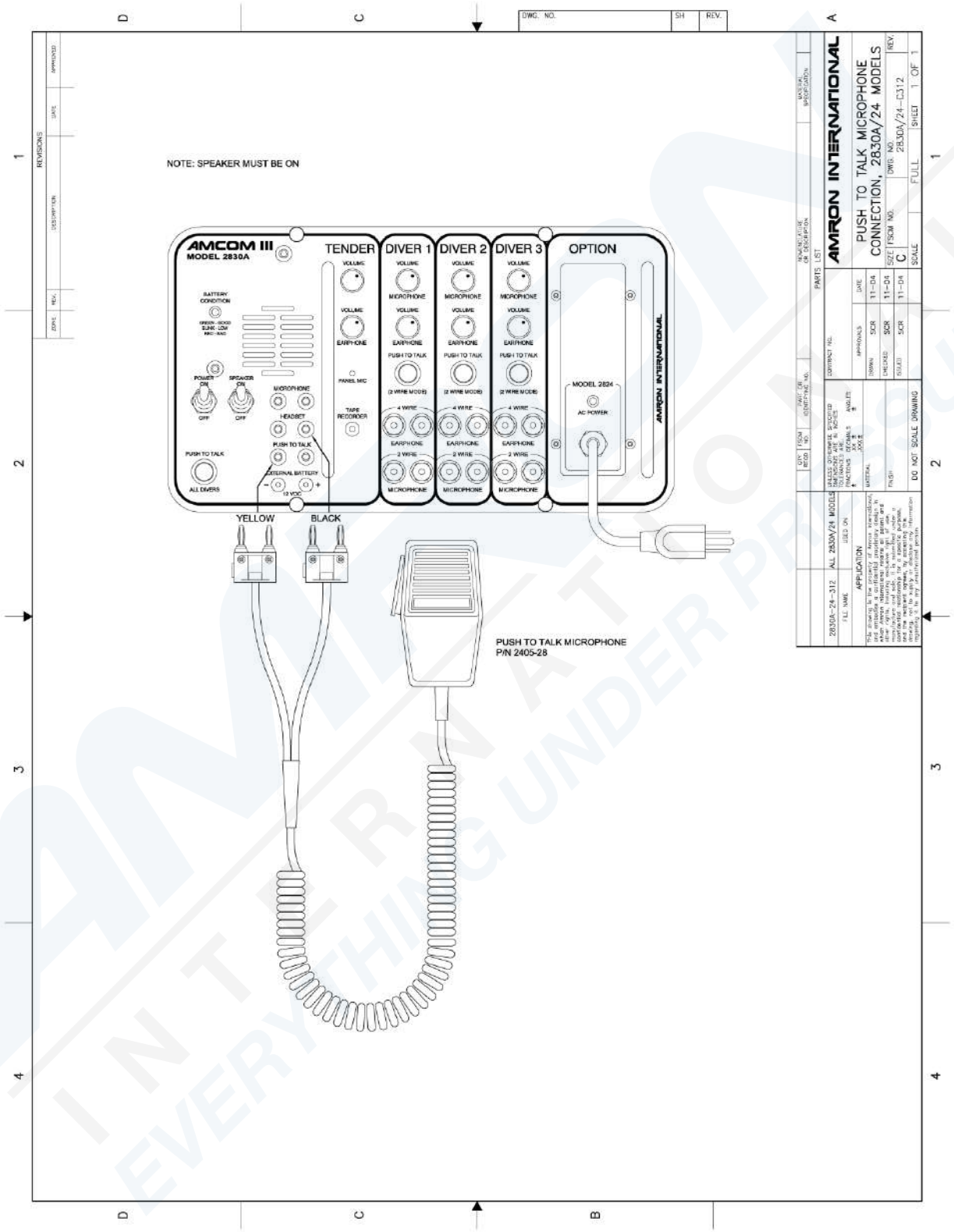
4.8 DRAWING, 2-WIRE CONNECTIONS



4.9 DRAWING, FULL DUPLEX (4-WIRE) CONNECTIONS



4.10 DRAWING, PUSH-TO-TALK MICROPHONE CONNECTIONS



5 INSTALLATION AND OPERATION

5.1 OPERATION

The 2830A comes in a yellow, rugged plastic case. 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 III panels are graphically dived into sections: Tender Controls, Diver Controls, and Power input. Items within these areas are functions or controls relating to the Tender, Diver(s) or power items.

