DIVELINK®

COM-HW-RM-2 Installation & Operation Manual

Table of Contents

INTRODUCTION 1
DIVER EAR-MIC HARNESS 2
DIVER MICROPHONE MPC-GUARDIAN 3
CONNECTION OF EAR-MIC HARNESS TO THE CABLE CAB-HW 3
EARPHONE CAPABILITIES AND PLACEMENT 4
DIVER MICROPHONE INSTALLATION TO FULL FACE MASK 7
SYSTEM BLOCK DIAGRAM 8
RACK EQUIPMENT FROM DIVELINK 9
REFERENCE DETAIL: SIGNAL PINOUTS OF XLR PLUGS 10
DL-SOUNDWEB SIGNAL PROCESSOR REAR PANEL: 11
Interconnectivity Detail: Signal Wiring: Soundweb and COM-HW-RM-2 12
Interconnectivity Detail: Signal Wiring: Soundweb and Public Address System 13
PROTOCOL SPECIFICATION 14
SOUNDWEB FIRMWARE 17
Functional Walk-Through 18
DIVELINK RACK EQUIPMENT 24
MAINTENANCE AND FACTORY SERVICE 25
OPERATION, INDICATORS, CONTROLS 27
SPARES 28
WARRANTY 29
Period and Coverage 29
Transferability 29
Limitations 29
DISCLAIMER 29
SERVICING 30
Contact Information 30
Warranty/Repair Conditions 30
Sending Procedure 30

Introduction

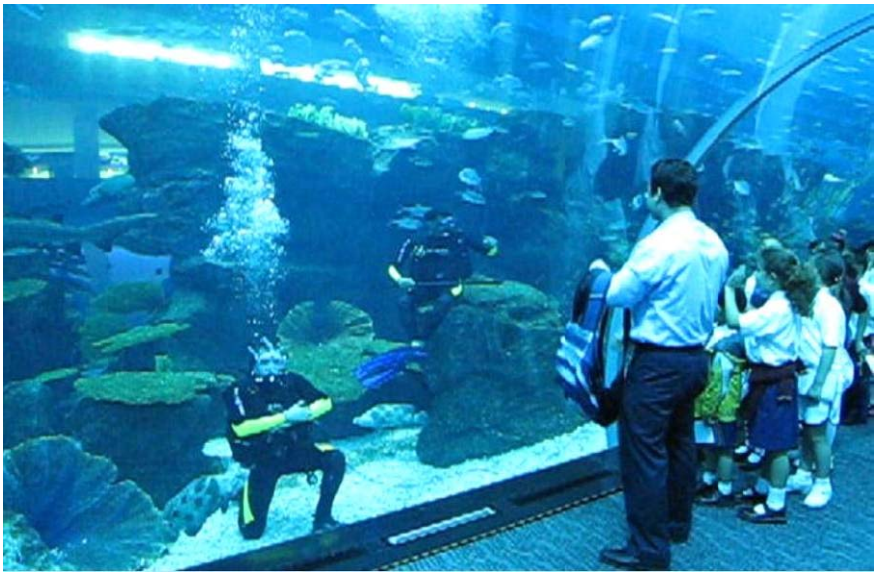
This document describes the electrical wiring and installation of the following rack mounted gear:

- DIVELINK HARDWIRE transceiver model **COM-HW-RM-2**.
- Interface Module model DL-SOUNDWEB that automatically operates the DIVELINK transceivers and delivers or accepts sound from the Venue Public Address system.

It also describes how the Interface Module mitigates sound from the PA and in so doing automatically engages the DIVELINK system.

By way of summary, the whole premise of operation is based on an announcer speaking to the divers in the large aquarium. This is done typically by means of a microphone and earphone that is hard-wired to the diver. The isolated feed (no other audio mixed in with it) is sent to the Interface Module from the Public Address Audio Mixer. This is a DUPLEX SYSTEM. The Diver hears the announcer at all times. When the announcer speaks, the diver in the tank hears the announcer with waterproof earphones. When the announcer stops speaking, then Interface Module sends the diver transmissions to the Public Address System.

Using the above method, the process of the general public communicating with divers as seen in a tank becomes a reality. Some regular training will be necessary to cause a diver to enunciate clearly underwater, and also to make sure the announcer allows enough silence for the system to respond with audio from the diver.



Outside of the times of public performance, divers are required to maintain or train inside the aquarium. During these times, the dive staff have the ability to MUTE diver audio to the audience. This is done at the DIVELINK rack located in the venue sound room.

Local speech to and from the diver is available at the rack using a hand-held microphone. As divers enter the water, typically an equipment check is performed with the PA system feed disabled. This is done to ensure that all SCUBA gear is fully functional before going live before an audience and is part of the venue's training and performance protocol.

The remainder of this manual is devoted to the actual install wiring, maintenance procedures and operation.

Diver EAR-MIC Harness

This Harness has connections for the diver microphone MPC-xxx and the hardwire cable CAB-HW.

EAR-MIC-NOPTT Harness with two velcro holders EAR-HOLDER-1 covering the earphones to locate them between full face mask straps over the ears.

Typical Full Face Mask (Interspiro AGA)

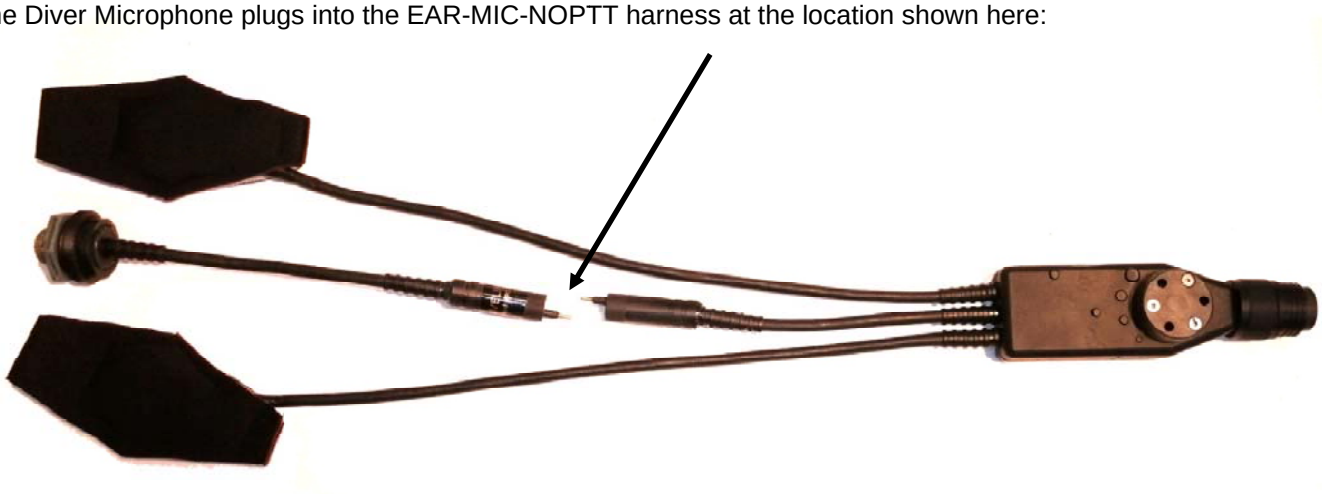
Microphones to suit Full Face Mask Brands

MPC-AGA to match Interspiro AGA Divator
MPC-DRAGER to match Drager Full Face Mask
MPC-EXO to match Kirby Morgan EXO Full Face Mask
MPC-GUARDIAN for Guardian Full Face Mask
MPC-KM48 to match Kirby Morgan Super Mask M48
MPC-MANTIS to match Mantis Full Face Mask
MPC-POSIEDON to match Posiedon Full Face Mask
MPC-REEF to match Ocean Reef Neptune Nira Full Face Mask
MPC-SCUBAPRO to match Scubapro Full Face Mask

Diver microphones may be ordered as spares, or to suit other full face masks, or for sanitary reasons to allow divers to use their own full face masks.

Diver Microphone MPC-GUARDIAN

The Diver Microphone plugs into the EAR-MIC-NOPTT harness at the location shown here:

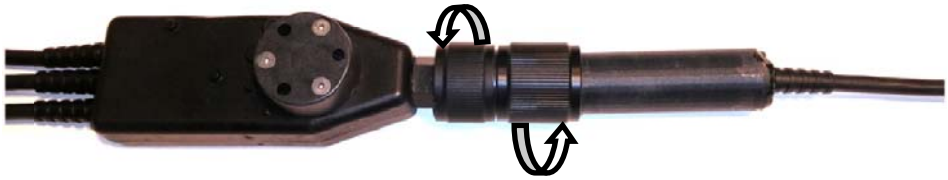


A very light coating of silicone grease such as DOW Corning DC-4 should be wiped into the socket and onto pin rubber. This will prevent wear. Align the two pins with the sockets and plug fully together.

Connection of EAR-MIC Harness to the cable CAB-HW

Pull back the captivating shell on the EAR-MIC housing. A very light coating of silicone grease such as DOW Corning DC-4 should be wiped into the sockets and onto pin rubber. This will prevent wear.

Align the 5 pins of the cable with the 5 sockets. Press together so that there is no gap in the connection area.

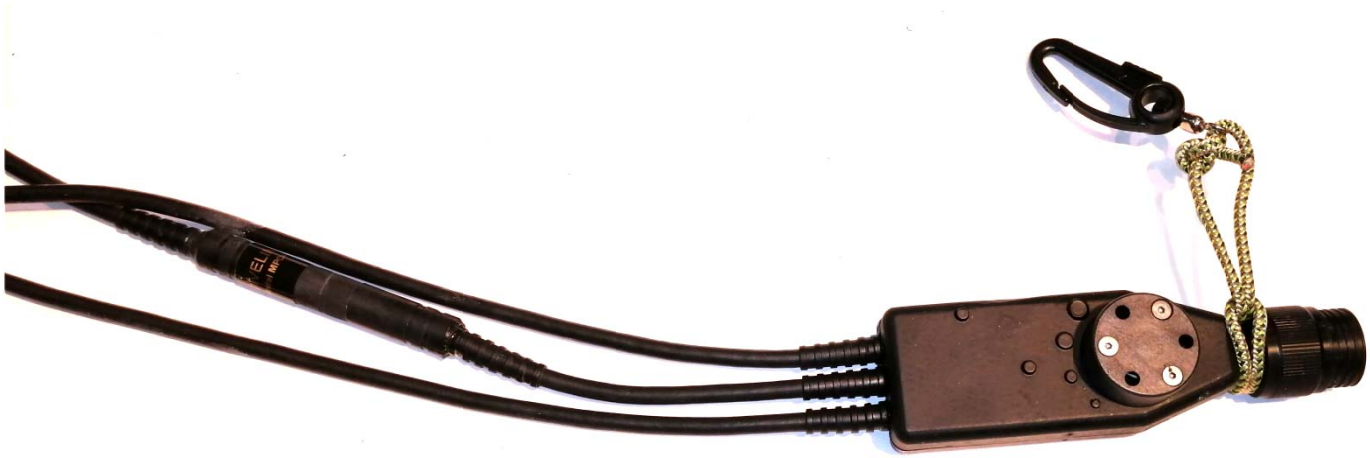


Rotate the shells into each other to allow full captivation, until resistance is felt there and is a very small gap remaining between them. *(Note: Cable CAB-HW has a Kevlar strength member to allow for robust use in an aquarium. The kevlar is anchored inside the handle on each cable end*.)

Anchor the EAR-MIC and CAB-HW to the BC or Weight Belt

There is a part also supplied with the EAR-MIC-NOPTT that will assist with anchoring the intercom CAB-HW cable to the diver. This is important as tugging on the earphone or microphone components due to tension on the intercom cable while swimming is not beneficial as the diver will continually attempt to manage the cable tension.

The DIVELINK part number SNAP-01-ROPE nylon snap hook and rope supplied with the EAR-MIC-NOPTT will secure the EAR-MIC-NOPTT and the connected CAB-HW-X cable. To do this the diver should attach the snap hook onto a buoyancy compensator D-Ring or weight belt fastening point.



The rope is secured as shown above to the EAR-MIC-NOPTT connector collar, and the hook snapped onto a D-Ring or other fastening point in a location on or slightly above the diver's waist. Alternative fastening methods are at the discretion of the diver or dive-master to ensure so that the cable is secured to the diver, including tucking the CAB-HW under the weight belt. Regardless of the attachment method, the CAB-HW has a Kevlar® central strength member to ensure that all conductors internal to the cable do not break down due to tension and high use in a commercial environment.

