



TWO-DIVER RECHARGEABLE PORTABLE  
COMMS UNIT



Model: 214-2STD / 214-2XTD

User's Guide

## Bruce Systems S.r.l.

### NOTICE

The information contained in this manual is provided for maintenance and operational purposes. This user guide is made available for the express use of owner of this Bruce Systems product. No part of this user guide may be reproduced, stored in any retrieval system, or transmitted, or used in any form or by any means, whether electronic, graphic, mechanical, photocopy, or otherwise by technology known or unknown, without the prior written permission of Bruce Systems srl.

### SAFETY NOTICE

It is absolutely essential that the Tender/Supervisor is trained in the use of the equipment in question and has carefully read and understood this manual before attempting to use the Comms Unit.
---

This user guide must always be available on site even if this equipment is loaned or rented it must always be provided with this document.
--

© Copyright 2022 by Bruce Systems srl.

All rights reserved. Specifications are subject to change without prior notice.

## TABLE OF CONTENT

<b>1</b>	<b>INTRODUCTION .....</b>	<b>4</b>
<b>2</b>	<b>CHARACTERISTICS.....</b>	<b>5</b>
<b>3</b>	<b>OPERATIONAL INSTRUCTION.....</b>	<b>6</b>
3.1	FRONT PANEL COMPONENTS.....	6
3.2	HALF DUPLEX MODE (2 WIRE).....	7
3.3	FULL DUPLEX MODE (4 WIRE) .....	9
<b>4</b>	<b>UNIT ACCESS.....</b>	<b>9</b>
4.1	FOOT REMOVAL AND ACCESS .....	10
4.2	BATTERY.....	11
<b>5</b>	<b>FRONT PANEL BATTERY MONITOR .....</b>	<b>12</b>
<b>6</b>	<b>WHAT INCLUDED .....</b>	<b>13</b>
6.1	INCLUDED .....	13
<b>7</b>	<b>TROUBLE SHOOTING.....</b>	<b>13</b>
<b>8</b>	<b>DECLARATION.....</b>	<b>16</b>
<b>9</b>	<b>WARRANTY .....</b>	<b>17</b>
9.1	LIMITED WARRANTY.....	17
9.2	BATTERY WARRANTY.....	17
9.3	SERVICE POLICY .....	17

## 1 INTRODUCTION

Thank you for purchasing one of our products. At Bruce Systems we are not commercial parts assemblers but product builders. We're committed to manufacturing and delivering products and services of the highest possible quality, consistently meeting the requirements of not only our consumers, but of applicable statutory and regulatory parties.

The 214-2XXX Series of Communication Unit is a stand-alone systems design to provide a clear communication between Tender/Supervisor and Diver(s). The systems can operate in 2 Wire mode and/or 4 Wire mode.

The present document has been design to provide all the necessary information about operational aspect and basic maintenance.

In case of more info and or particular assistance please contact us at the following address:

### Bruce Systems srl

Via San Michele degli Scalzi, 12  
56124 – Pisa (ITALY)  
Phone: +39 05861837643  
e-mail: [info@bruce-systems.com](mailto:info@bruce-systems.com)  
VAT: IT02363490505

## 2 CHARACTERISTICS

- AC Power Operating Range: 90-264 VAC, 50-60 Hz
- External Power Supply Voltage: 12 VDC
- Internal charger
- Internal battery: 2 x 12V x 3,4Ah Model 214-2STD  
2 x 12V x 7,2Ah Model 214-2XTD
  
- Ext. Dimensions: L 40 cm l 30 cm h 22,3 cm.  
Weight (2STD): 7 Kg  
(2XTD): 9,2 Kg
  
- Separate channels and volume controls for each Diver(s)
- Separate channels and volume controls for Tender/Supervisor
- Power Out: 20 Watt
  
- Audio OUT for recording
- Operational mode: 4-wire mode (Full Duplex)  
2-wire mode (Half Duplex)
  
- Front Panel: 10 mm Al, Black Hard Anodized and silk-screened
- Protective Case Material: PP
  
- Automatic speech status identification to easily identify which Diver is talking

### **3 OPERATIONAL INSTRUCTION**

#### **3.1 FRONT PANEL COMPONENTS**

The following list describe the lay-out components installaed on the front panel.