5.2 CHARGING THE BATTERY

The AMCOM III portable diver communicators are supplied with a gel cell sealed lead acid battery, with an internal charger. To charge the batteries, connect the unit to a 110/220 V_{AC} outlet. The charger has an universal input voltage range of 90-264V_{RMS} with a frequency range of 47-440Hz. Always use a power cord approved for the country of use. It may be purchased locally or ordered from AMRON.

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 roughly 10 hours (depending on the age of the battery 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.

Operating time for the rechargeable batteries 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 INITIAL POWER ON - BATTERY CONDITION CHECK

Turn all the volume controls to minimum and turn on the POWER SWITCH. The state of the battery is shown on the BATTERY CONDITION INDICATOR as follows:

- STEADY GREEN – the battery is good and has more than 30% remaining life
- BLINKING GREEN – the battery is low and has less than 30% remaining life
- OFF or NO LIGHT the battery is depleted and needs to be changed/recharged before use

The BLINKING GREEN light provides a warning that the battery is low and should be changed or recharged before starting the dive operation. When the indicator starts BLINKING GREEN during dive operations, there is, depending on age of the battery and the ambient temperature, approximately 4 hours of remaining life for the 2830A. This should be sufficient

time to safely complete dive operations. A battery that has not been used for a long period of time will exhibit a higher voltage than the actual charge state. This is known as surface charge and will quickly dissipate once the unit is turned on. It is recommended that the unit be left on for 5 minutes before relying on the BATTERY CONDITION INDICATOR.

5.4 MODES OF OPERATION

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

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

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

5.4.1 2-WIRE

For communicator model 2830A (Binding Post Connectors) - Connect the communications cable from the divers umbilical (hat/helmet) to Diver 1, Diver 2 and/or Diver 3, microphone (input) under the words 2-wire. Wires should be well fastened to the binding posts and not touching each other. If more than one diver is connected to any input, (Diver 1, Diver 2 or Diver 3), the divers on the same two terminals will not be able to cross-talk (talk to each other).

For communicator model 2830A-MS (MS Connectors, 5 PIN) - Connect the communications cable from the divers umbilical (hat/helmet) to Diver 1, Diver 2 and Diver 3, Umbilical MS Connector Pin A & B. Pin A should have one of microphone wires and one of earphone wires, same thing for Pin B. Wires should be well soldered to the mating connector. Pin A & B wires should not touch each other.

When the diver is wired in the 2-wire mode, the diver earphone jack can be connected to a remote speaker to allow support personnel to hear both the diver and tender conversation.

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.

5.4.2 FULL DUPLEX (4-wire) OPERATION

Connect two wires from the diver's microphone to the Microphone (input) Diver 1 (For model 2830A-MS, MS Connector PIN A & B). Connect the two wires from diver's earphones to the Earphone (output) Diver 1 (For model 2830A-MS, MS Connector PIN C & D). Repeat the same for divers 2 & 3.

Note: Diver microphone is louder in 4-wire than 2-wire operation.

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

5.5 VOLUME CONTROLS – 2 WIRE

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

- 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.

5.6 OTHER DIVER CONTROLS (2-WIRE MODE)

5.6.1 PTT ALL DIVERS SWITCHES

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

5.6.2 DIVER PTT SWITCHES (DIVER 1, DIVER 2 & DIVER 3)

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

5.7 VOLUME CONTROLS (4-WIRE MODE)

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.

Turn unit on and adjust volume controls as follows:

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

5.7.2 Tender (Volume Controls)

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

5.8 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), which cuts off his microphone, yet will enable him to monitor the diver/tender conversation. Or you can disconnect his microphone circuit, which will disable his microphone.

5.9 WIRELESS TENDER OPTION /28A

This option is installed in the right hand area of the Diver Communicator front panel. Amron's Full Duplex (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 two wire mode to listen to the diver-tender communications.

The Wireless Tender Option operates on one of forty 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 have to 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.

Additional 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 a 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.

To operate the unit, 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.

5.10 HELIUM SPEECH UNSCRAMBLER OPTION /26DSP3

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

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

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

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

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

feature. This allows the tender to finely adjust the level necessary and lock the control to prevent accidental adjustments.

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

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

6 MAINTENANCE AND TROUBLESHOOTING

The following section describes the procedures for checking the operation of your 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 AMCOM III 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.