Part "SNAP-01-ROPE" may be re-ordered as a replacement or a spare part. The rope has a knot called a "sheep bend" to create a circle from an 18" length. The rope is attached as shown above to the EAR-MIC-NOPTT connector collar.

SNAP-01-ROPE

Earphone Capabilities and Placement

Earphones are manufactured with a solid rubber compound, and are pressure compensated. This means depth is not an issue as both sides of the earphone have equal pressure during diver descent in the water column.

The concave shape prevents damage from impact on the top or on the side of the round earphone. Internal metal reinforcement prevents damage by twisting stress.

> Important! When listening underwater the diver must equalize the ears to maximize hearing.

Lycra Hood

Earphones may be placed over the ear canal, the mastoid or cheek bone. Ideally they should be placed inside a dive hood for easy adjustment. In warm waters a **Lycra hood** may be used for this purpose.

Over Ear Canal

On the Mastoid Bone

On the Cheek Bone

Alternately the earphone holders (supplied) locate earphones between the full face mask straps over the ear canal.

The straps on a typical full face mask are used to mount the earphone over each ear, using the part EAR-HOLDER-1 which has both a pocket to install the earphone inside, and locations for the full face mask straps to be captivated.

Instructions to mount the earphones with the earphone holders:

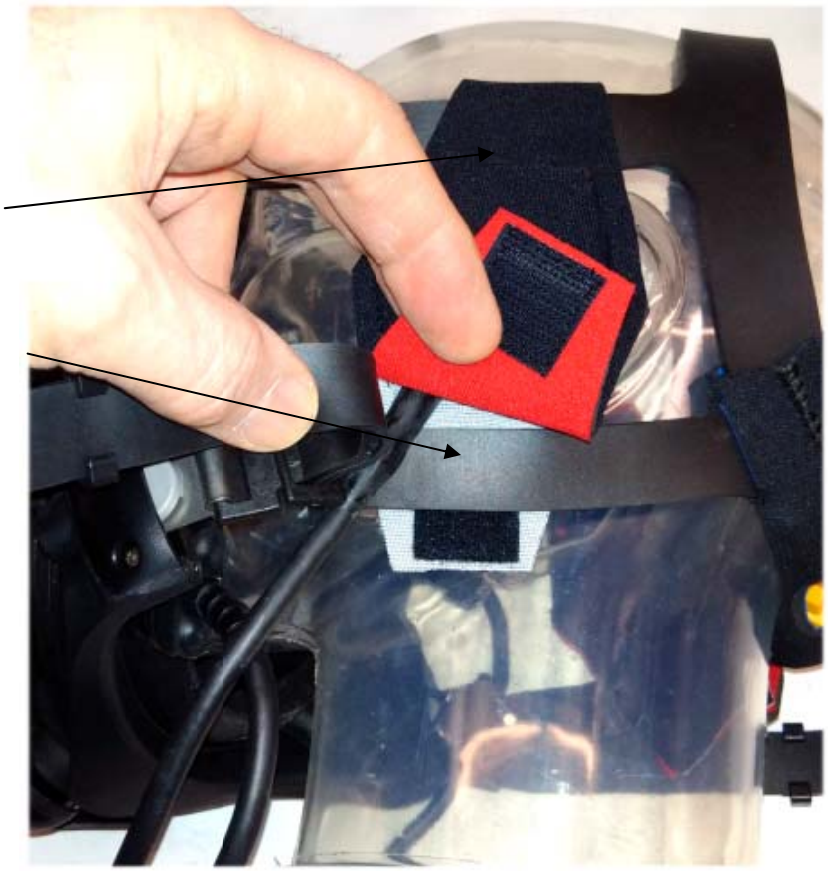
There are two earphones and two earphone holders. The procedure is the same for both sides of the head.

Insert the upper strap into the upper channel of the earphone holder, then re-attach strap to the mask buckle.

Insert the earphone into the holder.

Capture the lower strap and the earphone cable with the lower flaps of the earphone holder.

Press together the Velcro® tabs.



Earphone Holder Between Straps

Diver Microphone Installation to Full Face Mask

(Guardian Full Face Mask)

Remove the microphone port blank from the full face mask. Save for later in the face mask bag.

Disassemble the MPC-GUARDIAN. There are three fastening parts:

Install the O-Ring onto the microphone, past the threads and on to the groove behind the microphone flange.

Install the microphone with the O-Ring on it from INSIDE the mask.

Put the Washer over the microphone threads with the Washer groove facing the Mask.

Put the Nut up to the threads rotate clockwise until snug against the washer.

Tighten the nut as much as possible by hand so that the mask rubber is fully captivated.

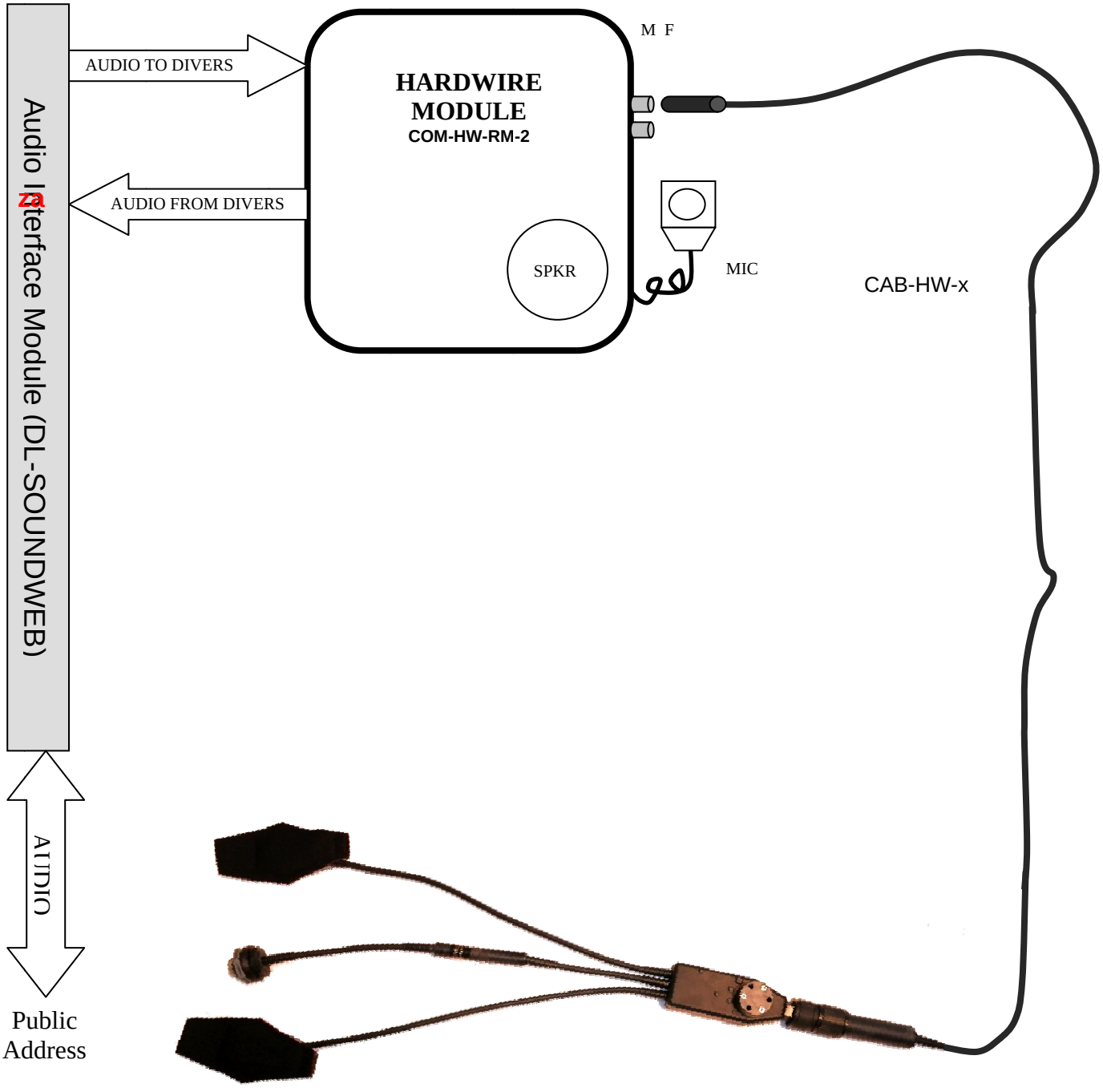
Use as much pressure as possible by holding the microphone flange inside the mask and tightening the nut from the outside.

The result will be a watertight and secure microphone installation.

Ensure that the port has been fastened together by testing that the whole microphone does not rotate in the rubber hole, but instead is firmly grabbing the rubber mask. Do this by grabbing the nut and twisting it clockwise. The microphone should not rotate inside the rubber mask port.

Ensure that the rubber is completely air tight around the microphone port as this is a life-support pathway.

System Block Diagram



Rack Equipment from DIVELINK

This installation places the COM-HW-RM Hardwire unit in a remote rack close to the aquarium pool.

<u>At the same location</u> an Audio Interface Module is also required, which provides spectral equalization and noise reduction of diver transmission sound back to the PA.

The Audio Interface Module is engineered to equalize, route audio signal pathways, and mute audio according to a programmed response to audio stimulus.

The Audio Interface Module is Soundweb® BSS Audio BLU-50 that is delivered complete with programming. It is also field programmable and permanent, meaning there are no front panel controls that may be changed inadvertently by a novice over the years.

DL-SOUNDWEB

Re-programming may be accomplished with a portable PC running an application. The design involves gain, mixing, compression, equalization and gating (ducking).

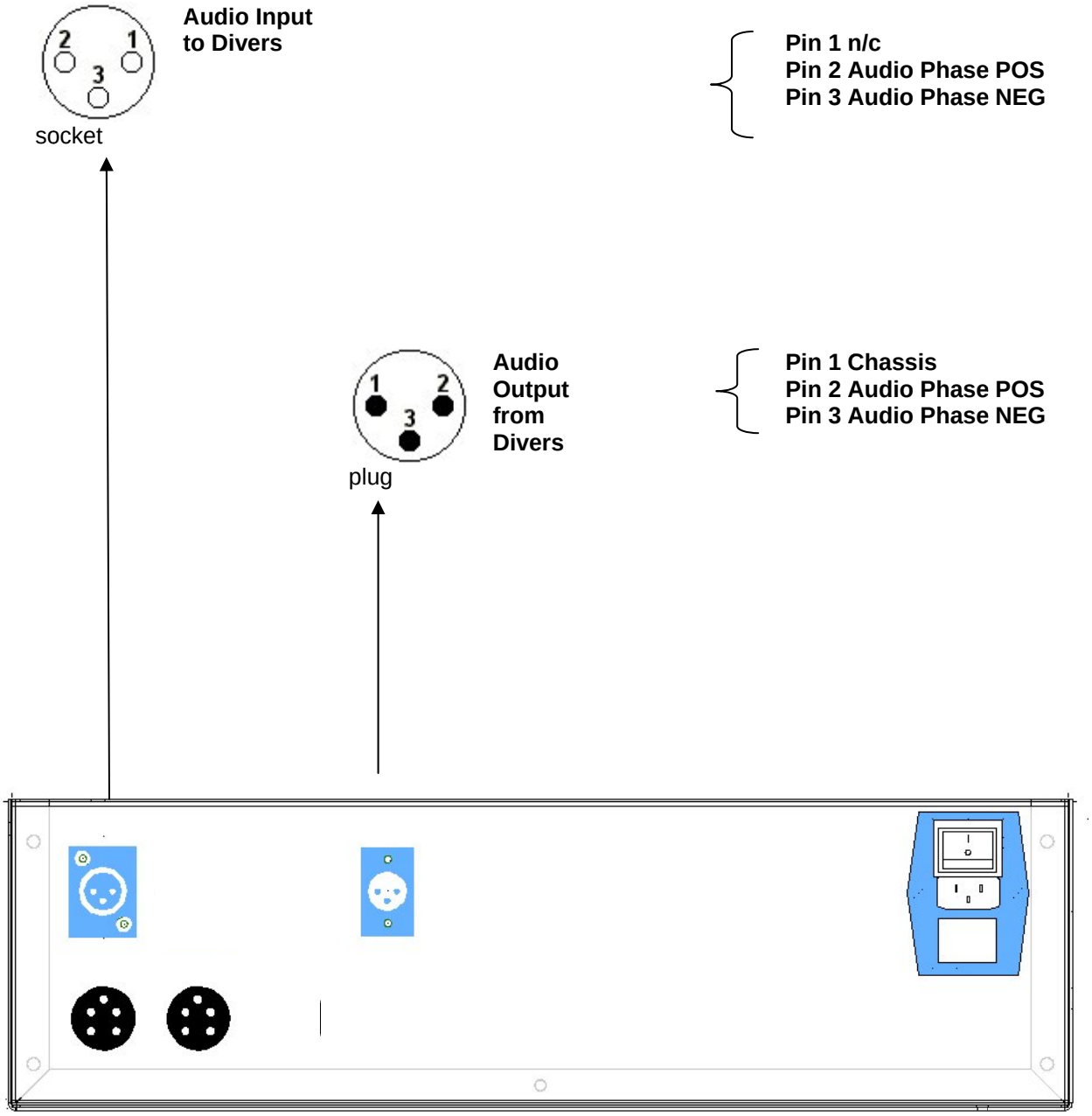
Rear View of DL-SOUNDWEB which is a pre-programmed BSS Audio BLU-50

The I/O labeled “DL” connects via XLR plugs to the COM-HW-RM Hardwire unit in the immediate rack space vicinity (XLR plugs included with shipment).