- 1) AC Power Supply connection
- 2) AC Led Status
- 3) DC External 12VDC Power supply (riportare codice connessione)
- 4) Battery Status Monitor
- 5) AC Power FUSE
- 6) Unit Power ON/OFF
- 7) Power On Led Status
- 8) Speaker ON/OFF
- 9) Recording OUT
- 10) Tender Microphone Volume
- 11) Tender Earphone Volume
- 12) Push to talk all Diver (2 Wire Mode)
- 13) Diver 1 Microphone Volume
- 14) Diver 1 Earphone Volume
- 15) Diver 1 Led Status
- 16) Push to talk (2 Wire Mode)
- 17) Diver 1 2 Wire Conn
- 18) Diver 1 4 Wire Conn
- 19) Diver 2 Microphone Volume
- 20) Diver 2 Earphone Volume
- 21) Diver 2 Led Status
- 22) Push to talk (2 Wire Mode)
- 23) Diver 2 2 Wire Conn
- 24) Diver 2 4 Wire Conn
- 25) Speaker
- 26) Tender Microphone Connection
- 27) Tender Head Set Connection
- 28) Tender Push to talk Connection

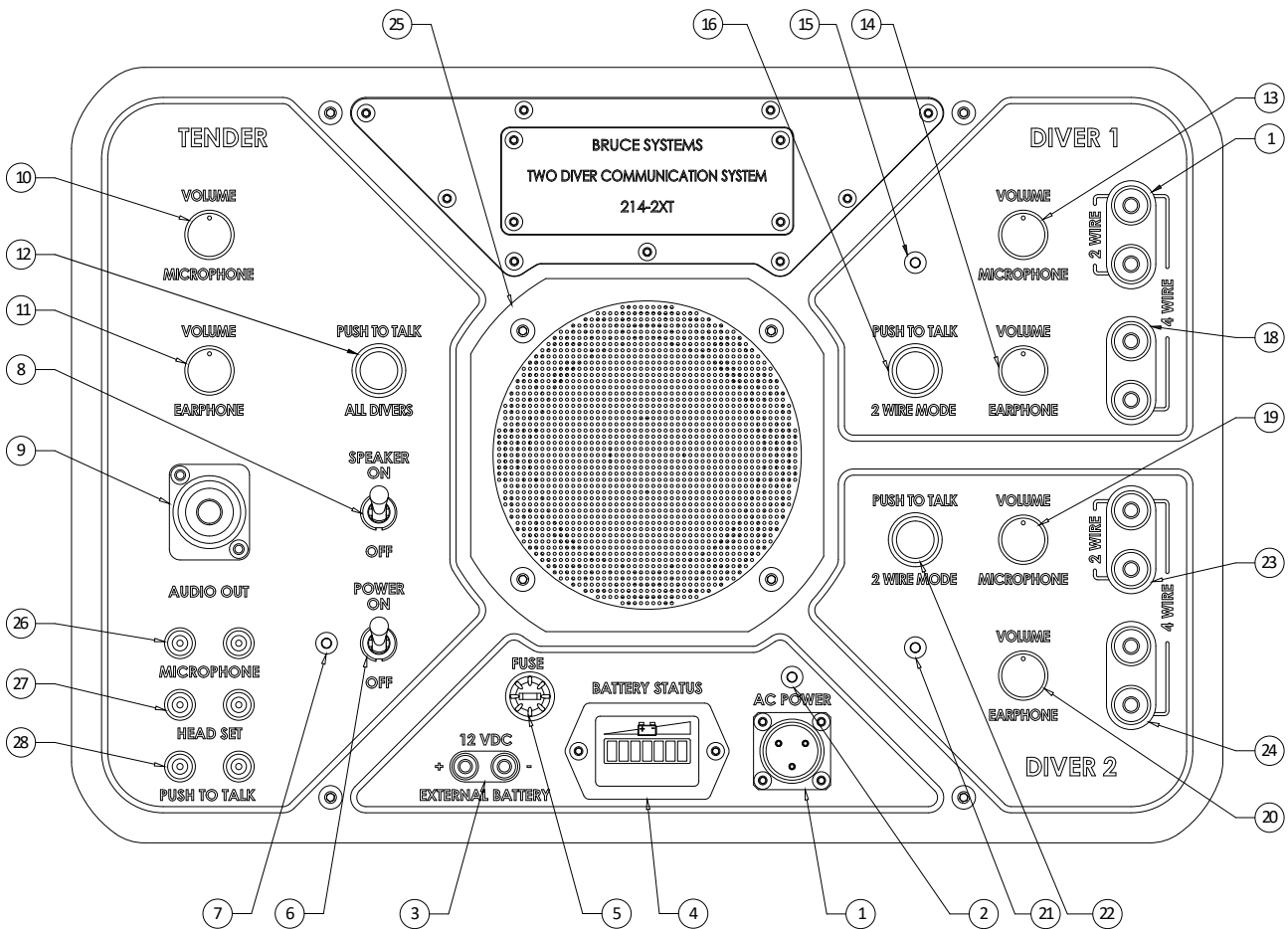


Fig.1 Front Panel Components

### 3.2 HALF DUPLEX MODE (2 WIRE)

Our unit can be used in the configuration with two-wire mode even if nowadays the international standard uses 4-wire systems in *Full Duplex* which guarantees a more secure system.