6.4 RECOMMENDED MAINTENANCE SCHEDULE

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

6.4.1 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.

6.4.2 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.

6.4.3 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.

6.4.4 YEARLY CHECK

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

6.4.5 LONG TERM STORAGE

If the diver communicator is to be stored for a period greater than 30 days, it is recommended that it be stored in a cool dry location. Make sure that the POWER SWITCH is turned off during storage.

6.5 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.

6.5.1 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.

6.5.2 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.

6.5.3 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.

6.5.4 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.

6.5.5 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.

6.5.6 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.

6.5.7 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.

6.5.8 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 my 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.

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

6.5.9 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 by removing the four thumb screws and gently lift the front panel by the handles. Inspect the wiring for breaks and make sure all the connectors are firmly seated on the PCA. . 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.

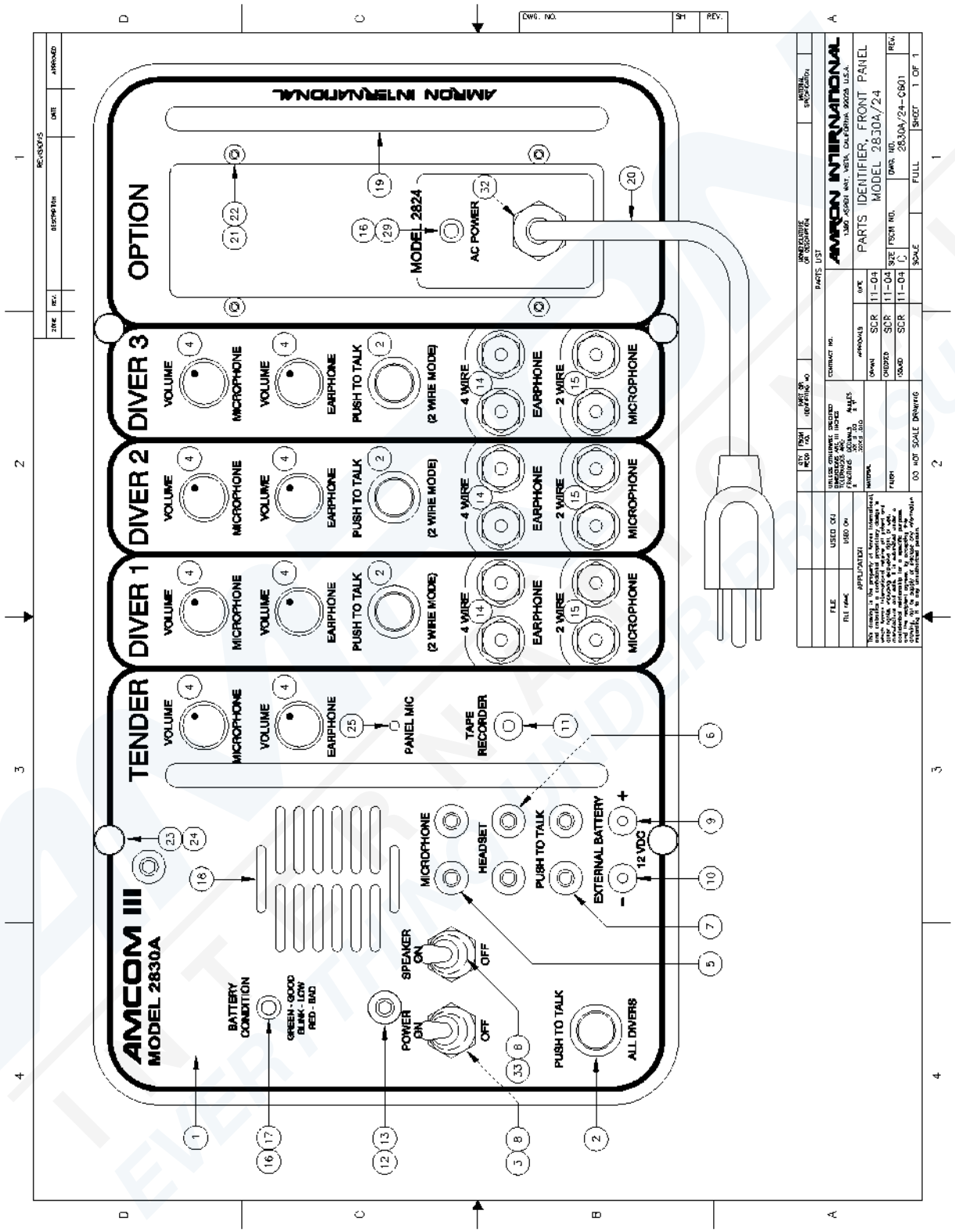
When using AMCOM diver communicators with multiple diver capacity, each diver can be wired in either 2-Wire or Full Duplex (4-Wire) mode. All divers do not have to operate in the same mode.