The I/O labeled VENUE connects long run line level audio cable to the PA system main audio rack room.

Reference Detail: Signal Pinouts of XLR PLUGS

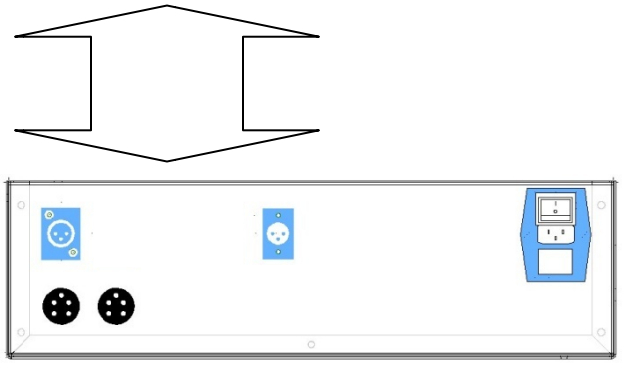
On the rear of COM-HW-RM-2 Unit



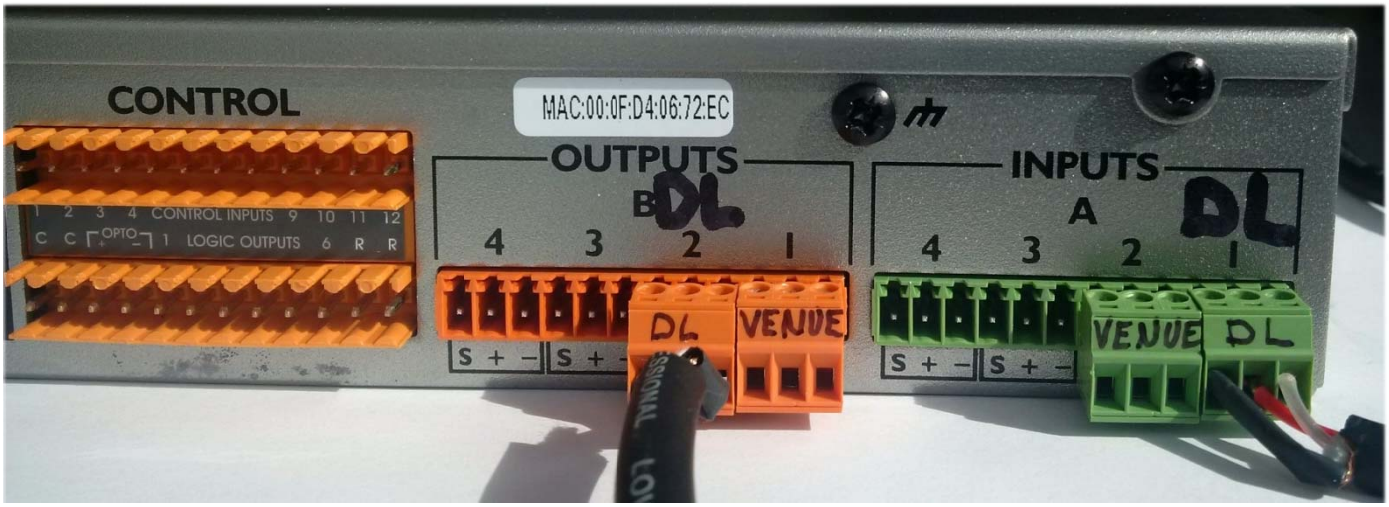
Rear View of COM-HW-RM-2

DL-SOUNDWEB Signal Processor REAR PANEL:

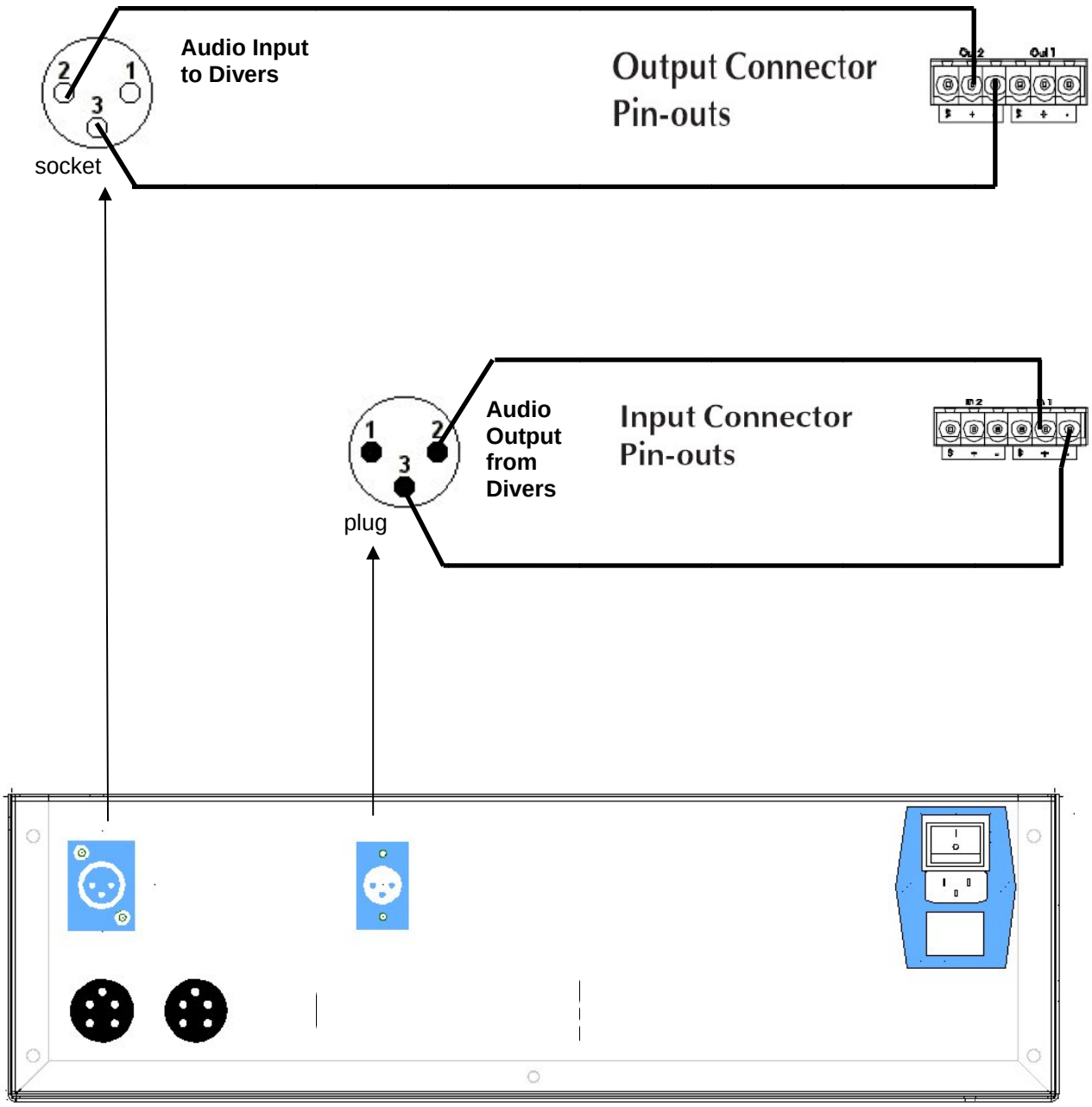
COM-HW-RM-2 interfaces with Audio IN/OUT connections of the Soundweb Signal Processor.



Rear of COM-HW-RM-2 Hardwire Rack Mount Surface Unit



Interconnectivity Detail: Signal Wiring: Soundweb and COM-HW-RM-2



Rear View of COM-HW-RM-2 Unit

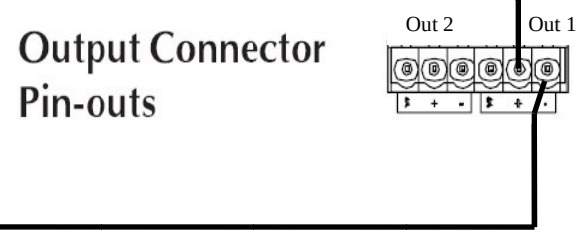
The above wiring connects the HARDWIRE diver's audio input to Soundweb channel 2 output and diver's audio output to Soundweb channel 1 input. (Cables are supplied with delivery)

Interconnectivity Detail: Signal Wiring: Soundweb and Public Address System

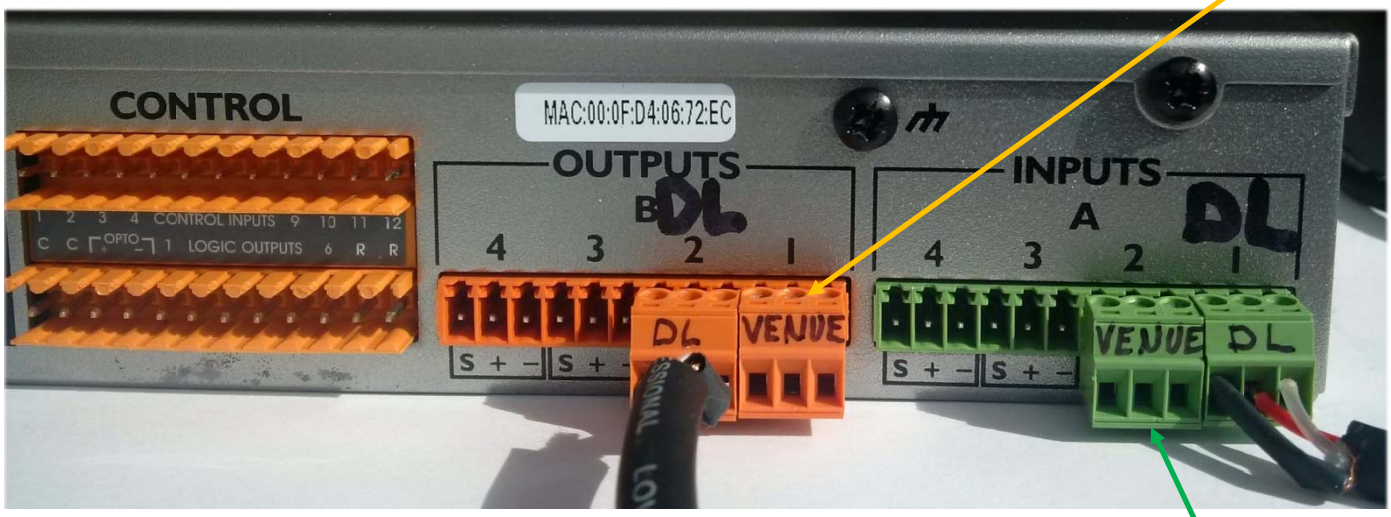
To Public Address System Mixer fader XLR pin 2 +

This is a 0 dB balanced audio line level signal

To Public Address System Mixer fader XLR pin 3 -



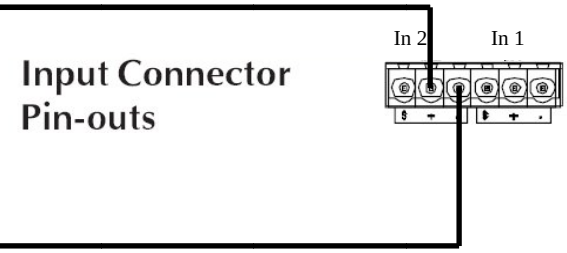
"VENUE"



From Public Address System DIRECT OUT XLR pin 2 +

This is a 0 dB balanced audio line level signal from the channel containing the WIRELESS MICROPHONE.

