User Manual
for
Amron International, Inc.

Amron Model 2810E and 2810E-1
1-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

AMRON
INTERNATIONAL
EVERYTHING UNDER PRESSURE™

TABLE OF CONTENTS

1. INTRODUCTION AND SPECIFICATIONS

1.1 INTRODUCTION

The 2810E is the newest member of the Amron International AMCOM I series of diver communicators. The 2810E is a full featured, one-diver, hardwire communicator that uses state-of-the-art electronics and introduces even more features to the diving community. The first is a digital audio power amplifier which significantly reduces the current draw resulting in a nearly doubling of the battery life. The 2810E uses a new audio filtering network for improved sound clarity and communications. An auxiliary audio input allows the diver to listen to audio from an MP3 player while remaining in constant communication with the tender. Please note that this feature is only available when diving in 4-Wire mode. These new features allow the AMCOM I 2810E to remain the most advanced one-diver communicator on the market. To enjoy all the features, it is important that the tender read and understand the entire manual including all warnings.

Like previous members of the AMCOM I family, the 2810E can operate in 2-Wire or Full Duplex (4-Wire) communication modes. There is a single volume control for the up-link (Diver-to-Tender) and another volume control for the down-link (Tender-to-Diver). Designed for a long and dependable service life, the 2810E has a powder coated, stainless steel front panel with a waterproof speaker and heavy-duty switches with waterproof seals. The 2810E is enclosed in a rugged plastic case with all the user connectors situated so that the unit can be operated with the case lid closed.

1.2 ELECTRICAL SPECIFICATIONS

Input Impedance (Microphone Inputs) ..... 300 Ohms

Frequency Response ..... 300 - 4000 Hz

Common Mode Rejection (minimum) ..... 40 dB

Entertainment Input Impedance ..... >47 kOhms

Current Drain Maximum Full Volume ..... 3 Amps

Typical Quiescent ..... 55 mAmps

Minimum Load Impedance ..... 2 ohm

Nominal Power Supply Voltage ..... 12 VDC

Operational Supply Voltage ..... 9 - 18 VDC

Sensitivity (Input) ..... 1.8 mVRMS

Maximum Output Power (4 Ohm Load, 14 VDC) ..... 20 Watts

Battery Life Model 2810E (typical) ..... 85 Hours

Model 2810E-1 (typical) ..... 120 Hours

1.3 MECHANICAL SPECIFICATIONS

Panel ..... Powder Coated Stainless Steel

Enclosure ..... High Impact Resistant Plastic

Size Length ..... 9.0 in. (23cm)

Width ..... 6.55 in. (17cm)

Height ..... 7.1 in. (18cm)

Weight With Batteries

2810E ..... 10.0 Lbs. (5.55kg)

2810E-1 ..... 7 Lbs. (3.2kg)

1.4 MODEL 2810E WITH BATTERY CHARGER

The Model 2810E comes equipped with a sealed lead-acid rechargeable battery along with the 2823-603 universal input (115/230 VAC) battery charger. The 2823-603 Battery Charger has medical grade electrical isolation for maximum safety to the diver. Carefully read section 4.1 before using any other external power source.

1.5 MODEL 2810E-1

The Model 2810E-1 comes equipped with two lantern style, 6 Volt alkaline batteries. The unit can be operated using an external power supply as described in the operation section of this manual. Carefully read sections 3.4 and 4.3 before using any external power source.

2. WARRANTY AND SERVICE POLICY

2.1 LIMITED WARRANTY

Amron warrants that its manufactured products are free from defects in material and workmanship under normal use and service, as described in all literature covering the products for a period of 90 days from date of shipment. Amron's obligations under this warranty are limited to the repair of, or replacement of materials at Amron's discretion. 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. ACCESSORIES

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

3.1 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 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).

3.3 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).

3.4 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.

3.5 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.

3.6 AUDIO ADAPTOR CABLE - AMRON PART NUMBER 180-1000-00

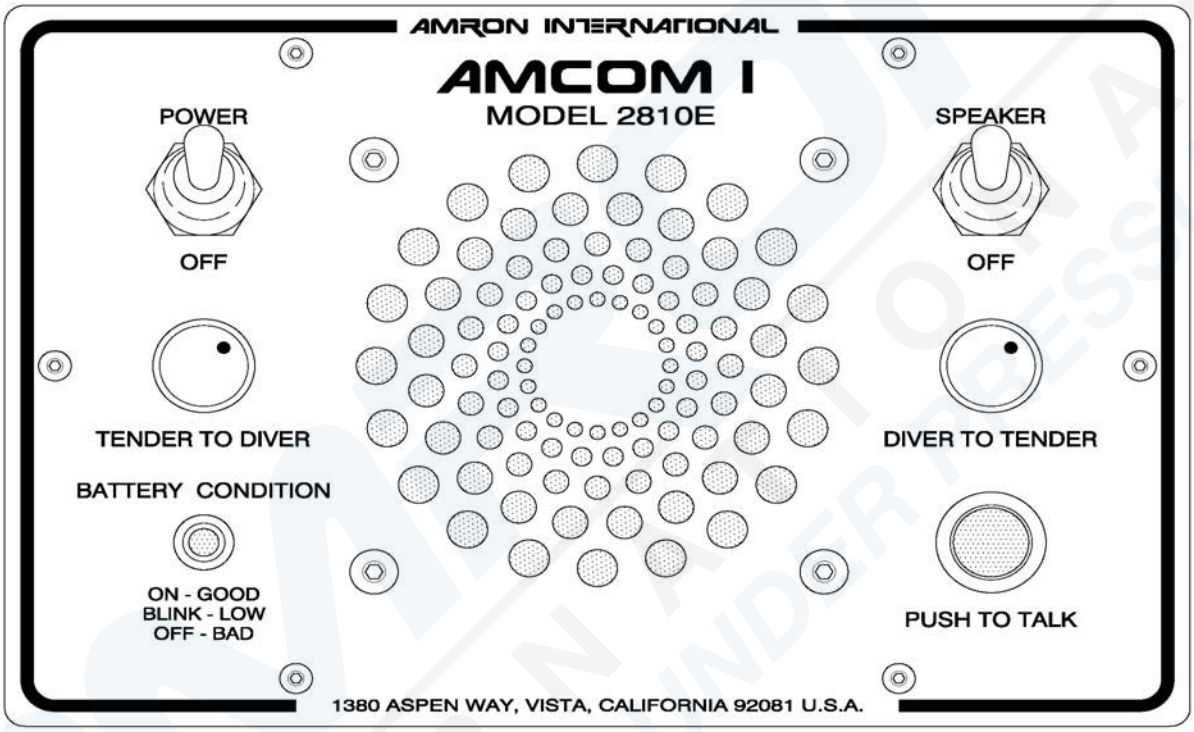
A 2 meter long cable with two RCA Phono plugs that connect the auxiliary audio input to a standard 3.5 mm stereo phone plug which mates to the headphone jack of most common portable audio devices.