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.

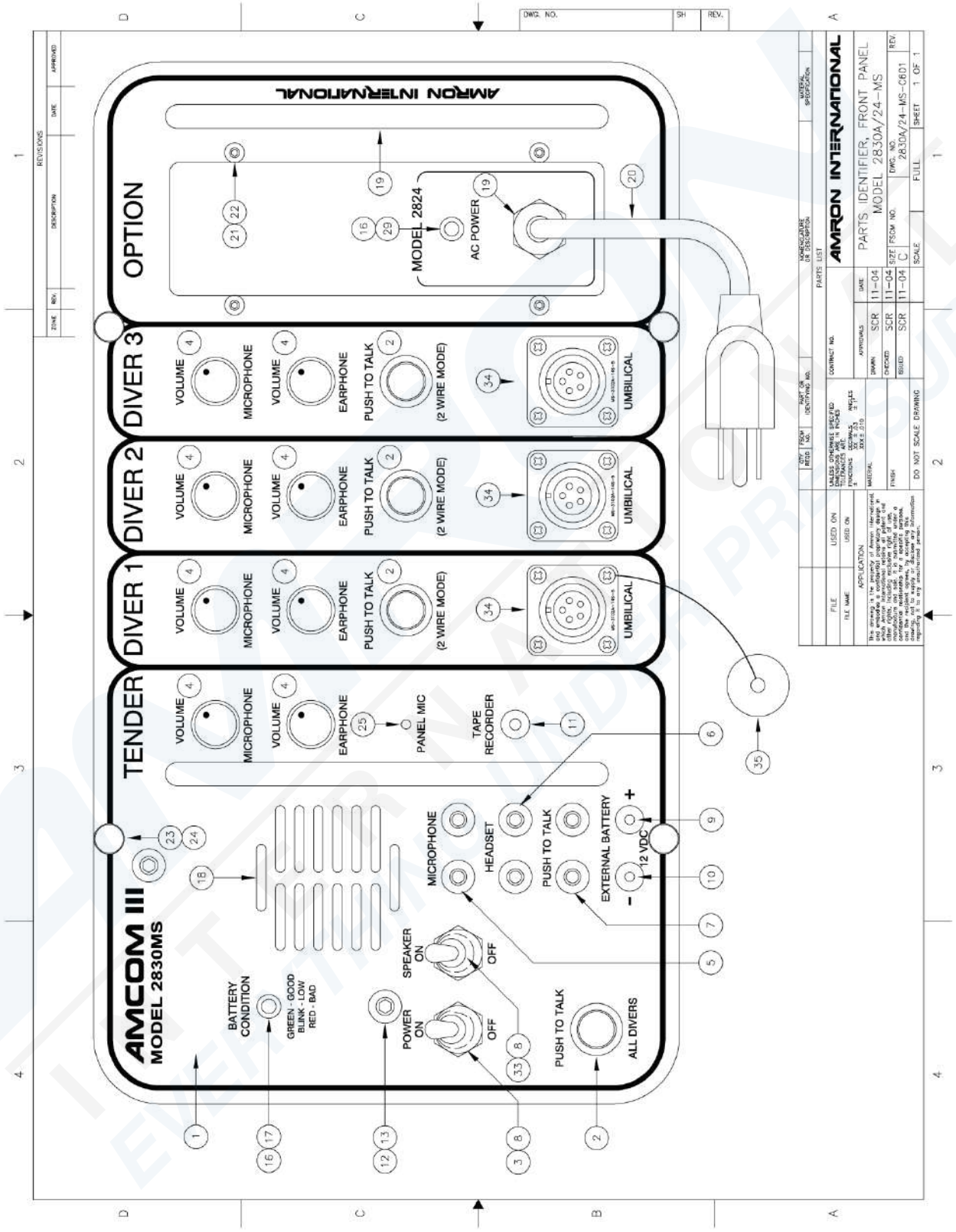
8 DRAWINGS

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

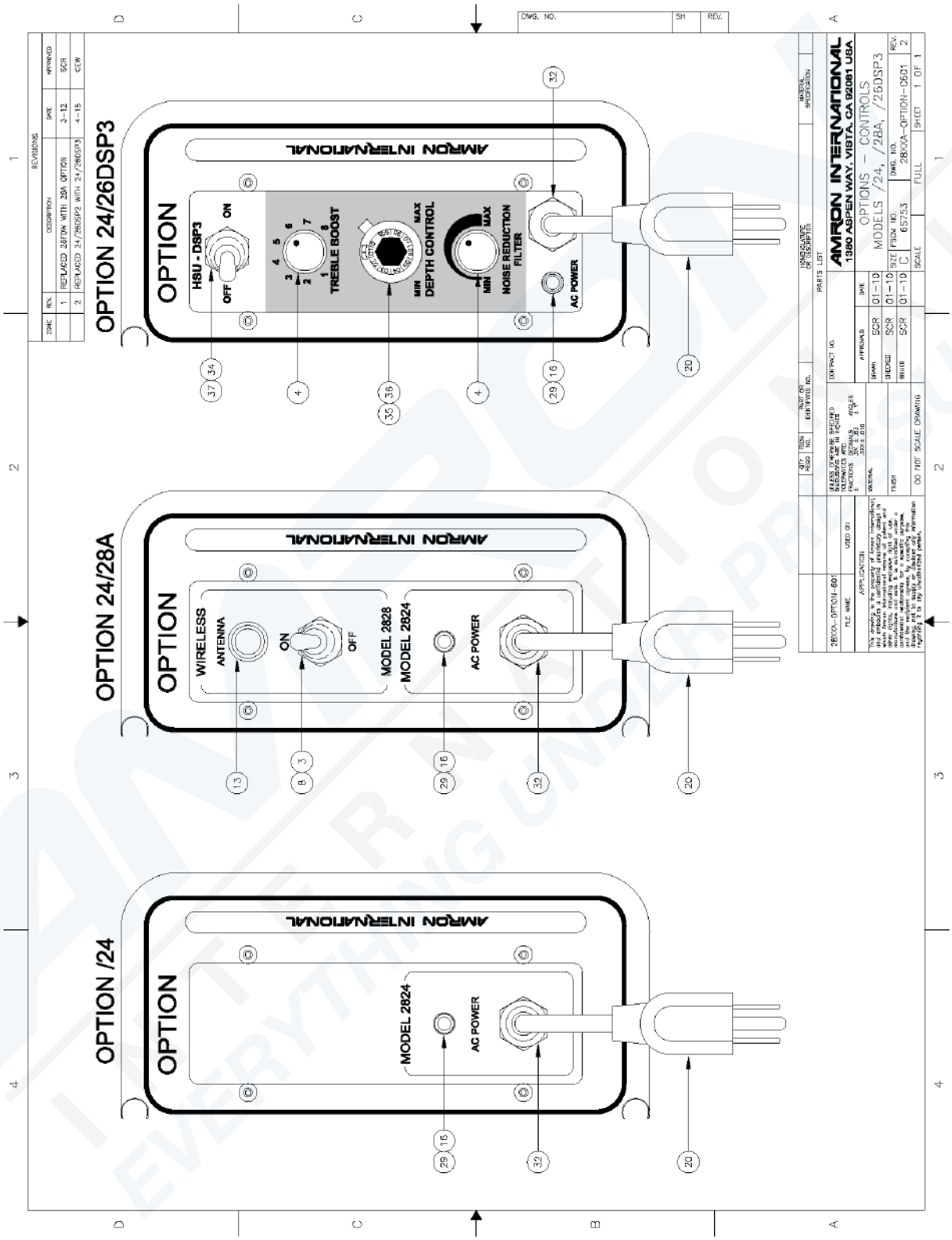
8.1 PARTS IDENTIFIER, FRONT PANEL MODEL 2830A/24



8.2 PARTS IDENTIFIER, FRONT PANEL MODEL 2830A/24-MS



8.3 PARTS IDENTIFIER, MODEL 2826DSP3 & 28A OPTIONS



9 PARTS LIST GENERAL

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

REVISIONS

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

To Order Replacement Parts Contact:

Amron International, Inc.
1380 Aspen Way, Vista, California, 92081 U.S.A.
Telephone: (760) 208-6500 Fax: (760) 599-3857
Email: sales@amronintl.com
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 III MODEL 2830A/24

Reference	Part Number	Description
N/S	2832-203-01	PC CARD ASSEMBLY AMCOM III
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2830A-400	FRONT PANEL/COMPONENTS ONLY
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
24	8FWF	WASHER FLAT FIBER NO 8
19	492	HANDLE ROUND 1.5X5.5X5/16
N/S	10LWSSS	WASHER SPLIT LOCK NO 10 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	8FWSS	WASHER FLAT 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	LED GREEN 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	TAT-1/8	HEAT SHRINK TUBING 1/8IN BLACK
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	8511-30-00	CLIP CORD WHITE STYLE C2A
N/S	2830A-UM	USER MANUAL FOR ALL 2830A

9.2 AMCOM III MODEL 2830A/24/26DSP3

Reference	Part Number	Description
N/S	2832-203-01	PC CARD ASSEMBLY AMCOM III
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2830A-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 RECHARGE12V 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	2824/26DSP3-007	PANEL OPTION HSU DSP3
20	P-2392	CORD AC EURO 3 COND (7421.072)
32	3207	GROMMET .114-.250 DIA. HOLE
29	LEDGREEN	LED GREEN 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 LOCKING8-32 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, RECHARGEABLE
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 4 PIN 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
35	113-10K0-05	POTENTIOMETER; 10K OHM

Reference	Part Number	Description
36	190-0500-15	KNOB TURN COUNTING DIAL
N/S	8511-30-00	CLIP CORD WHITE STYLE C2A
N/S	2826-DSP32-200	PC CARD ASSEMBLY UNSCRAMBLER
N/S	2836	SHORTY BUSHING.750 HOLE
N/S	2830A-UM	USER MANUAL FOR ALL 2830A

9.3 AMCOM III MODEL 2830A/24/28A

Reference	Part Number	Description
N/S	2832-203-01	PC CARD ASSEMBLY AMCOM III
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2830A-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 RECHARGE12V 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	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	8/18-22	TERMINAL RINGNO 8 STUD/18GA
N/S	8NUTSSL	NUT LOCKING8-32 S/S
N/S	2824/28-017	OPTION PANELAC WIRELESS
31	190-0000-01	ANTENNA 2.4GHZ
N/S	180-1001-00	CABLE, RG315 SMA
3	7580K6	SWITCH TOGGLE SPST
32	3207	GROMMET .114-.250 DIA. HOLE
20	P-2392	CORDAC EURO 3 COND (7421.072)
29	LEDGREEN	LED GREEN 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

Reference	Part Number	Description
N/S	2324-J2	J2 CABLE ASSEMBLY
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 TUBING 1/8IN BLACK
N/S	43025-0800	RECEPTACLE 8PIN MICRO-FIT
N/S	43030-0007	CONTACT 3.0mm FEMALE SOCKET
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	2830A-UM	USER MANUAL FOR ALL 2830A

9.4 AMCOM III MODEL 2830A/24-MS

Reference	Part Number	Description
N/S	2832-203-01	PC CARD ASSEMBLY AMCOM III
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2830A-MS-400	FRONT PANEL ASSEMBLY 3-DIVER
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 NO 10 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	8FWSS	WASHER FLAT 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	LED GREEN 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

Reference	Part Number	Description
N/S	8NUTSSL	NUT LOCKING 8-32 S/S
N/S	TAT-1/8	HEAT SHRINK TUBING 1/8IN BLACK
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	8511-30-00	CLIP CORD WHITE STYLE C2A
N/S	2830A-UM	USER MANUAL FOR ALL 2830A

9.5 AMCOM III MODEL 2830A/24/28A-MS

Reference	Part Number	Description
N/S	2832-203-01	PC CARD ASSEMBLY AMCOM III
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2830A-MS-400	FRONT PANEL ASSEMBLY 3-DIVER
N/S	2824-500B	BATTERY BOX-INTERNAL CHARGER
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-05	BATTERY RECHARGE12V 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	8/18-22	TERMINAL RINGNO 8 STUD/18GA
N/S	8NUTSSL	NUT LOCKING8-32 S/S
N/S	2824/28-017	OPTION PANELAC WIRELESS
31	190-0000-01	ANTENNA 2.4GHZ
N/S	180-1001-00	CABLE, RG315 SMA
3	7580K6	SWITCH TOGGLE SPST
32	3207	GROMMET .114-.250 DIA. HOLE
20	P-2392	CORDAC EURO 3 COND (7421.072)
29	LEDGREEN	LED GREEN BRITE