From Public Address System DIRECT OUT XLR pin 3 -



"VENUE"

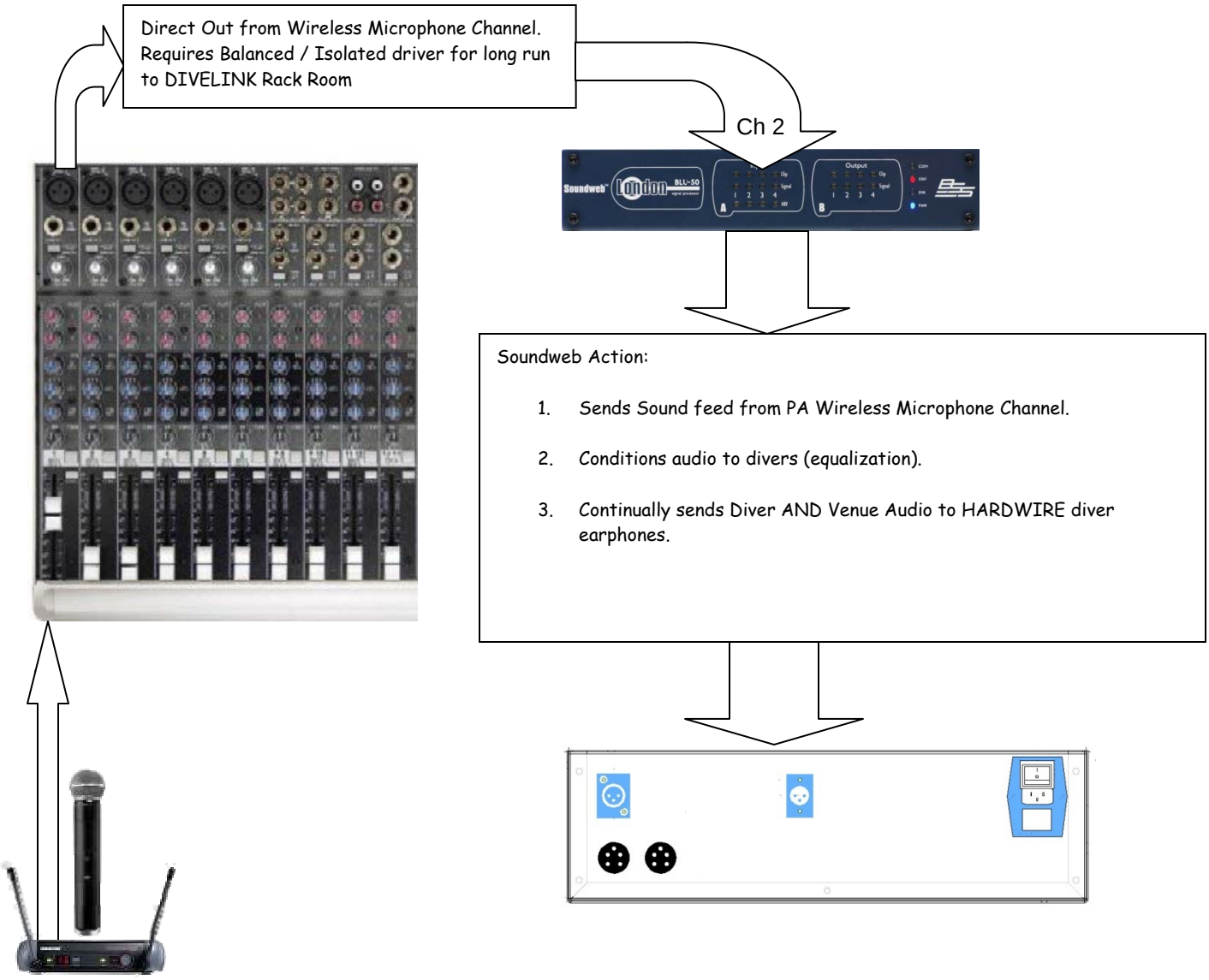
<u>This wiring is performed by an installer at the venue.</u>

PROTOCOL SPECIFICATION

Channel 1 output of the Soundweb Signal Processor is used to route audio from the diver to the Venue PA mixer. Channel 2 output is used to route audio from the Venue PA mixer to the diver.

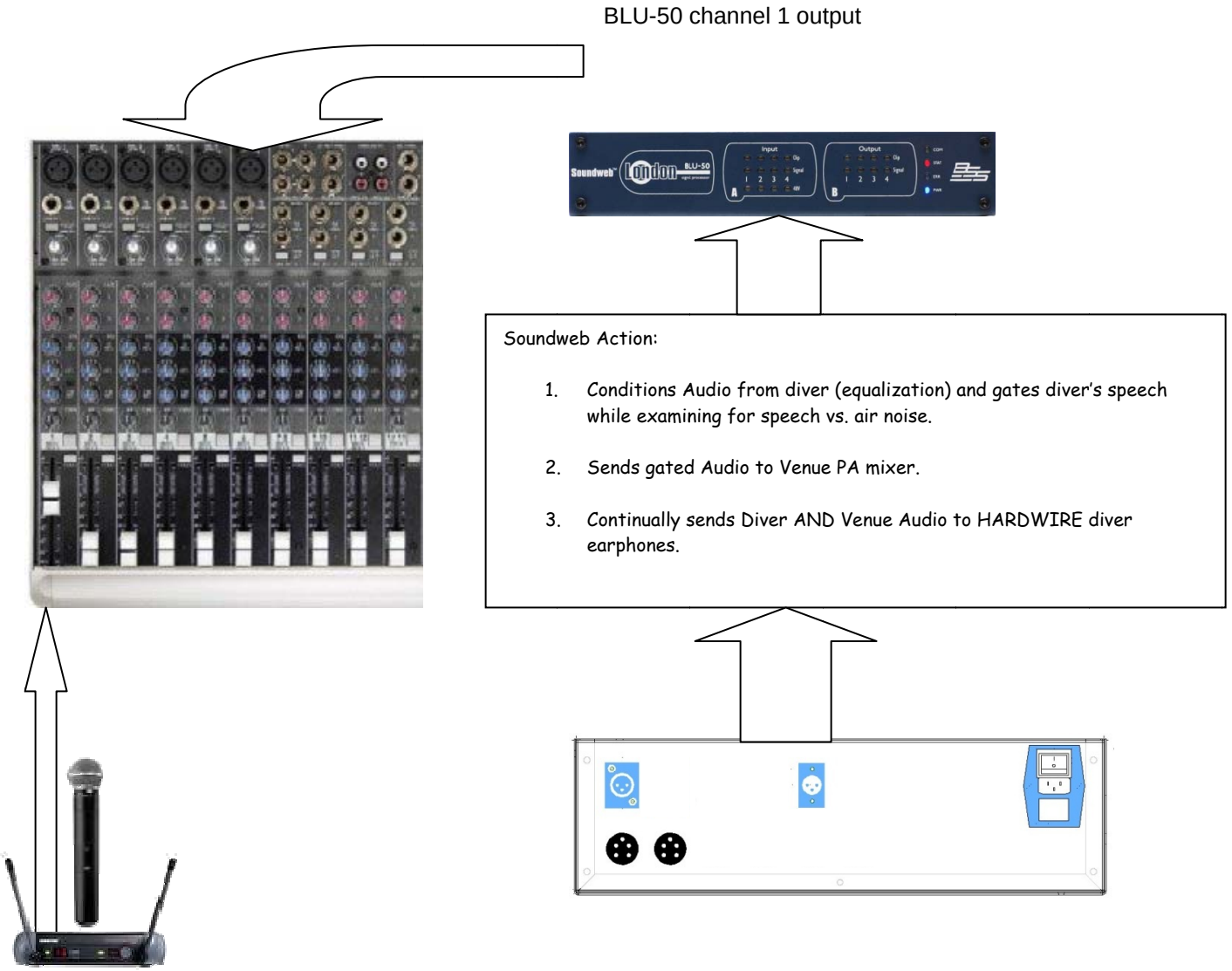
Protocol 1: **Announcer Speaks to Diver(s).**

Announcer on WIRELESS MICROPHONE speaks and in doing so is also heard by the divers. Announcer Audio is routed to the PA however a DIRECT OUT from the AUDIO CONSOLE is also fed to the SOUNDWEB Input #2 for distribution to the DIVELINK HARDWIRE Rack Unit.

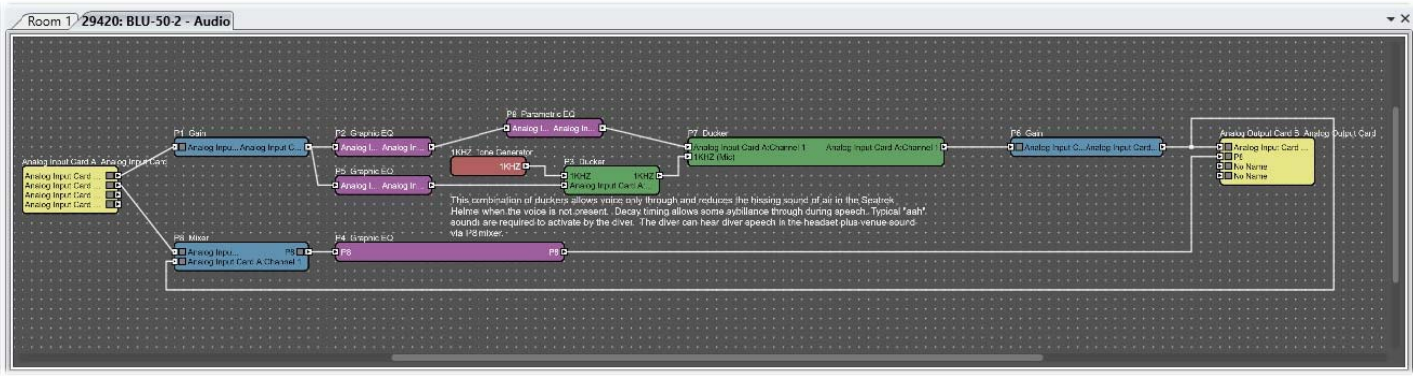


Protocol 2: Diver begins talking on HARDWIRE.

Diver Audio from HARDWIRE is sent to the Public Address System.



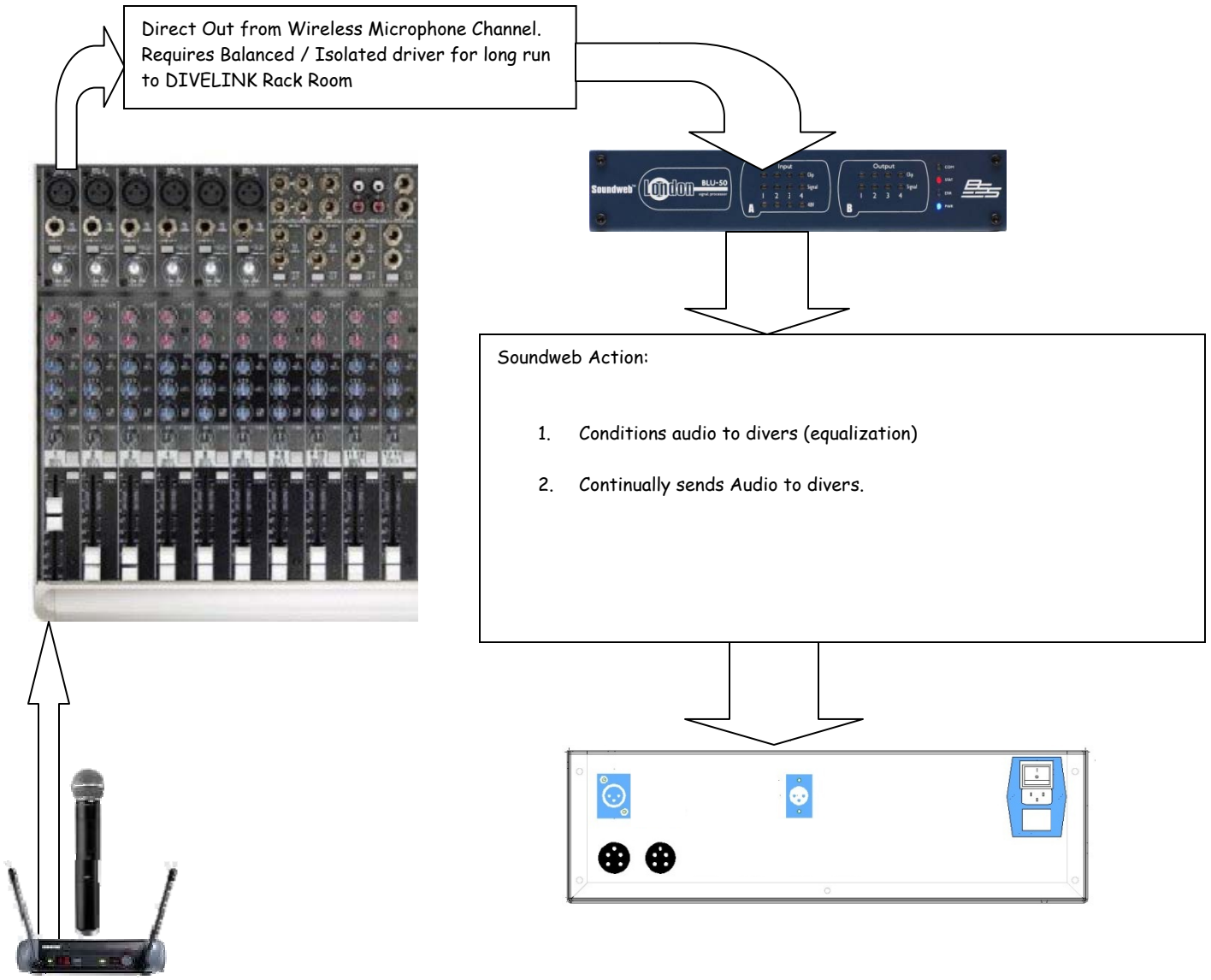
The soundweb also returns the diver audio to the diver earphone via channel 2 so that the diver may hear when speech is being triggered.