4. CONTROLS AND CONNECTIONS

Before using the 2810E diver communicator, the tender should be familiar with all the operating controls and connections. While reading this manual, you will find capitalized words such as PANEL SPEAKER. These words are to remind the reader that additional information can be found in this section of the manual.

4.1 TENDER AND DIVER CONTROLS

The following controls are located on the front panel of the 2810E



4.1.1 POWER SWITCH - The power on/off control.

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 including any signal from the AUXILIARY AUDIO INPUT. 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 speaker that allows the tender to monitor communication to the diver and act as a microphone by using the PUSH-TO-TALK BUTTON. The volume level is controlled by the DIVER TO TENDER VOLUME control and it can be turned off using the SPEAKER SWITCH.

4.1.7 BATTERY CONDITION INDICATOR - This LED is used by the tender to determine the available battery level. A steady green light means that the battery charge level is greater than 30%. When the battery reaches approximately 30% remaining life, the LED will start blinking at a rate of about once per second. When the battery reaches its end-of-charge, the LED will turn off and the 2810E will go into shutdown mode to prevent damaging the communicator or rechargeable battery. It is advised that the 2810E with rechargeable battery be connected to the charger as soon as possible once the BATTERY CONDITION INDICATOR starts blinking. While there should be enough time to safely complete a normal diving operation, the exact amount of time is dependent on the age and condition of the sealed lead acid battery.

4.2 TENDER CONNECTIONS

The tender connections are located on the front side of the 2810E communicator.

4.2.1 **TENDER HEADSET** - 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 3.6. 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 2810E. To prevent this, the PANEL SPEAKER can be turned off using the SPEAKER SWITCH. Another option is to move the tender away from the 2810E 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 3.5. 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 3.7. 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** - 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 2810E. The difference between using the PUSH-TO-TALK JACK and PUSH-TO-TALK BUTTON is that the button allows the tender to communicate using the PANEL SPEAKER as a microphone. If both are used at the same time, the PANEL SPEAKER is active as a microphone. This allows a crew member to talk to the diver using the PANEL SPEAKER even if the tender is away from the 2810E using the Remote Push-to-Talk Module in 2-Wire mode.

4.3 DIVER CONNECTIONS

The diver connections are located on the left side of the communicator.

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 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 3.6. The diver can use this mode even if the tender is wired in 2-Wire mode.

To connect the diver in 2-Wire mode, connect both the diver microphone and earphone to this jack. If the diver umbilical uses banana plugs, simply stack both plugs into this jack as shown in the wiring diagram in section 3.5. In this mode, the diver microphone will be active and heard on tender headset and/or PANEL

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

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

4.4 REAR PANEL CONNECTIONS

4.4.1 **EXTERNAL BATTERY JACK** - The 2810E can be powered using an external battery or power supply via the two color coded TIP jacks. The red TIP jack is the positive power input and the black is the negative power input. The input voltage must be between 9 and 18 VDC and must be able to supply a peak current of 3 Amps for proper operation. The following warnings need to be heeded when using the EXTERNAL BATTERY JACK. A minimum wire size of 18 AWG and maximum wire run of 3 feet (1 meter) are recommended.

WARNING!

When using the EXTERNAL BATTERY input with the 2810E-1 (non-rechargeable battery) current can flow into the alkaline batteries and, with prolonged use or high current, cause the battery to leak. To prevent this, it is advised that the alkaline batteries be disconnected or removed from the unit when an external power supply is used.

WARNING!

The EXTERNAL BATTERY input can be used to recharge the 2810E 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.