Often when the 2-wire mode is used it is because the Diver Umbilical does not have 4 wires or because one of the 4 wires is damaged and when to overcome the problem and not stop the operations, it is necessary to use the 2-wire mode by mode by putting the microphone in parallel with the headphones.

In the two-wire configuration, the Umbilical banana plug is connected to the corresponding two-wire connection on the Unit panel (Diver # 1 Mic - Diver # 2 Mic).

Using this configuration, it is possible to speak separately to each Divers. If you need to talk to all the Divers at the same time, you can use the dedicated PTT in the Tender section. The unit is equipped with a loudspeaker that allows listening to the diver (s). If you want to use headphones, the loudspeaker can be silenced by using the dedicated switch. Remember that in 2-wire mode when headphones with microphone are used it is still necessary to use PTT.

When the Tender uses the PTT the signal of the Diver (s) is interrupted, and the primary communication becomes that of the Tender. In the meantime, if the diver is speaking, the Tender will not be able to hear him unless the PTT button is released.

Refer to Fig. 2 where the connections of the Diver (s) are shown

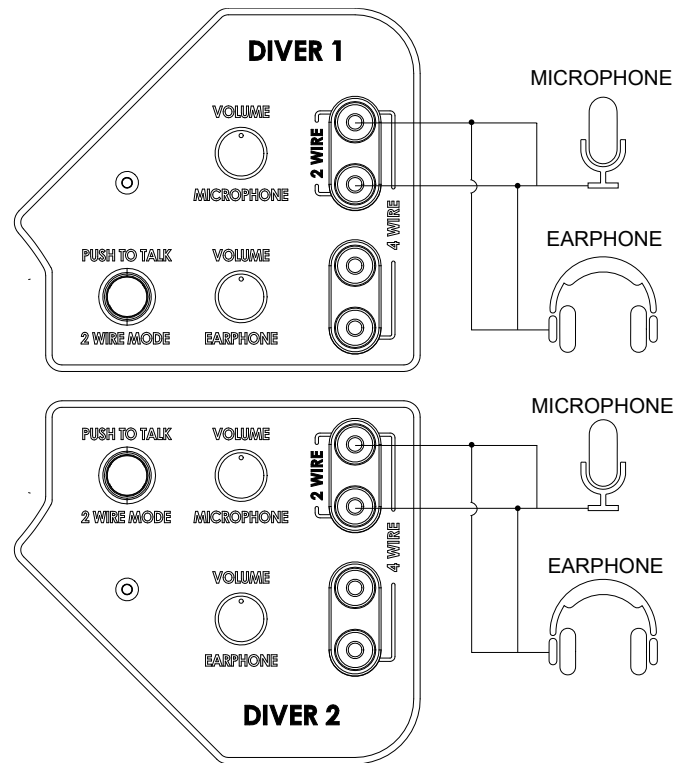


Fig.2 Half Duplex Mode (2 Wire)

**Note:** Always check how the microphone and headphones of your helmet and/or full- face mask is wired.



### 3.3 FULL DUPLEX MODE (4 WIRE)

The 4-wire communication mode allows you to have the ability to speak simultaneously between Tender and Diver (s) and/or between Diver (s).

To allow this type of communication it is necessary to have the Umbilical (s) of the diver (s) equipped with 4 wires. The helmets and/or the full-face mask must have separate wiring headphones and microphones to overcome problems of disturbances caused by returns signals.