Protocol 3: Announcer Interrupts Diver.

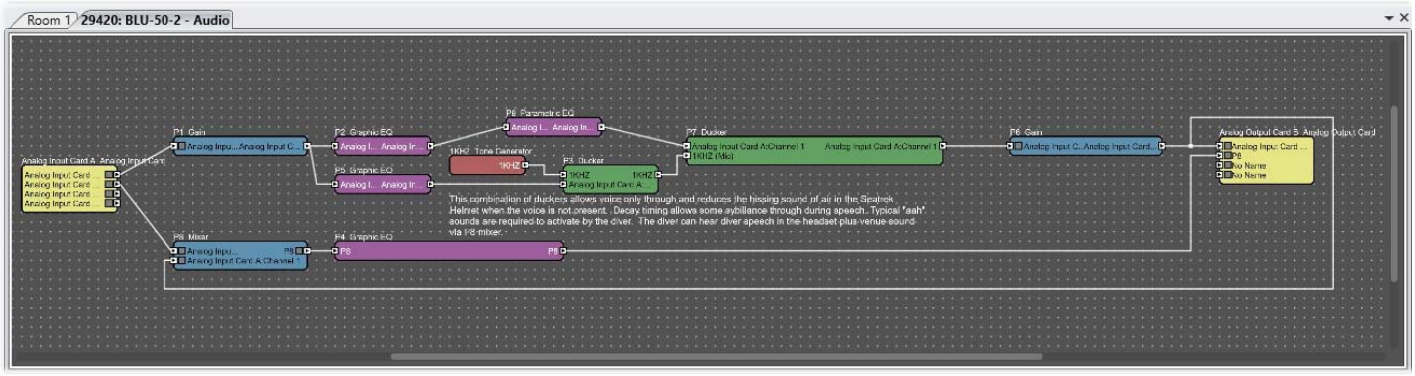
Announcer on PA WIRELESS MICROPHONE speaks at the same time that a diver is speaking. The Soundweb will continue to provide audio to the diver, via output 2 of the soundweb.
This protocol is is similar to protocol 1, except that

1. If the HARDWIRE diver is speaking then the diver WILL hear the announcer while the diver continues to speak. Audio engineers may increase the volume to the diver manually or in the soundweb firmware to overcome bubble noise.

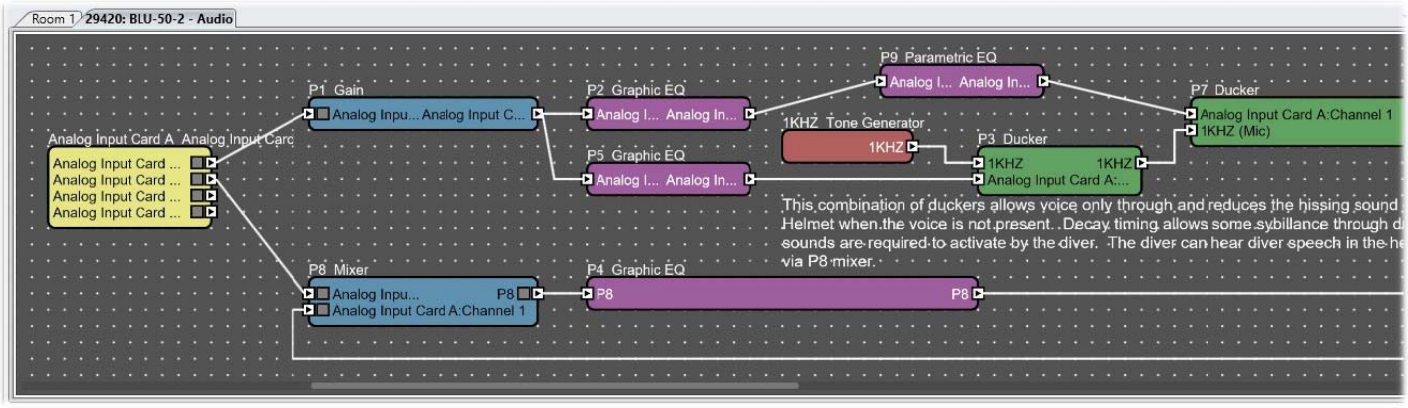


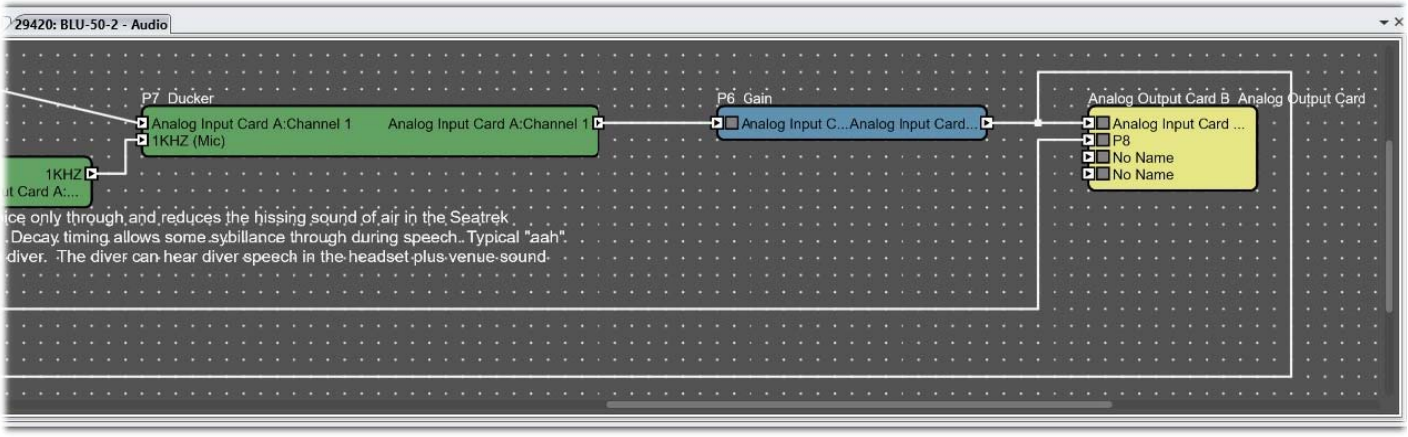
Soundweb Firmware

The general block diagram is as follows:

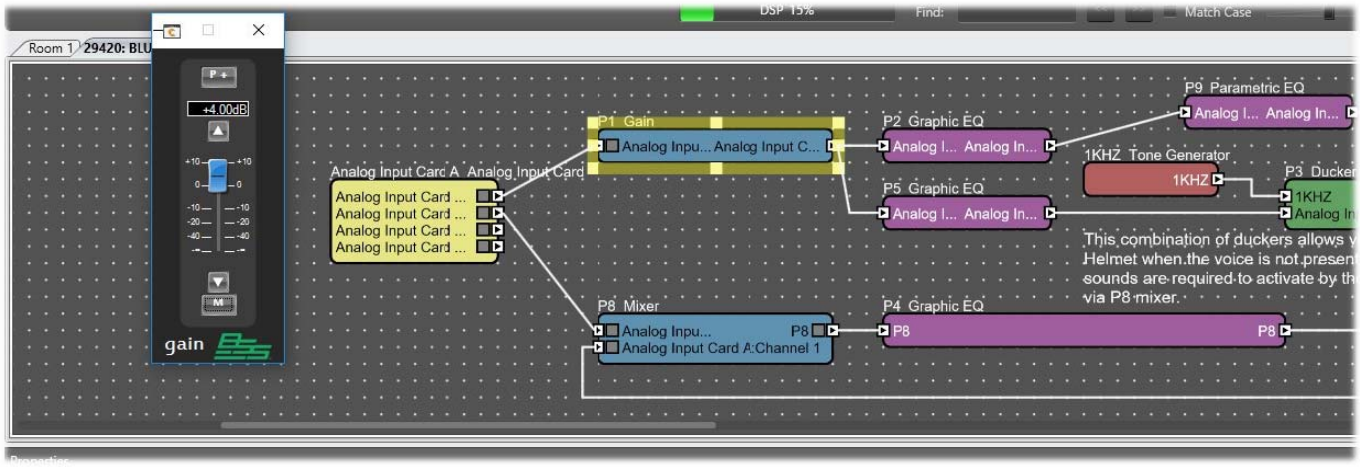


For clarity the screen is re-produced here





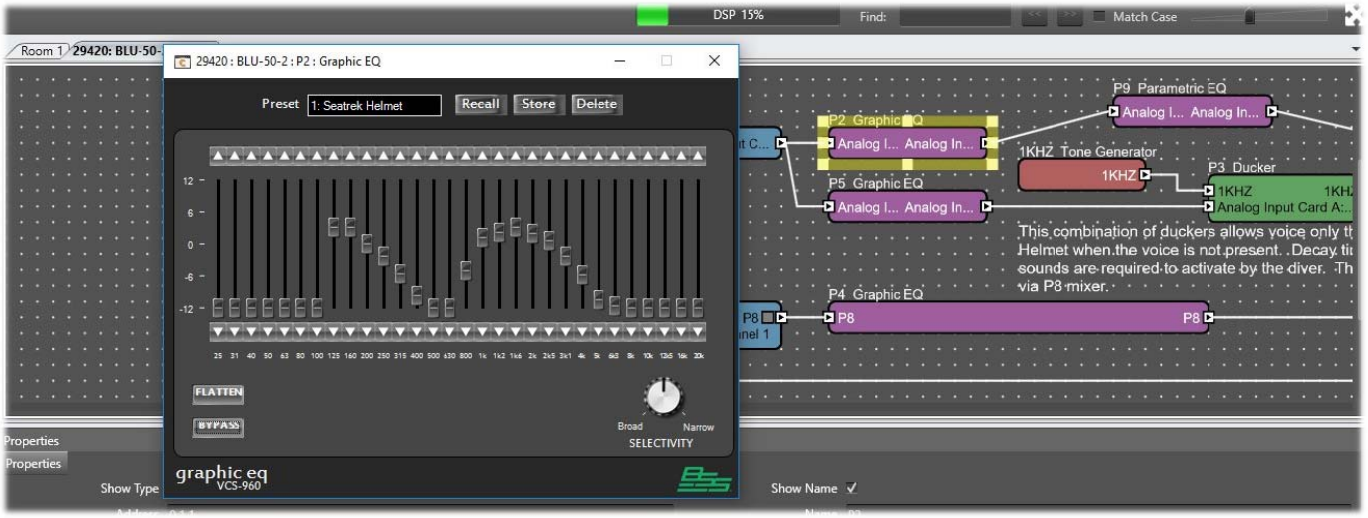
Functional Walk-Through



Analog inputs are:

1. From COM-HW-RM-2 diver audio output. This will route through the DSP to output 1 then on to the VENUE.
2. From VENUE audio. This will route through the DSP to output 2 then on to the COM-HW-RM-2 diver audio input.