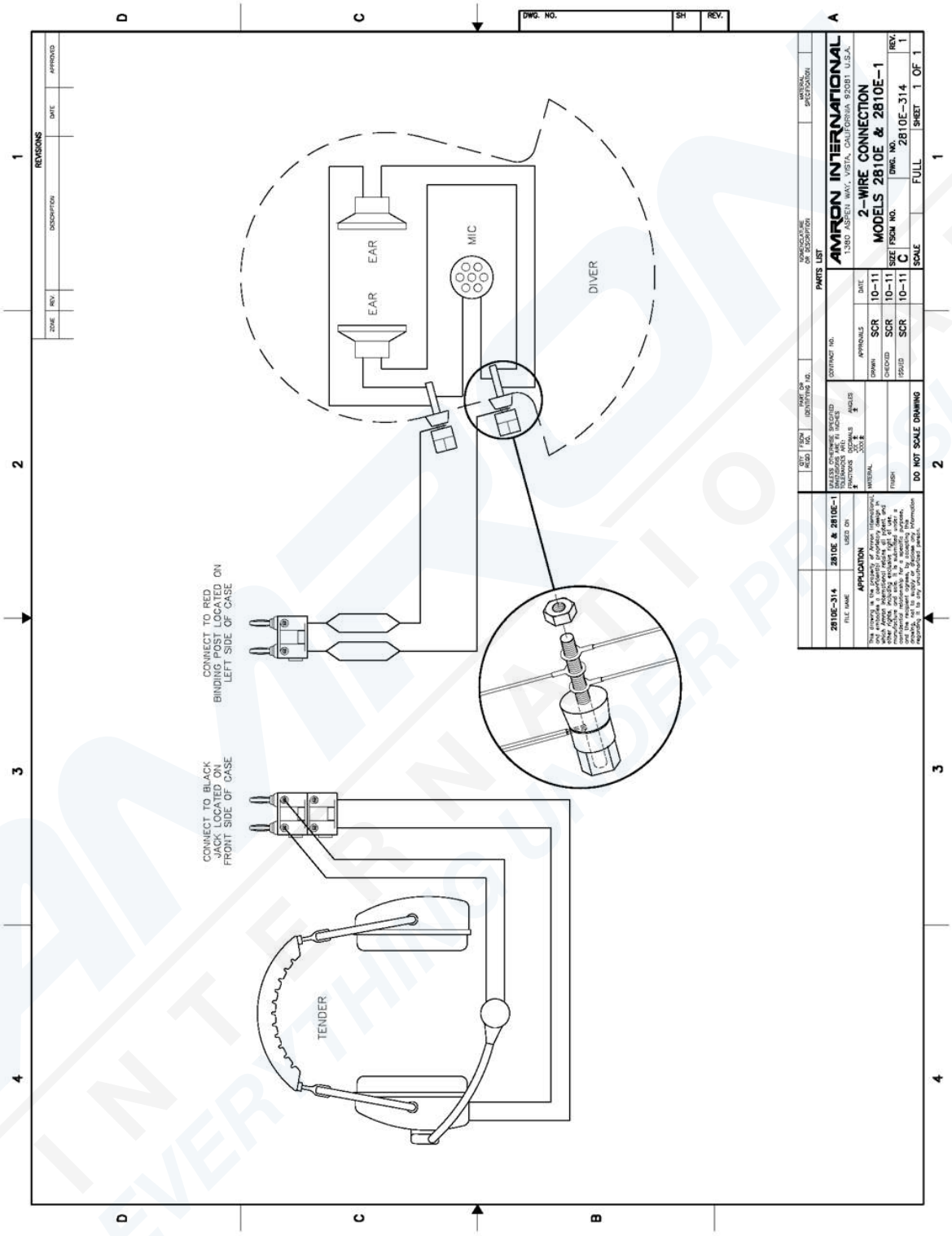
If you use an external power supply, the maximum voltage needs to be limited to 15 Volts if the rechargeable battery is in the unit. If a higher voltage is to be used, it is advised that the battery be disconnected or removed from the communicator to prevent possible damage to the battery.

4.4.2 **RECORDER OUTPUT** - This is a single RCA Phono jack (color-coded black) that provides a transformer isolated 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. The RECORDER OUTPUT will not record the signal from the AUXILIARY AUDIO INPUT.

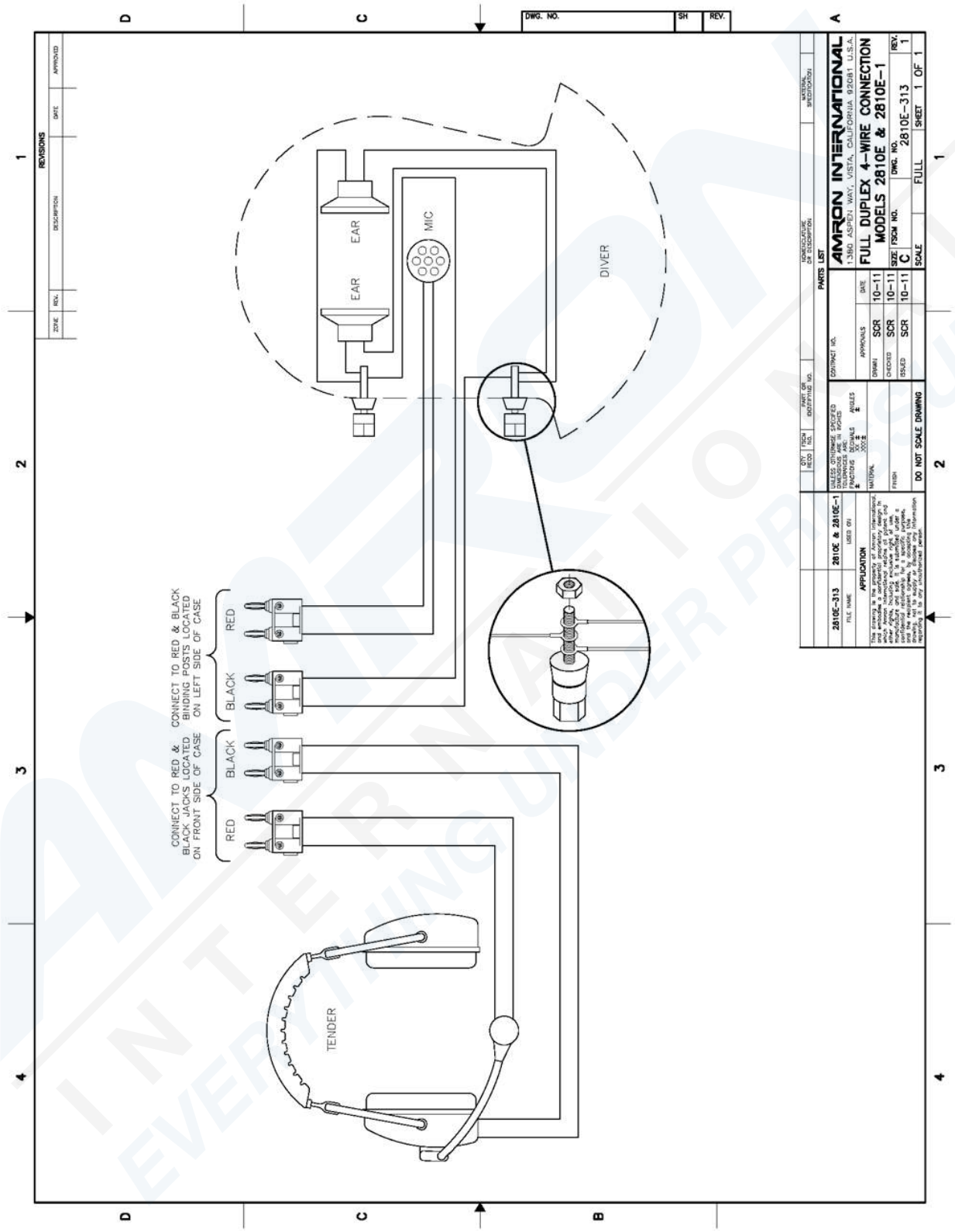
4.4.3 **AUXILIARY AUDIO INPUT** - This is a set of two RCA Phone jacks (color-coded red and white) that provides a means to connect an external audio signal for diver entertainment. Although this input will accept a stereo audio source, it will be converted into a monaural signal before going to the diver. This signal is not heard in either the tender headset or via the PANEL SPEAKER. The earphone output of most MP3 players can be connected to this input using an adaptor cable like the Amron Audio Adaptor Cable (Amron Part Number 180-1000-00). This feature will only work if the diver is wired in Full Duplex (4-Wire) mode.