Refer to Fig. 3 where the connections of the Diver (s) are shown

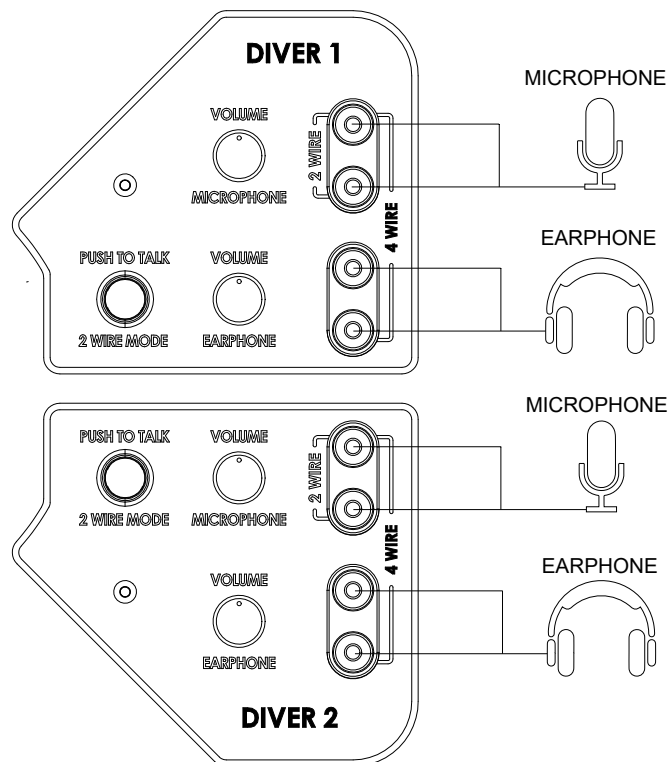


Fig.3 Full Duplex Mode (4 Wire)

**Note:** Always check how the microphone and headphones of your helmet and/or full- face mask is wired.

## 4 UNIT ACCESS

The Bruce Systems Communications Model 214-2XX are contained in a protective case that guarantees damage from shocks and splashes of water, preventing the electronics from being damaged. In order to guarantee this type of protection we have created a watertight system both on the front of the control panel and in the base area of the case where the 4 aluminum feet are present.

To access the electronics contained inside, it is necessary to remove the 4 stainless steel socket screws present under the aluminum feet. (see Fig. 4) If you wish to access the internal part for any reason, carefully follow the instructions below in the Foot Removal chapter.

#### 4.1 FOOT REMOVAL AND ACCESS

There are two ways of accessing the electronic part; the first is through the use of the support base (MSB-01 “Maintenance Support Base”) dedicated to opening the unit and the second way is to use long screws to facilitate the opening of the unit itself and the removal of the protective case.

In both cases we need the following tools in order to open/closed the unit:

- 4 mm Allen key
- Slotted screwdriver
- Silicon Greases



##### **Case 1 using MSB:**

Use the maintenance support base to facilitate the opening of the unit and its maintenance. This base can be purchased on our website and/or requested directly from your local reseller.

Follow the below sequence:

- Keep the case lid closed.
- Place the case sideways.
- Remove the 4 screws located under the feet of the protective case using the 4 mm Allen key.
- Remove the 4 aluminum feet by levering with the tip of the Allen key.
- Make sure that the flat gaskets have come off with the feet otherwise use the screwdriver to remove them taking care not to damage the plastic and the gaskets themselves.
- Now place the whole unit on the 4 pins which must enter the holes under the feet.
- Now open the lid of the case.
- By exerting a slight pressure on the edge of the case (with the lid open) it will slide down to the end of the pins themselves, thus allowing the technician to easily lift the inner part with two hands.
- Once the unit has been extracted, you can place it on your workbench.
- Now you can remove the case from the MSB and reposition the internal assembly unit on the 4 posts of the base itself. In this way you will have a raised support to perform other operations if necessary.

**Case 2 Using long screw:**

Use the 4 longer screw to facilitate the opening of the unit and its maintenance. Get 4 M6 screws with a length of at least 70 mm.

Follow the below sequence:

- Keep the case lid closed.
- Place the case sideways.
- Remove the 4 screws located under the feet of the protective case using the 4 mm Allen key.
- Remove the 4 aluminum feet by levering with the tip of the Allen key.
- Make sure that the flat gaskets have come off with the feet otherwise use the screwdriver to remove them taking care not to damage the plastic and the gaskets themselves.
- Install the 4 screws with a length of at least 70 mm.
- Place the case on the 4 screws head.
- Now open the lid of the case.
- By exerting a slight pressure on the edge of the case (with the lid open) it will slide down to the end of the screws themselves, thus allowing the technician to easily lift the inner part with two hands.
- Taking care not to damage the unit, now place it on its side.
- Remove the 4 longer screws.
- Now remove the unit by holding the edge of the aluminum front plate with two hands while vertically removing it from the case and placing it on the workbench.