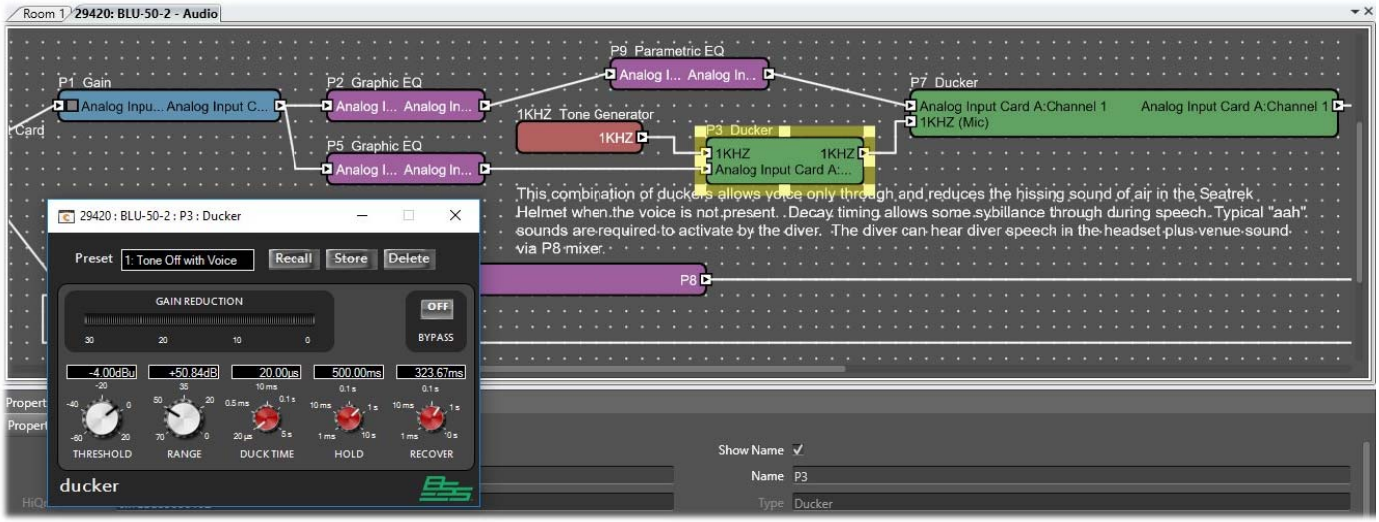
The P1 Gain stage allows some pregain for the diver's speech (illustrated above). Some boost may be necessary during installation.



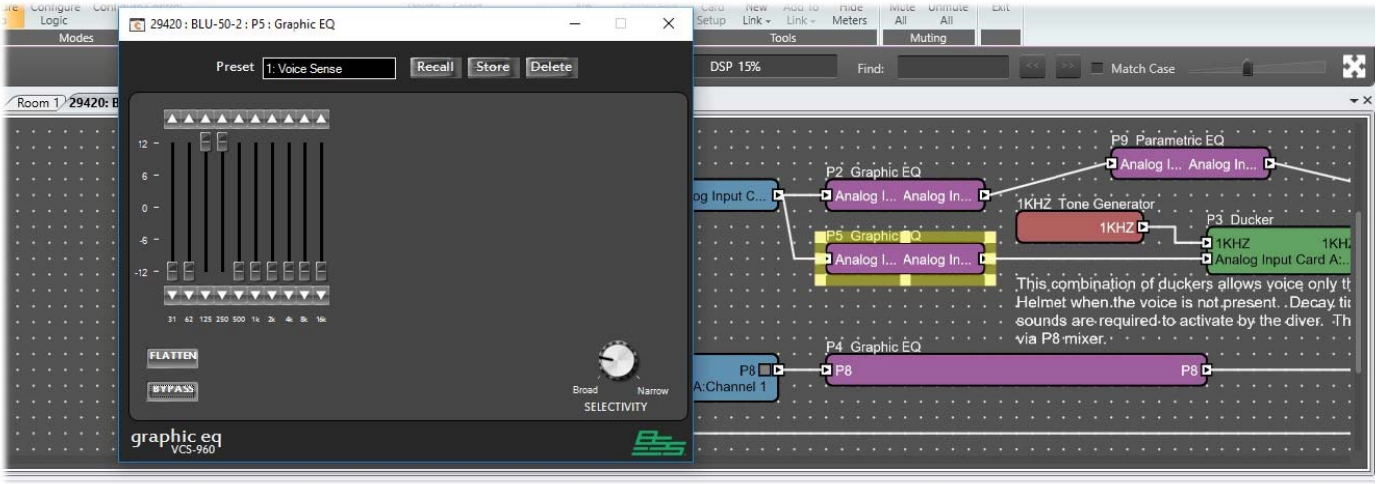
P1 feeds **P2 which is a graphics Equalizer**, and this is intended to boost BASS in the helmet, reduce bubble noise in the unused portion of the voice spectrum (400-800 Hz) and reduce hissing noise above 4KHz.

Sound engineers are encouraged to adjust this spectrum for best speech quality over the Venue PA. The general settings above serve as a guide based on past experience at DIVELINK. Bass may need to be boosted further to suit venue sound.

Now for the advanced stuff. A ducker is activated by sound only. We need the opposite of a ducker, meaning sound being passed when VOICE comes through but blanking hissing and bubble noise. This is done by using TWO duckers. **The first ducker P3 mutes a constant sound input which is in the form of a tone generator**. The tone generator is set to 1000 Hz.

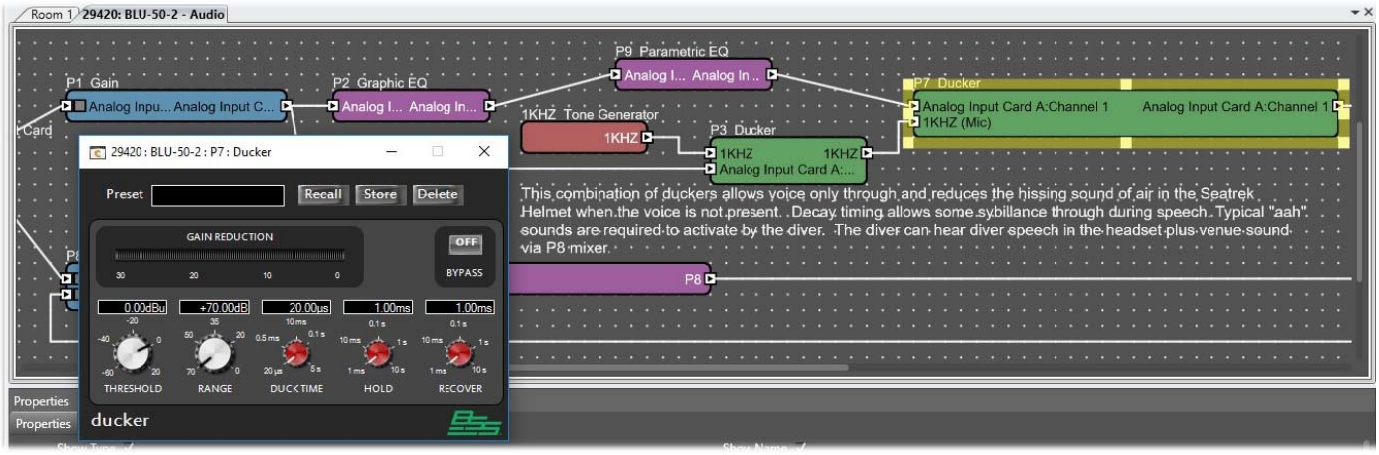


The P3 ducker is activated by the ***fundamental frequencies ONLY of the diver's voice***. **These voice frequencies are fed from a graphics equalizer P5 which gates the tone OFF with ducker P3**:

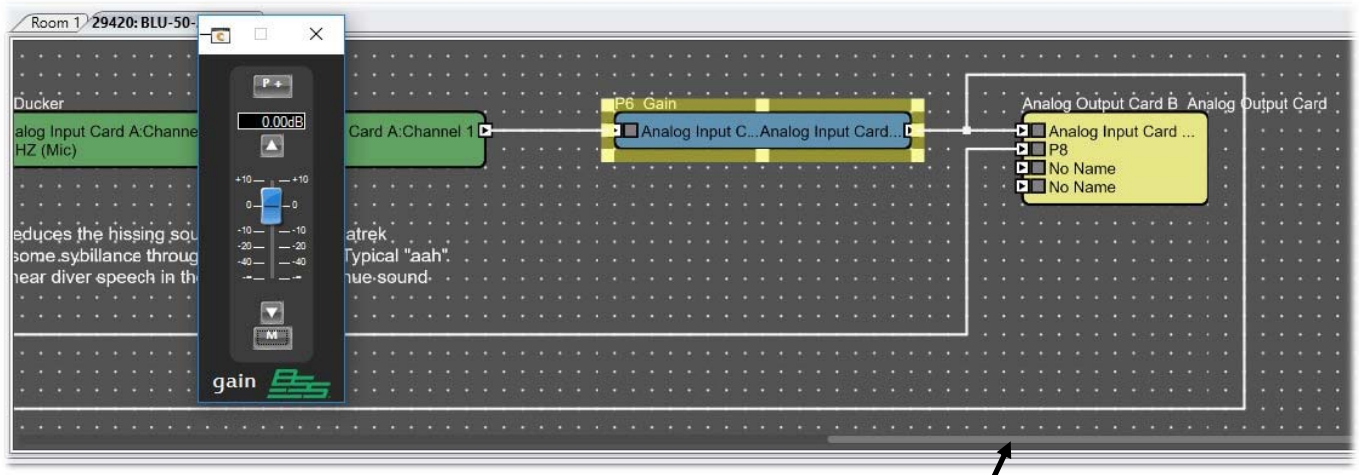


Sound engineers are encouraged to adjust this spectrum for best speech activation over the Venue PA. The general settings above serve as a guide based on past experience at DIVELINK.

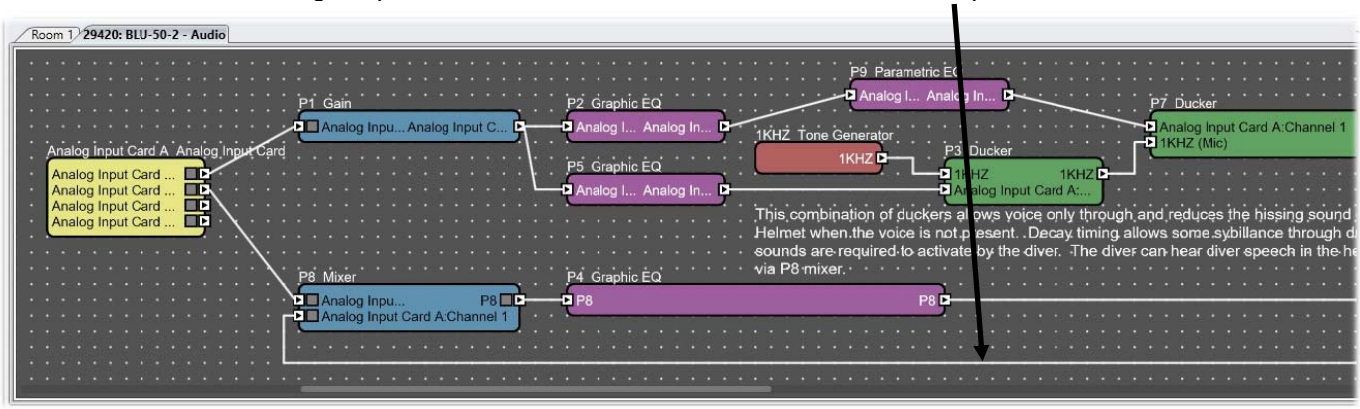
The action of the second ducker P7 will take the 1KHz tone on the "MIC" input and when it disappears (when the diver is talking) then audio is permitted through P7. Note that the 1KHz tone is programmed NOT to continue through ducker P7.