There is no separate volume control provided for the diver entertainment signal. The audio device provides the volume control. It is advised at the start of diving operation, and before the external audio device is turned on, that the tender adjust and verify the TENDER TO DIVER VOLUME level is correct and comfortable for the diver. Then starting with the lowest volume, adjust the volume on external device until a comfortable level is achieved. If the tender is connected in the Full Duplex (4-Wire) mode, the volume level should not be so loud as to prevent the diver from hearing the tender. If the tender is connected in the 2-Wire mode, then the entertainment will be cut off whenever the PUSH-TO-TALK BUTTON or PUSH-TO-TALK JACK is used. The PUSH-TO-TALK BUTTON can be used by the tender to cut off the entertainment even if the tender is connected in the Full Duplex (4-Wire) mode.

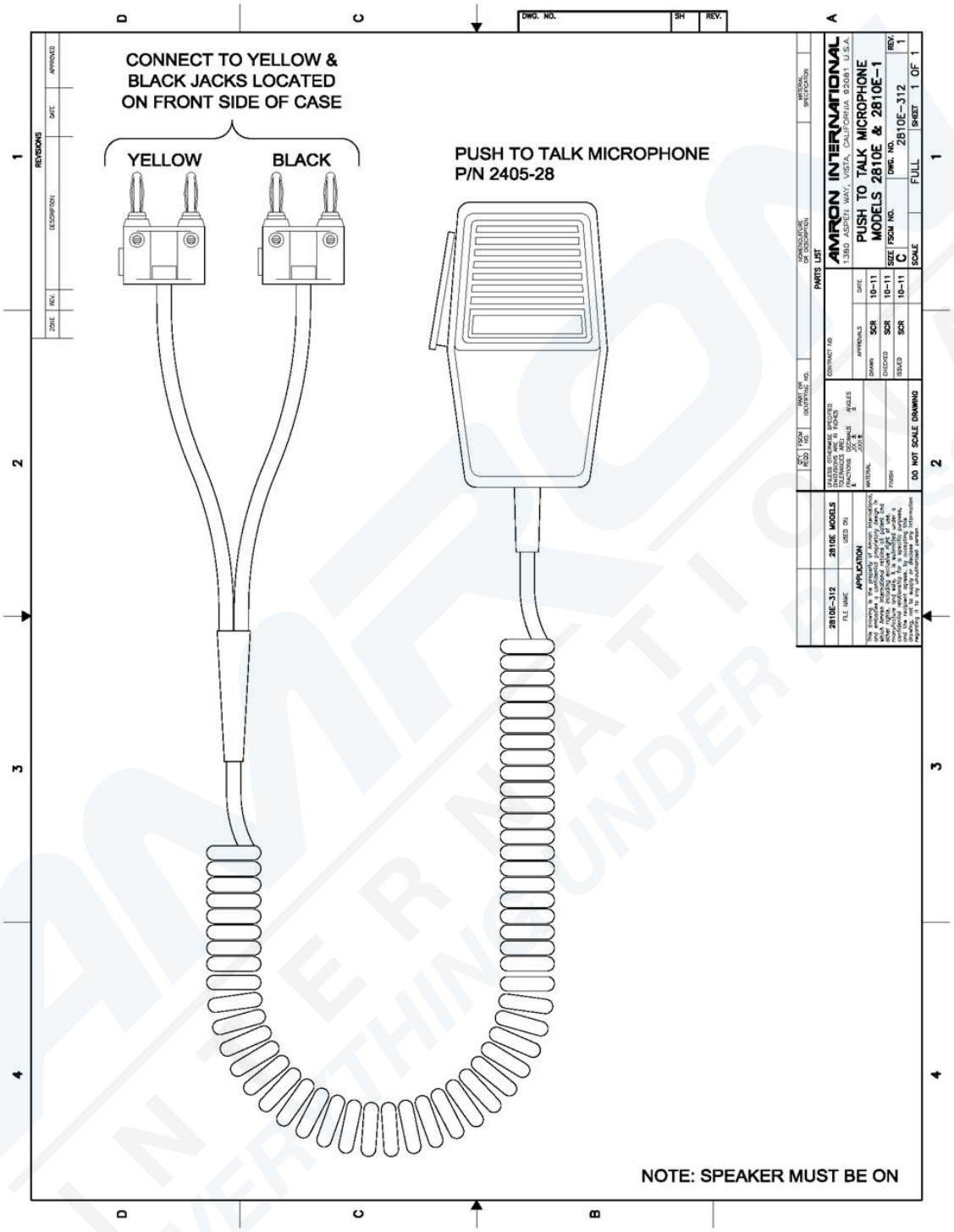
4.5 DRAWING, 2-WIRE CONNECTIONS



4.6 DRAWING, FULL DUPLEX (4-WIRE) CONNECTIONS



4.7 DRAWING, PUSH-TO-TALK MICROPHONE CONNECTIONS



5. OPERATION

The 2810E comes in a yellow, rugged plastic case. To gain access to the front panel, open the case by releasing both latches on the front of the unit. To gain access to the battery compartment, turn the unit over and release both latches on the front of the unit.