**4.2 BATTERY**

The unit is equipped with 2 lead batteries. this is to allow weight balancing and above all to have the possibility of having a redundant system that in the event of damage to a battery can remain in operation, giving the Tender/Supervisor the possibility to intervene. There are two battery compartments located on the side of the unit. To remove the batteries, you will need to get a 2.5mm Allen key.

After loosening the two screws, slightly slide the fixing plate on the battery and lift it to open the compartment. Now you can disconnect the two wires from the battery and remove it. Repeat the operation for the other battery.

## 5 FRONT PANEL BATTERY MONITOR

The unit is equipped with a synoptic system dedicated to providing information regarding the state of charge of the batteries.



The battery fuel gauge is displayed in 10 bars, and respectively represent the different battery capacity in the battery, step down from right to left.

When the battery power is different the indicator shows a different status. When the battery power is in a certain gear position:

- a) The single display will light up the corresponding LED light, and the other LED lights are off.
- b) The multiscreen display will light up the LED lights from the 1<sup>st</sup> LED bar to the corresponding LED bar, and the color of the LED light will vary according to the battery power condition.

Note: Regular model and SR model LED strips are different in color, The regular model LED shows that the first light bar from left to right is red, the 2-3th light bar is yellow, and the others are green; and the SR model LED display is all red.

Multi-screen display (Regular Model):

LED BAR	Display Status	Battery Capacity
BAR 1	Red	Battery voltage has been discharged to 90% of their capacity.
BAR 1-2	1 red 1 yellow	Battery voltage has been discharged to 80% of their capacity.
BAR 1-3	1 red 2 yellow	Battery voltage has been discharged to 70% of their capacity.
BAR 1-4	1 red 2 yellow 1 green	Battery voltage has been discharged to 60% of their capacity.
BAR 1-5	1 red 2 yellow 2 green	Battery voltage has been discharged to 50% of their capacity.
BAR 1-6	1 red 2 yellow 3 green	Battery voltage has been discharged to 40% of their capacity.
BAR 1-7	1 red 2 yellow 4 green	Battery voltage has been discharged to 30% of their capacity.
BAR 1-8	1 red 2 yellow 5 green	Battery voltage has been discharged to 20% of their capacity.
BAR 1-9	1 red 2 yellow 6 green	Battery voltage has been discharged to 10% of their capacity.
BAR 1-10	1 red 2 yellow 7 green	Battery capacity is full

**NOTE:** When the unit is not recharged for a long time, there may be a situation where the Monitoring System shows no signs of life. This is because the batteries are completely discharged and therefore it is necessary to recharge the unit for at least 8 consecutive hours. In case no sign of life please check the battery and replace.

## 6 WHAT INCLUDED

### 6.1 INCLUDED

The unit is supplied with the following items:

- Hand-held Push-to-Talk Microphone
- 2m of Europe Power Cable (CEE 7/7)
- Sealed Lead Acid Gel-Cell Rechargeable Battery (Ah depend on the Unit you have bought)

## 7 TROUBLE SHOOTING

### Field Check Porcedures

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

### 4-WIRE CHECK (Full Duplex)

This brief procedure checks diver radio functions in Full Duplex: set all volume controls at mid-scale, turn unit on.

1. Identify headset microphone lead and headset earphone lead. Plug into dual banana jack adapters. (Usually the microphone plug is red.)
2. Plug in headset microphone to "Tender" "Microphone" (input) and headset earphone to "Tender" "Headset" (input/output). You should be able to hear yourself talk. This verifies tender circuit.
3. Move headset microphone to "Diver 1" "Microphone" (input) and headset earphones to "Diver 1" "Earphone" (output). You should be able to hear yourself talk. This verifies diver 1 circuit.
4. Move headset microphone to "Diver 2" "Microphone" (input) and headset earphones to "Diver 2" "Earphone" (output). You should be able to hear yourself talk. This verifies diver 2 circuit.

The basic Full Duplex function of the diver radio has now been checked.

### 2-WIRE CHECK (Half Duplex)

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

1. Identify headset microphone lead and headset earphone lead. Plug into dual banana jack adapters. (Usually the microphone plug is red.)
2. Plug headset earphone into "Tender" "Headset" (output) and the headset microphone into "Tender" "Microphone" (input). Turn power on, speaker off. Put on headset and speak into microphone, listening for your own voice. Adjust diver to tender volume, and check that controls respond and there is adequate volume. If you can talk to yourself, then tender circuit is operating properly.