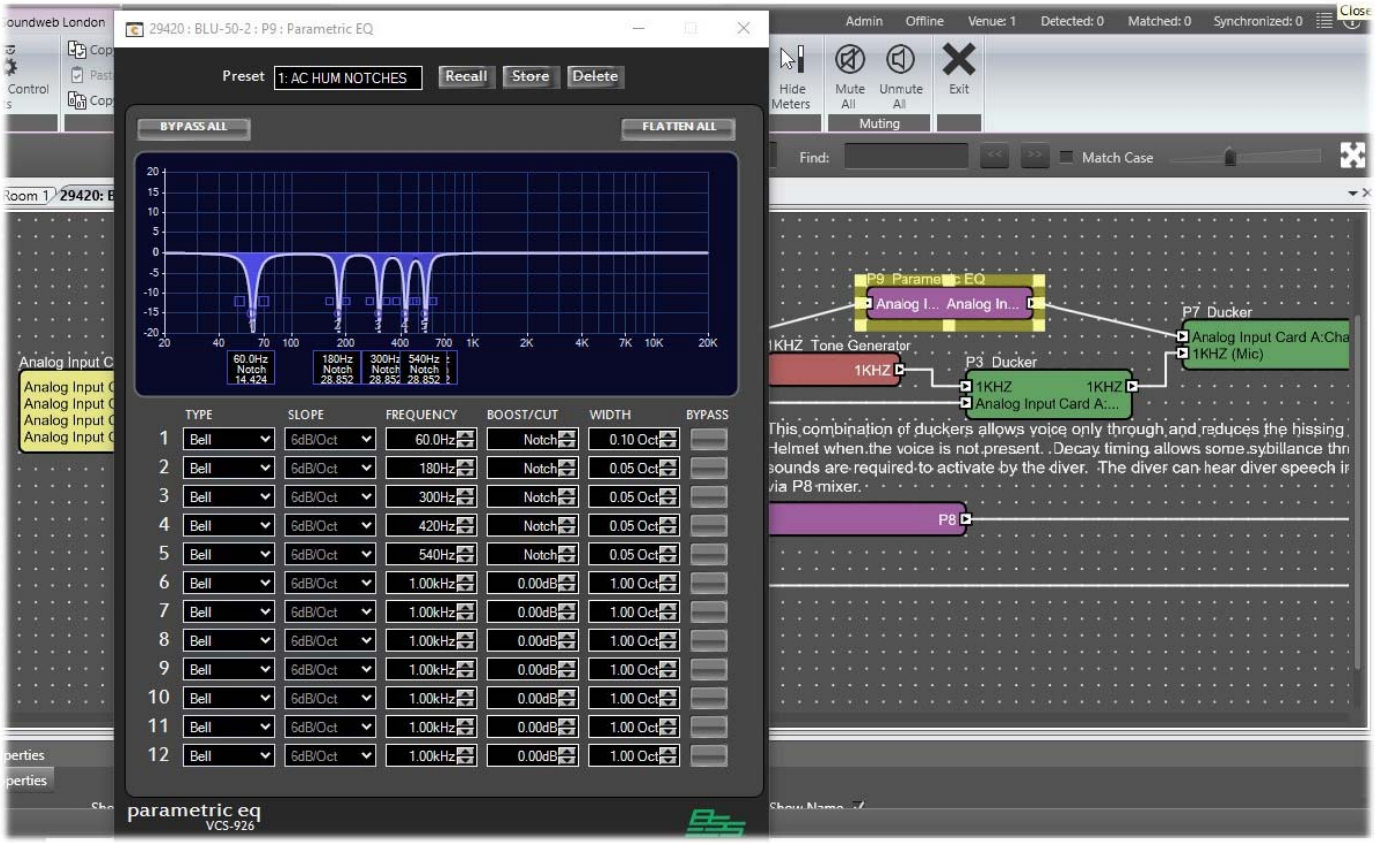
After the P7 ducker the diver's audio continues on to another gain element P6, then on to output channel 1:

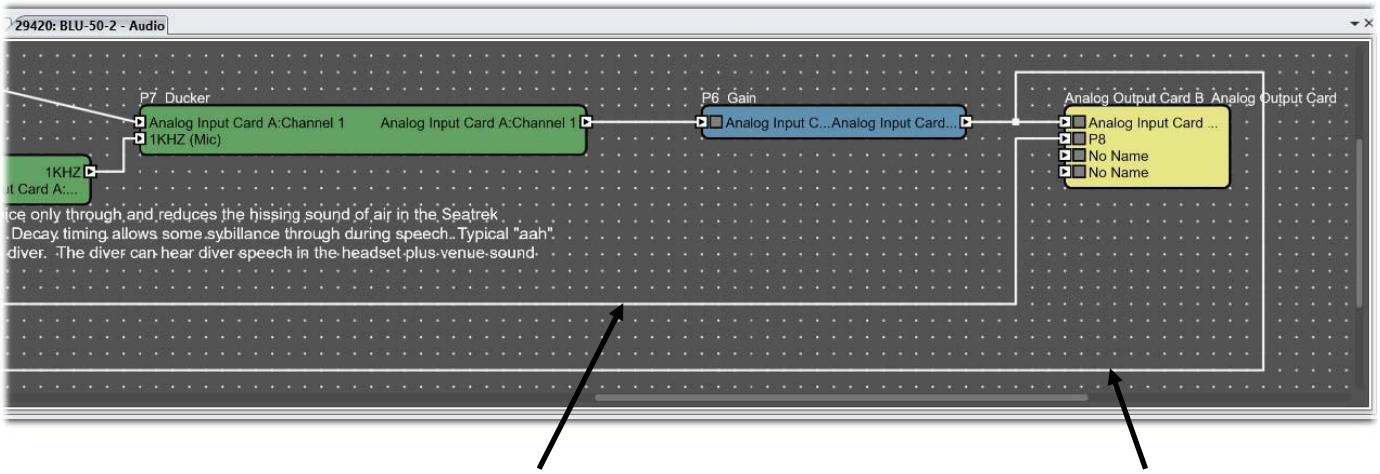


Note that the audio at Analog Output channel 1 is also routed back to the diver's earphone.

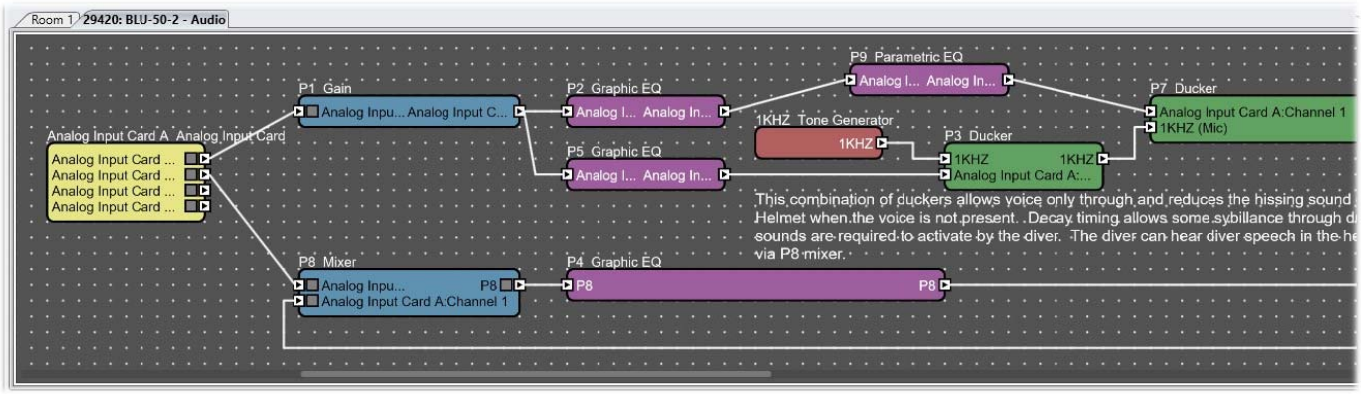


As a measure of precaution, in the case that AC hum is being introduced on the microphone circuit, notch filters have been added. This may not be used (bypassed) but element P9 is available for further audio adjustment:

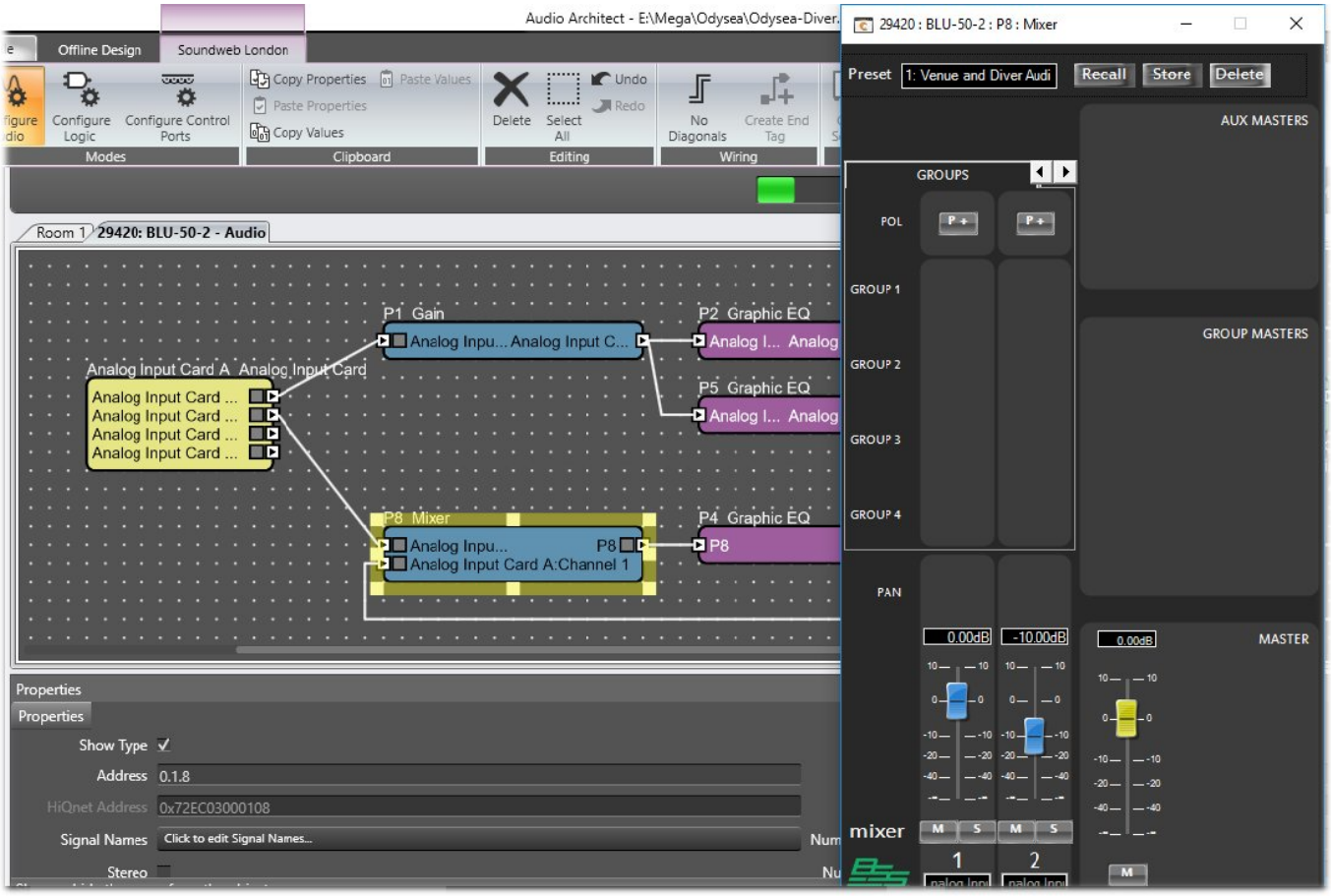




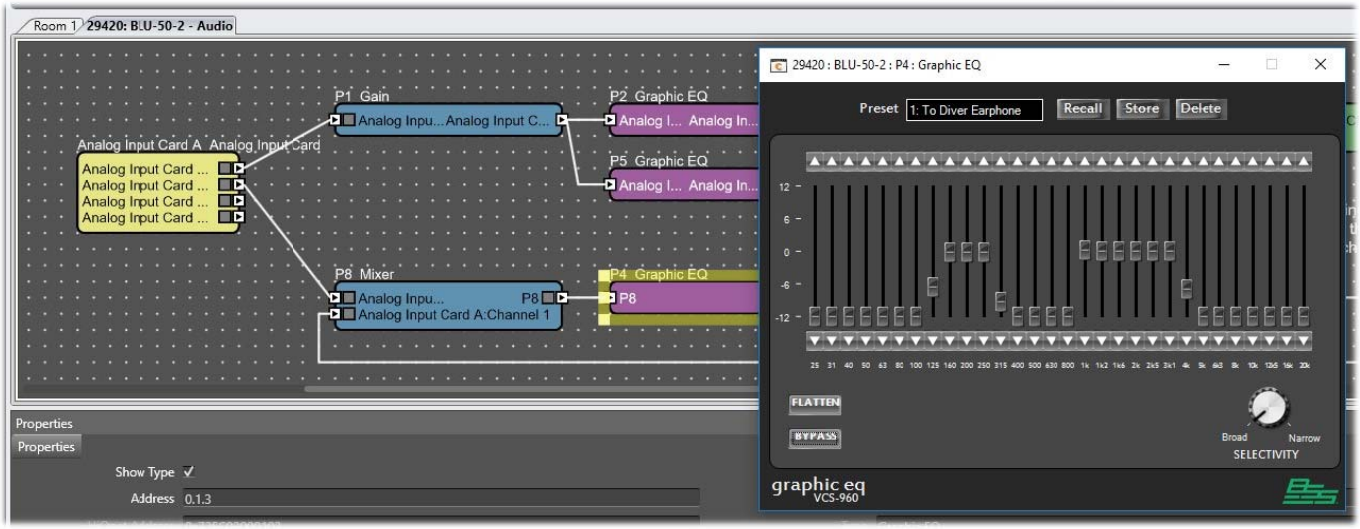
The diver will receive venue audio from the DSP channel 2. Audio is also folded back from the channel 1 feed to the venue, so that the diver may hear his own speech though his earphones.