5.1 CHARGING THE BATTERY (2810E ONLY)

The Model 2810E is supplied with a sealed lead acid battery. To charge the battery, connect the 2823-603 Battery Charger to the EXTERNAL BATTERY JACK located on the back of the unit. Following the color coding of the jack, connect the red plug to the red jack and the black plug to the black jack. The Amron Model 2823-603 charger is able to operate on 115 and 230 VAC lines without the user having to make any adjustments.

The 2823-603 Battery Charger is designed to charge the battery in float mode so the charger can be left on indefinitely, without damage, to ensure the battery is fully charged and the unit is ready to use. A fully discharged battery will take approximately 10 hours to reach full charge (depending on the age of the battery and the surrounding temperature). To ensure maximum service life, the battery should be fully charged at least once every six months.

The operating time for a fully charged battery is approximately 85 hours. The exact operating time depends on the age of the battery and the ambient temperature. The sealed lead acid battery used in the 2810E has a service life of 300 full charge/discharge cycles or 3 years. The BATTERY CONDITION INDICATOR will start to blink when the battery has approximately 30% remaining charge. To maximize the service life, the battery should be recharged as soon as possible after the indicator starts to blink. When the battery reaches the full discharge state, the 2810E will shutdown to prevent damage to both the battery and the electronics.

5.2 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 24 hours of remaining life for the 2810E and approximately 36 hours for the 2810E-1. 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.

5.3 OPERATING ON AC POWER

As noted in section 3.4 on the EXTERNAL BATTERY JACK, it is possible to operate the 2810E with an external AC power supply. Review all warnings in this section and section 3.4 before using an AC power supply.

It is strongly advised that the 2810E only be operated for AC Power when using the Amron Model 2823-603 Battery Charger. Amron has designed the 2823-603 with medical grade electrical isolation that prevents any possible leakage of AC current into the 2810E communicator. This protects the diver and tender from electrocution.

The 2823-603 Battery Charger can also be used to power the 2810E-1. It is recommend that if the battery charger is going to be used for an extended period of time, the alkaline batteries should be removed to prevent possible leakage.

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.

5.4 MODES OF OPERATION

The Models 2810E and 2810E-1 have 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. For example, the diver can be connected in Full Duplex (4-Wire) mode to take advantage of the new entertainment feature while the tender is wired in 2-Wire mode. 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. If the diver is connected in 2-Wire mode, the AUDIO AUXILIARY INPUT cannot be used to deliver entertainment to 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 6, FULL DUPLEX (4-WIRE) - WHAT, WHY AND HOW.

5.4.1 **2-WIRE**

To connect the diver in 2-Wire mode, connect the communication umbilical wires to the DIVER MICROPHONE binding post jack on the 2810E as shown in the wiring drawing in section 3.5. If the umbilical uses a banana plug, simply insert the plug into the binding post jack. Verify that it is firmly and completely seated. This may require that the external plastic nut be tightened down. If the umbilical uses bare wires, loosen the external plastic nut of the binding post jack. Either insert the bare end of the wire into the hole in the metal shaft of the binding post or firmly wrap the wire around the shaft. Tighten the nut until the bare wire is firmly fastened by the nut. The nut should not be fastened on the insulation of the wire nor should any of the bare wires touch.

The tender can operate in 2-Wire without a headset or push-to-talk microphone by using the PANEL SPEAKER as both a speaker and microphone. When the tender wants to talk to the diver, he presses the PUSH-TO-TALK BUTTON on the front panel and speaks clearly into the PANEL SPEAKER at a distance of between 4 to 8 inches (10 to 20 cm). When done speaking, the tender releases the PUSH-TO-TALK BUTTON to allow the diver to communicate.

When the tender uses a headset or push-to-talk microphone, follow the connection instruction in section 3.2 and in the wiring diagram in sections 3.5 and 3.7. When using the Amron Model 2405-28 Push-to-Talk Microphone, the tender presses the push-to-talk button on the side of the microphone and speaks clearly at a distance of between 1 and 2 inches (25 to 51 mm). When done speaking, the tender releases the push-to-talk button to allow the diver to communicate.

Whenever either the diver or the tender are connected in 2-Wire, the tender must use one of the push-to-talk methods when talking to the diver.

5.4.2 FULL DUPLEX (4-WIRE)

To connect the diver in Full Duplex (4-Wire) mode, connect the communication umbilical wires to the DIVER MICROPHONE and DIVER EARPHONE jacks as shown in wiring diagram in section 3.6. If the umbilical uses a banana plug, simply insert the plug into the correct binding post jack. Verify that it is firmly and completely seated. This may require that the external plastic nut be tightened. If the umbilical uses bare wire ends, loosen the external plastic nut of the binding post jack. Either insert the bare end of the wire into the hole in the metal shaft of the binding post or firmly wrap the wire around the shaft. Tighten the nut until the bare wire is firmly fastened by the nut. The nut should not be fastened on the insulation of the wire nor should any of the bare wires touch. If the AUDIO AUXILIARY INPUT is to be used to deliver entertainment to the diver, then the diver must be wired in Full Duplex (4-Wire) mode. The diver microphone will be louder in Full Duplex (4-Wire) mode than in 2-Wire mode. This can be a significant advantage when using longer dive umbilical cables.

To use Full Duplex (4-Wire) mode, the tender must use a headset and connect per the instructions in 3.2. The tender will have to use the PUSH-TO-TALK BUTTON to communicate if the diver is in 2-Wire mode. The tender can also use the PUSH-TO-TALK BUTTON to cut off the AUDIO AUXILIARY INPUT signal from the diver even if the tender is connected in Full Duplex (4-Wire) mode. When the tender uses a headset, the SPEAKER SWITCH should be turned off to prevent acoustic feedback. Acoustic feedback can also be avoided by moving the tender away from the 2810E by using the Amron Model 2822-28 Remote Walk-and-Talk Module. In this way, the PANEL SPEAKER can allow other members of the diving crew to monitor the dive operation or to communicate to the diver by pressing the PUSH-TO-TALK BUTTON and talking into the speaker.