## **PROBLEMS & POSSIBLE CAUSES**

### **Unit Does Not Operate**

Check to see that unit is turned on, (speaker and headset switch). Check that battery condition is ok, (battery condition indicator). Check to see that connections are proper, correct if necessary. Use diver radio field check procedure to determine if problem is within the unit or elsewhere within the communication system. Check to see that internal P.C. Card connectors are properly seated, there should be no gap between the bottom of the connector housing and the circuit card. Push connector down and recheck.

### **Low Volume**

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

### **Garbled Voice to Diver**

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

### **Garbled Voice to Tender**

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

### **Diver Cuts Out**

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

### **Connections**

Most diver communications problems are caused by bad connections. The time spent in making good connections will result in years of good communications. All connections must be soldered to last for any period of time. Copper wire must be tinned as a minimum, it is strongly suggested that dual banana plugs be used for topside connections. This provides a convenient and secure connection which will last for several years if treated with a reasonable amount of care.

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

### **Push to Talk Does Not Function But Tender Hears Diver (2 wire only)**

Check connection to tender headset microphone if used. Check battery condition indicator to be steady green. The first function to fail because of low batteries is the actuation of the push-to talk function. Find which push to talk switch is not working (PTT All Divers, PTT-Diver 1 & PTT-Diver 2). It could be a broken wire on the switch terminals or a bad connection with PC card.

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

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

**Feedback**

These situations may cause feedback, tender's speaker on while headset is connected, unused diver communications connected to system, damaged Comm. cable or connections, (open or shorted wires or connections). Feedback can be caused by leakage between microphone wires and earphone wires in the umbilical. Leakage can be determined by a continuity test between the wires. Resistance for a new cable should be in excess of 10 Meg ohms. In a situation where the Comm. cable is damaged, reduce volume to diver as low as possible (reduce side tone), or go to 2-wire operation until cable can be repaired.

**Distortion**

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

**Every 2 years:**

- Replace all the soft goods, seals, gaskets and batteries.

**8 DECLARATION****EU Declaration of conformity****Bruce Systems Srl**

Via San Michele degli Scalzi, 12

56124 – Pisa (ITALY)

Phone: +39 05861837643

e-mail: [info@bruce-systems.com](mailto:info@bruce-systems.com)

VAT: IT02363490505

**Declares that the product:****TWO-DIVER RECHARGEABLE PORTABLE COMMS UNIT****Model(s): 214-2STD / 214-2XTD**

To which this declaration relates is in conformity with 2009/125/EG-Eco Design Directive, 2011/65/E-RoHS2 Directive, 2014/35/EU-Low Voltage Directive, 2015/863/EU-Delegated Directive to amending Annex II of Directive (RoHS3)

**WEEE directive**

The use of this symbol on Bruce System products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic equipment (WEEE) to enable reuse or recycling. Correct disposal of this product will help to save valuable resources and prevent potential negative effects on the environment.

Signed for and on behalf of: **Bruce System Srl**

Place and date: Pisa, 01/09/2022

Name: David Marzi

Title: Founder &amp;CEO



## 9 WARRANTY

### 9.1 LIMITED WARRANTY

Bruce Systems srl, warrants that its products are free from defects in material and workmanship under normal use and service. literature covering this product, for a period of 1 year from date of shipment. Bruce Systems obligation under this warranty is limited to the repair of or replacement, at Bruce Systems option, of defective material. This warranty shall not cover defects, which are the result of misuse, negligence, accident, repair or alterations.

### 9.2 BATTERY WARRANTY

All the batteries are covered of 6 months of warranty

**NOTE:** A correct and constant recharging cycle can extend the life of the batteries. It is recommended to charge the unit at least twice a month. In case of long storage periods it is advisable to disconnect the batteries.

### 9.3 SERVICE POLICY

Bruce Systems srl encourages owners of equipment to call +39 0586 1837643 for assistance if problems are encountered. Every effort will be made to assist in solving your problem. Equipment which must be returned to the factory for repairs should be safely packaged, insured, and shipped prepaid to:

## Bruce Systems srl

Via di Nugola Vecchia, 41  
57014 – Collesalveti - LI (ITALY)  
Phone: +39 0586 1837643

Be sure to include the following information:

**Your Name**  
**Your Company**  
**Shipping address**  
**Phone Number**  
**Contact Name**

A short description of the problem is most helpful.

Valid in-warranty repairs will be made at no charge. Out-of-warranty repairs will be handled in the same fashion, except you will be advised of the repair charges before any work is done.