Venue audio is presented to the diver on Analog Input #2. **Mixer element P8 will mix both venue audio and diver foldback audio**.



A Graphic Equalizer P4 element is added to equalize venue audio to provide best sound for the AUDIOFLOOD earphones.



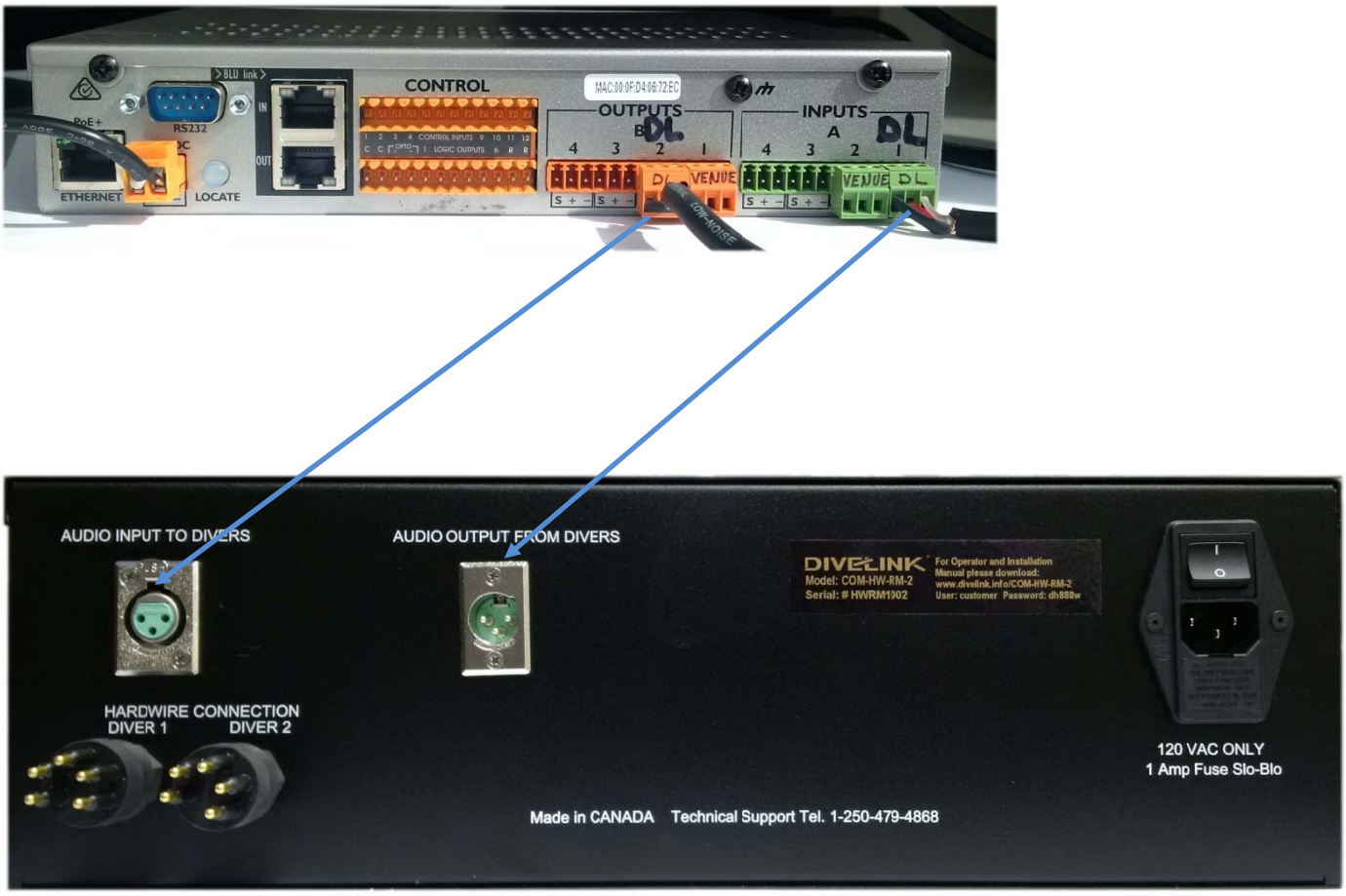
These values may also be experimented with to provide appropriate audio to the diver.

DIVELINK Rack Equipment

- Install the COM-HW-RM-2 Hardwire Unit into a rack.
- Connect the power cord that came with the product.

- Install the DL-SOUNDWEB DSP into the rack also.
- Connect power supply that came with the product.

- At the rear of the unit connect the audio cables from DL-SOUNDWEB to COM-HW-RM-2:



Connections to the Venue P.A. system from the DL-SOUNDWEB are the responsibility of the Audio Installation Technicians.

Maintenance and Factory Service

There is no particular maintenance necessary after the initial installation of the rack unit except for the following:

All hardwire connections will need lubrication with Dow-Corning DC4 or equivalent silicone grease. This is necessary to prevent abrasion of the rubber parts during connection and disconnection. Silicone grease should be applied after cleaning all grit, fibers and hair off the pin and sockets. The grease should then be applied to the rubber parts only of the connector pins. A light coating only is required. Do NOT fill the socket side with grease as this will collect and press the connector apart with internal pressure.

Any other issues or concerns should be directed to DIVELINK on email:

mstone@divelink.net

or

sales@divelink.net

In an emergency, the following telephone number is available:

1-250-479-4868

- Apply DC4 silicone grease sparingly to the rubber parts only of the Hardwire Diver Connector.

- Plug the socket end of CAB-HW into HARDWIRE DIVER 1. Press firmly to end of travel.

The CAB-HW should be pulled through conduit from the aquarium area. There should be enough cable remaining in the aquarium for the diver to move to required areas. Longer lengths are available if necessary. Part numbers for ordering are listed in feet:

CAB-HW-100

CAB-HW-150

CAB-HW-200

CAB-HW-250

CAB-HW-300

CAB-HW-x

Operation, Indicators, Controls

After turning on both the COM-UW-RM-2 and the DL-SOUNDWEB unit, after 30 seconds the system will be available for use.

Three LEDs will light up. During normal operation this will occur.

POWER ON LED remains lit if the unit is operating, meaning the power cord is plugged in, the unit power switch is switched on at the rear, and no rear fuses have been blown.

Diver Cable Powered LEDs will remain ON if the diver is plugged in properly. If however the diver hardwire cable is unplugged and remains in the water, or if the diver earphone is unplugged underwater, the LED indicating that cable will turn OFF and the system will mute that channel.

EXTERNAL AUDIO IN VOLUME and **DIVER AUDIO OUT VOLUME** is for the local speaker in the unit only.

MIC VOLUME TO DIVER is to set the volume in the earphone of the diver from the MIC TO DIVER hand held microphone. This is set with a screwdriver and it is a 10 turn shaft.

MUTE DIVER TO P.A. should normally be in the DOWN position, so that audio from the diver passes to the P.A. system. Only when surface personnel supporting the diver want to speak to the diver through the hand held microphone should the switch be set to the UP position. Conversations such as audio tests or gear adjustment should only be heard locally and that is why the MUTE DIVER TO P.A. switch is made available.

ISOLATED ELECTRICAL CONNECTION TO DIVERS

This hardwire system has been designed with complete electrical isolation. If there is a ground fault at the rack then any electrical fault will not be passed on to the diver. Other manufacturers do not provide this feature because the likelihood of ground faults in rack rooms are rare. However we at DIVELINK want to remove any chance whatsoever of wires coming from an electrical room having electrical ground fault or noise on them, for the protection of the diver who is in electrically grounded water.

Spares

It is important for high–use equipment such as in this venue, that spares be stocked and made available should any piece of equipment fail for any reason. It is very likely that cords will be cut, snagged or pulled inadvertently by staff. To have a high paying performance go down because one component fails should never happen.

The following spare parts may be ordered from DIVELINK:

DIVELINK Model MIC-S08

Hand Held Microphone for COM-HW-RM-2 rack unit.

DIVELINK EAR-MIC-NOPTT Harness

MPC-AGA to match Interspiro AGA Divator
MPC-DRAGER to match Drager Full Face Mask
MPC-EXO to match Kirby Morgan EXO Full Face Mask
MPC-GUARDIAN to match GUARDIAN Full Face Mask
MPC-KM48 to match Kirby Morgan Super Mask M48
MPC-MANTIS to match Mantis Full Face Mask
MPC-POSIEDON to match Posiedon Full Face Mask
MPC-REEF to match Ocean Reef Neptune Nira Full Face Mask
MPC-SCUBAPRO to match Scubapro Full Face Mask

DIVELINK Model SIL-01

Dow Corning DC4
Also available from most local suppliers of industrial lubricants.

WARRANTY

Period and Coverage

The manufacturer warrants the Diver Unit for a period of one year from the date of delivery, to be free of defects arising from material or craftsmanship used or provided by the manufacturer, provided that:

- The unit is used under conditions of normal SCUBA use, and in compliance with the operating instructions set out in this manual, by the original owner.
- The unit is not used for purposes other than those for which it was designed, or otherwise is not abused, misused, or subjected to unusual conditions.
- No unauthorized attachments or modifications are made to the unit.

Should the unit prove to be defective within the warranty period, it will be repaired or replaced free of charge, at the election of the manufacturer, excluding shipping and handling charges.

Transferability

This warranty is non-transferable and is solely for the benefit of the original purchaser.

Limitations

This warranty is voided in the event that service or repairs to the unit are not performed by the DIVELINK factory.

This warranty specifically does not extend to damage to face masks, regulators or hoses arising from their usage, or to damage to the unit caused by improper maintenance, modification or tampering.

DISCLAIMER

The unit is intended for use only by certified SCUBA divers who are aware of and trained to deal with the risks and hazards associated with diving. The unit is not proclaimed or intended to be used as a substitute for safe diving practices. It is the personal responsibility of every diver to ensure that they and their partner(s) observe all rules of their certification training.

The manufacturer, its distributors and retailers make no warranties, either expressed or implied, with respect to the unit, or this owner's manual, except for those stated earlier.

It is expressly understood that in purchasing or using the unit, the purchaser or any other person who uses it accepts it "as is", with the entire risk as to its quality, performance, merchantability, or fitness for any particular purpose resting with the user. These conditions exclude replacement of defective parts as required by the original purchaser in the first year after purchase, as described in the *Period and Coverage* section.

Important!: By purchasing the unit, it is agreed and understood that in no event will the manufacturer, its distributors or retailers be held liable for any personal injuries arising from its operation, or for any damages whether direct, indirect, incidental, or consequential, even if the manufacturer, distributor or retailer have been advised of such damages.

SERVICING

Contact Information

Mailing Address/Return for Repair:
DIVELINK
300-1095 McKenzie Avenue
Victoria, BC Canada V8P 2L5

Telephone: 1-250-479-4868

E-mail: mstone@divelink.net

Internet Web Page: www.divelink.net

Warranty/Repair Conditions

Any defect of the unit in workmanship or material, as covered in the *WARRANTY* and *DISCLAIMER* sections of this manual, and discovered within one year from the date of purchase, must be promptly reported to the DIVELINK factory.

No product returns will be accepted by the factory without a Returned Merchandise Authorization (RMA). The factory provides the RMA number and shipping instructions to the owner, who returns the defective part, freight prepaid, to the factory (see the section entitled *Sending Procedure*).

DIVELINK will repair or replace the defective part at no charge, within a reasonable time, as it deems necessary.

Sending Procedure

Inside the box in which you are sending the defective part, provide the following on a single sheet of paper:

- RMA number
- Your complete shipping address (no Post Office [P.O.] box numbers)
- Your phone number (with area code)
- Description of the problem for each part being returned (as detailed as possible)