5.4.3 SETTING THE VOLUME CONTROLS

5.4.3.1 2-WIRE MODE - 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:

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

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

5.4.3.2 FULL DUPLEX (4-WIRE) MODE -Turn power switch to ON; turn speaker switch to OFF; adjust both volume controls to mid-scale. Tender to use headset. Tender and Diver talk to each other during Tender adjusting volume controls as below:

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

TENDER TO DIVER VOLUME - While tender is talking, tender adjusts this volume control to a comfortable level for the diver. If the AUXILIARY AUDIO INPUT will be used, the volume level of the external audio device should not be higher than the tender's voice.

WARNING!

To ensure clear communications when using the AUXILIARY AUDIO INPUT, it is critical that the volume level of the external audio device be set at a level below that of the tender's microphone as described above. It is recommended that the tender use the PUSH-TO-TALK BUTTON when talking to the diver as this cuts off the signal from the AUXILIARY AUDIO INPUT

6. MAINTENANCE AND TROUBLESHOOTING

The following section describes the procedures for checking the operation of your 2810E diver communicator, general maintenance procedures, and how to troubleshoot common problems.

6.1 DIVER RADIO COMMUNICATOR CHECK PROCEDURES

The following are a series of step-by-step procedures to perform a functional check of your 2810E communicator using only a headset. These steps check all communication functions of the 2810E in both 2-Wire and Full Duplex (4-Wire) mode. If the communicator checks out using these procedures, then any communication problems are probably located somewhere else in the system setup.

6.1.1 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. Connect a source device, such as a MP3 player, to the AUXILIARY AUDIO INPUT. Set the volume control of the device to low and start playing music. The music should be heard in the headset. Adjust the volume as required. Verify that the music is cut off when the PUSH-TO-TALK BUTTON is pressed.

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

6.1.2 2-WIRE CHECK

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

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

6.2 GENERAL MAINTENANCE

The 2810E 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.

3. When using a rechargeable battery, the battery should be recharged after use or as soon as possible when the BATTERY CONDITION INDICATOR starts blinking.

6.2.1 RECOMMENDED MAINTENANCE SCHEDULE

The following sections outline the recommended scheduled maintenance for the 2810E and 2810E-1.

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.

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.

6.2.2 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.

1. Inspect the PUSH-TO-TALK BUTTON, binding posts and volume controls for smooth operation.

2. Inspect the case lid O-ring for any damage and replace if necessary.

3. Inspect the front panel gasket for any damage and replace if necessary.

4. On the 2810E - recharge the battery using the Amron 2823-603 Battery Charger.

5. Perform the 2-Wire and Full Duplex (4-Wire) system checks as described in section 5.2.

6.2.3 YEARLY CHECK

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

6.2.4 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 2810E 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.

6.3 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.

6.3.1 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.

6.3.2 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 2810E with rechargeable battery to operate. It is recommended that the 2810E 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. For the 2810E-1, verify that the wire that connects the two batteries is also firmly attached.

WARNING!

When changing the battery it is critical that the RED wire be connected to the positive terminal of the battery and the BLACK wire connected to the negative terminal of the battery. For 2810E-1, using two lantern style alkaline batteries, the RED wire should be connected to the positive terminal of the first battery and the BLACK wire connected to the negative terminal of the second battery. The negative terminal of the first battery should be connected to the positive terminal of the second battery using the wire provided. Both batteries should be replaced at the same time. Used and new batteries should not be mixed

6.3.3 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.

6.3.4 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.

6.3.5 GARBLED VOICE TO THE DIVER

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

6.3.6 **GARBLED VOICE TO THE TENDER**

The DIVER TO TENDER VOLUME control is set too high. Reduce this control until the voice signal clears. If this does not solve the problem, check the diver's microphone for corrosion or other defect. Replace if necessary. If the tender is using a headset, remove the headset and listen to the diver using the PANEL SPEAKER. If this solves the problem then the tender headset may be wet or defective. If the tender is using the PANEL SPEAKER to talk to the diver, check the speaker for any accumulated water. Drain the speaker if necessary. If these steps have not solved the problem, then disconnect the diver umbilical and perform the communicator check out procedure per section 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.

6.3.7 **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.

6.3.8 **FEEDBACK - FULL DUPLEX (4-WIRE) MODE**

There are two forms of feedback that can affect the 2810E: 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 2810E. If the tender wants to operate with the headset and leave the PANEL SPEAKER on, Amron recommends the tender move away from the 2810E 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 2810E.

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.

6.3.9 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?

Now that we have made these claims, allow us to explain why and how. First, let’s define some basic industry terms so that we can all start from the same point.

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.