Reference	Part Number	Description
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
N/S	TAT-1/8	HEAT SHRINK TUBING 1/8IN BLACK
N/S	43025-0800	RECEPTACLE 8PIN MICRO-FIT
N/S	43030-0007	CONTACT 3.0mm FEMALE SOCKET
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	2830A-UM	USER MANUAL FOR ALL 2830A

9.6 AMCOM III MODEL 2830A/24/26DSP3-MS

Reference	Part Number	Description
N/S	2832-203-01	PC CARD ASSEMBLY AMCOM III
N/S	2820-301	AMCOM II CASE ASSEMBLY
N/S	2830A-MS-400	FRONT PANEL ASSEMBLY 3-DIVER
N/S	2824-500B	BATTERY BOX-INTERNAL CHARGER
N/S	2405-28	MICROPHONE PUSH TO TALK
N/S	2890-05	BATTERY RECHARGE12V 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	2824/26DSP3-007	PANEL OPTION HSU DSP3
20	P-2392	CORD AC EURO 3 COND (7421.072)

Reference	Part Number	Description
32	3207	GROMMET .114-.250 DIA. HOLE
29	LEDGREEN	LED GREEN 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 LOCKING8-32 S/S
N/S	8/18-22	TERMINAL RING NO 8 STUD/18GA.
N/S	43025-0800	RECEPTACLE 8PIN MICRO-FIT
N/S	39-01-2040	RECEPTACLE 4 PIN MINI-FIT
N/S	43030-0007	CONTACT 3.0mm FEMALE SOCKET
N/S	43025-1800	RECEPTACLE 18 PIN MICRO-FIT
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
35	113-10K0-05	POTENTIOMETER 10K OHM
36	190-0500-15	KNOB TURN COUNTING DIAL.
N/S	8511-30-00	CLIP CORD WHITE STYLE C2A
N/S	570-1006-02	DSP3 HSU PROGRAMMED
N/S	2836	SHORTY BUSHING.750 HOLE
N/S	2830A-UM	USER MANUAL FOR ALL 2830A

9.7 2820-301 CASE ASSEMBLY

Reference	Part Number	Description
1	2820-301	CASE ASSEMBLY
2	2820-3006	GASKET, LID TO CASE
3	2820-3031	GASKET, PANEL

9.8 2830A-400M FRONT PANEL ASSEMBLY

Reference	Part Number	Description
1	2830A-001	PANEL FRONT 3 DIVER
2	PBSWITCH	SWITCH PUSH BUTTONSEALEDN.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 TOGGLEGREY

Reference	Part Number	Description
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	SPEAKER8 OHM 15 WATT
4	P16NP-10K	POTENTIOMETER 10K OHM W/KNOB
12	1/4-20X1.25HSBHC	SCREW 1/4-20 X 1.25IN LONG 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

9.9 2824-500B BATTERY BOX INTERNAL CHARGER

Reference	Part Number	Description
N/S	4003-005	BRACKET SUPPORT RAIL
N/S	2820-013	CHASSIS UNIVERSAL CARD
N/S	2823-6003	CHARGER CHASSIS ASSEMBLY
N/S	GEE62F-C0	GROMMET EDGINGBLACK
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	2820-022	CHASSIS BATTERY BOX-UNIVERSAL
N/S	MFCCA-1/2	SPONGE ½ CC ADH

9.10 28XXA-FS-01 FIELD SPARES KIT FOR 2830A

Reference	Part Number	Description	Quantity
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	1
6	105-0602-001	JACK TIP RED	1
7	105-0603-001	JACK TIP BLACK	1
8	5168	SEAL HALF BOOT TOGGLE GREY	2

Reference	Part Number	Description	Quantity
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	1
18	LEDGREEN	LED GREEN BRITE	1

9.11 OPTIONAL SPARES

Reference	Part Number	Description	Quantity
1	2832-203-01	AMPLIFIER CARD ASSEMBLY	1
2	2823-6003	CHARGER CHASSIS ASSEMBLY	1
3	2405-28	MICROPHONE PUSH TO TALK	1
4	2890-05	BATTERY 12VDC SLIDE TERM. GEL	1