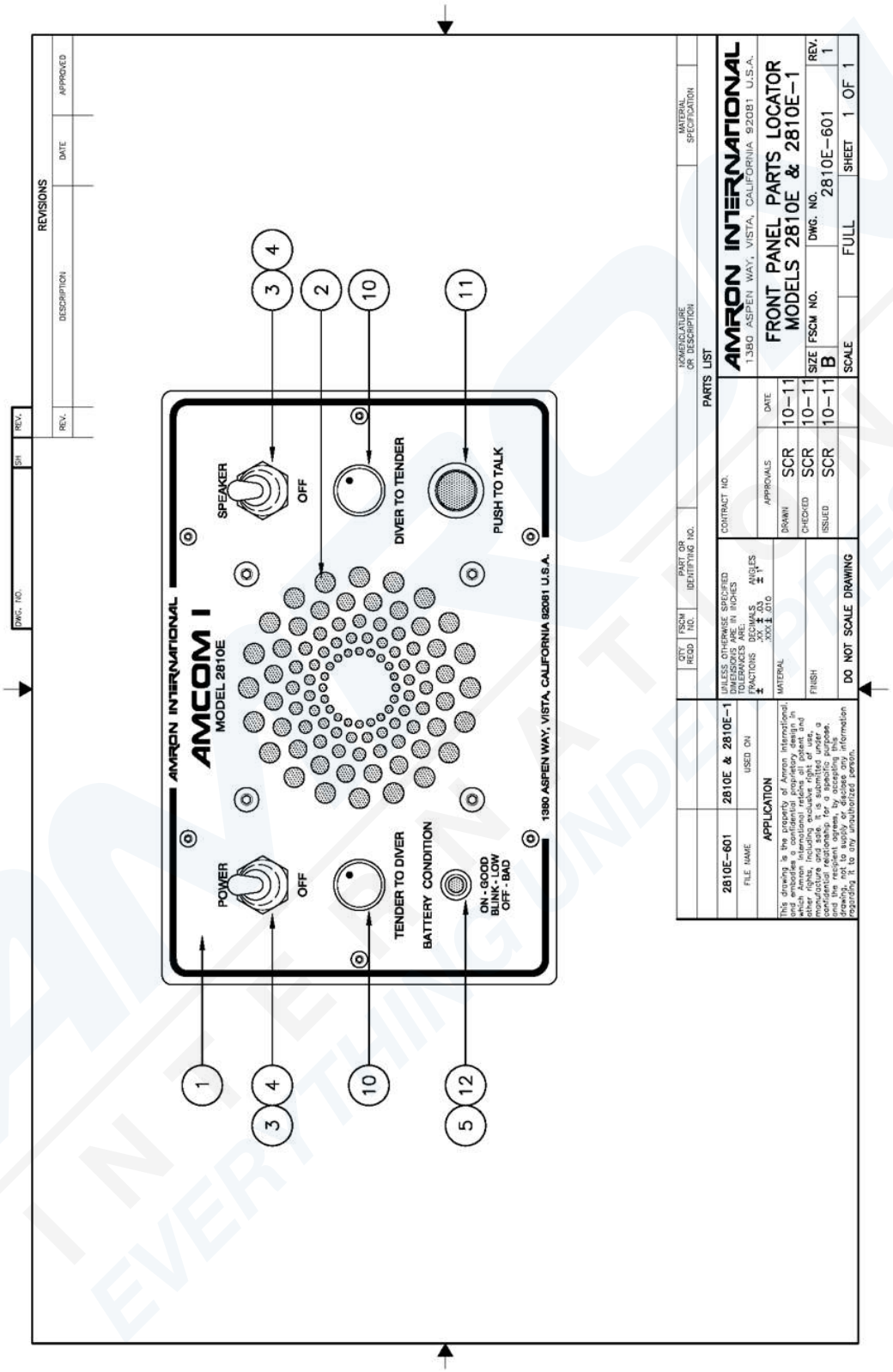
When using AMCOM diver communicators with multiple diver capacity, each diver can be wired in either 2-Wire or Full Duplex (4-Wire) mode. All divers do not have to operate in the same mode.

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.

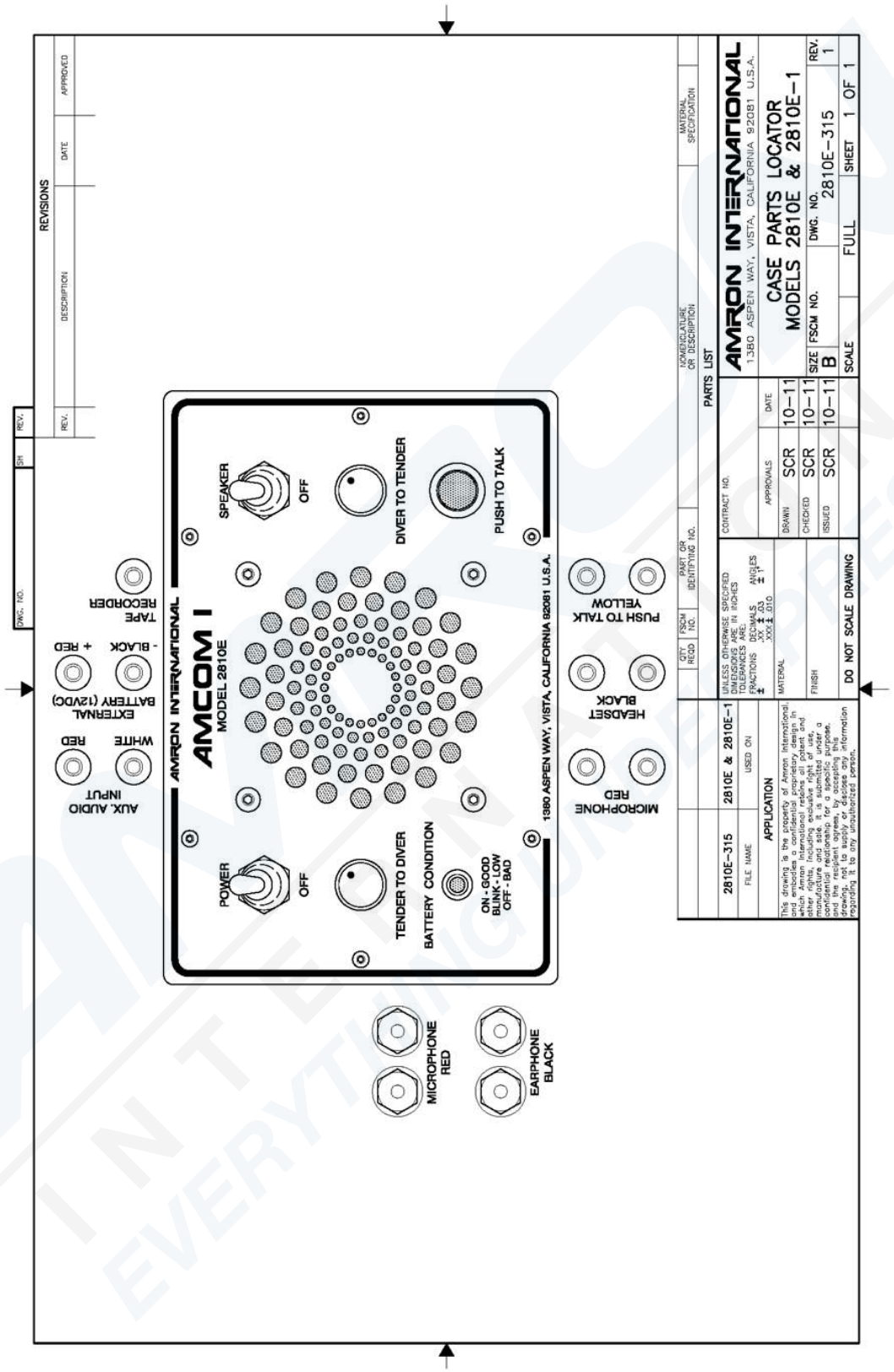
8. DRAWINGS

The following drawings illustrate the electrical and mechanical details of the diver communication unit. The corresponding parts lists for each drawing are detailed in the parts lists section, or are included as part of the drawing. All drawings are at their current revision level as of the date of printing. Amron reserves the rights to revise the documentation without notification.

8.1 FRONT PANEL PARTS LOCATOR, MODELS 2810E & 2810E-1



8.2 CASE PARTS LOCATOR, MODELS 2810E & 2810E-1



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 MODEL 2810E TOP ASSEMBLY

Reference	Part Number	Description
1	570-1000-02	P.C. Card Assembly
2	2810E-300	Case Assembly
3	2810E-400	Front Panel Assembly Amcom I
6	4-40x1/2SSPHP	Screw 4-40 1/2" SS PHP
7	4NUTSSL	Nut Locking 4-40 S/S
8	2890-05	Battery Rechargeable 12v 7amp
9	2-520194-2	Slide Terminals
10	2810E-UM	Operations Manual
11	MFS-PEE1	#2 Ethafoam
13	2823-603	Charger Assembly External

9.2 MODEL 2810E-1 TOP ASSEMBLY

Reference	Part Number	Description
1	570-1000-01	P.C. Card Assembly
2	2810E-300	Case Assembly Wired Complete
3	2810E-400	Front Panel Assembly Wired
4	4-40x1/2SSPHP	Screw 4-40 1/2" SS PHP
5	4NUTSSL	Nut Locking 4-40 S/S
6	2890-01	Battery 6v Non-rechargeable
7	8/18-22	Ring Terminal
8	2810E-UM	Operations Manual
9	MFS-PEE1	#2 Ethafoam

9.3 2810A-FS-01 FIELD SPARES KIT

Reference	Part Number	Description	Quantity
1	105-0603-001	Jack, Tip Black	1
2	105-0602-001	Jack, Tip Red	1
3	1498-103	Jack, Banana Black	2
4	1498-102	Jack, Banana Red	2
5	1498-107	Jack, Banana Yellow	2
6	14002B	5-Way Binding Post Black	2
7	14002R	5-Way Binding Post Red	2
8	7580K6	Switch, Toggle SPST	1
9	5168	Seal, Half boot Toggle Gray	1
10	PBSWITCH	Switch, Push Button, Sealed	1
11	P16NP-10K	Potentiometer, 10k Ohm w/knob	1
12	LEDGREEN	LED Green Brite	1
13	LEDHOLDER-BLK.25	Mounting Clip for 5mm LED	1
14	0034.6019	Fuse 3.15A/250V Micro Quick	1
15	0034.6617	Fuse 1.6A/250V Slow	2

9.4 2810E-300 CASE ASSEMBLY

Reference	Part Number	Description
1	2810E-300M	Case Assembly Components Only
2	2811B-J4	Wiring Harness for Case
3	2811B-J1	Wiring Harness for Battery
4	2810E-P5	Wiring Assembly for AUX Audio

9.5 2810E-300M CASE ASSEMBLY COMPONENTS

Reference	Part Number	Description
1	1120-101-240	Case
2	1120-PANEL-FRAME	Frame
3	105-0602-001	Jack Tip Red
4	105-0603-001	Jack Tip Black
5	1498-103	Jack Banana Black
6	1498-107	Jack Banana Yellow
7	1498-102	Jack Banana Red
8	14002R	5-Way Binding Post (Red)
9	14002B	5-Way Binding Post (Black)
10	2810-3005	Bumper Recessed Black
11	ME161-2003	Jack Phono
12	6-32x1/2SSPHP	Screw 6-32 1/2" SS PHP
15	6NUTSSL	Nut Locking 6-32 S/S
17	4-40x7/8SSPHP	Screw 4-40 X 7/8 SS PHP
18	1902A	Stand-off, 4-40x1/4 nylon hex
19	4-40x1/2SSPHP	Screw 4-40 X 1/2 Ss PHP
20	74115-04	Insert, Spred-lok, brass
21	2820-3006	Tubing, gasket
22	160-1001-01	Jack, RCA Red
23	160-1001-02	Jack, RCA White

9.6 2810E-400 FRONT PANEL ASSEMBLY

Reference	Part Number	Description
1	2810E-400M	Front Panel Assembly Components Only
2	TAT-1/8	Heat Shrink Tubing 1/8"
3	2811B-J2	Wiring Harness for Panel

9.7 2810E-400M FRONT PANEL ASSEMBLY COMPONENTS

Reference	Part Number	Description
1	2810E-001	Panel Front Amcom
2	100-0000-00	Speaker 3.5" 1w 8 Ohm 16w
3	7580K6	Switch Toggle SPST.
4	5168	Seal Half Boot Toggle Gray
5	LEDGREEN	Led Green Bright
6	6-32x3/8HSBHC	Screw 6-32 3/8"
7	6NUTSSL	Nut 6-32 S/S Locking
10	P16NP-10K	Potentiometer 10k Ohm W/Knob
11	PBSWITCH	Switch Sealed Push-Button Mom
12	LEDHOLDER-BLK.25	Mounting Clip for 5mm LED

9.8 2823-603 CHARGER ASSEMBLY

Reference	Part Number	Description
1	2823-6003	Charger Chassis Assembly
2	2823--J1-4.5	Ac Inlet Harness Snap-In
3	2324-021	Cover Model 2823-600 Charger
4	LEDGREEN	Led Green Bright
5	530-105-0772-1	Plug Tip Red
6	530-105-0773-1	Plug Tip Black
7	517-SJ-5003	Rubber Bumper Foot
8	4-24x1/4SSPHP	Screw Self-Tap
9	P-2392	Cord Ac Euro 3 Conductor
10	528-1017	Bushing Strain Relief Nylon
11	39-01-2060	Receptacle 6 Pin Mini-Fit
12	39-00-0039	Terminal Female Crimp Mini-Fit
13	LEDHOLDER-BLK.25	Mounting Clip for 5mm LED