INTEROPERABILITY NOW

Installation and Operation Guide

RSP-Z2

Dual Channel

Radio to IP Interface

Designed and Manufactured by:

JPS Interoperability Solutions

5800 Departure Drive

Raleigh, NC 27616

919-790-1011

Email: sales@jpsinterop.com / support@jpsinterop.com

www.jpsinterop.com

JPS P/N 5160-600200   **Revision 1.1**   **April 2018**

FEDERAL COMMUNICATIONS COMMISSION

(FCC) COMPLIANCE NOTICE:

RADIO FREQUENCY INTERFERENCE NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case users will be required to correct the interference at their own expense.

CAUTION

Changes or modifications to this equipment not expressly approved by JPS Interoperability Solutions could void the user's authority to operate this equipment.

NOTICE

JPS Interoperability Solutions reserves the right to make changes to the equipment and specifications without prior notice.

PROPRIETARY STATEMENT

The information contained in this manual is the property of JPS Interoperability Solutions and is intended for the purchaser's use only. It may not be reproduced without the expressed written consent of JPS Interoperability Solutions.

JPS Interoperability Solutions, Inc.
Phone: (919) 790-1011
Fax: (919) 865-1400
E-mail: sales@jpsinterop.com / support@jpsinterop.com
5800 Departure Drive
Raleigh, NC 27616

Table Of Contents

Glossary

ACUs	JPS Interoperability devices of various form factors that interface different types of communications devices. Include ACU-1000/2000/M/T/5000/Z1.
ARA-1	JPS device that provides a SIP interface to an individual radio or other four-wire device.
BSI	Bridging Systems Interface – A specification jointly developed by government and industry to provide a standard interface for radio interoperability systems. The BSI is based on SIP and RTP and allows bridging of radio nets between disparate interoperability systems.
COR	Carrier Operated Relay - A receiver signal that gives a positive indication a carrier or signal is being received and the receiver is unsquelched. Same as **COS**.
COS	Carrier Operated Squelch - See **COR**.
Cross-Connection	A link made between two communications systems interfaced to a single ACU-5000 chassis, or between systems interfaced over a network to two or more ACU-5000 systems.
DTMF	Dual Tone Multi Frequency - The standard touch-tone telephone dialing method sends DTMF audio characters over a PSTN line for control purposes. Can also be used with FM radio.
DSP	Digital Signal Processing (or Processor).
Hangtime	A system with hangtime will remain in the transmit mode for the duration of the set hangtime beyond the time indicated by any keying inputs. The hangtime prevents transmitter unkey during brief pauses in the transmission.
Key	To key a transmitter means to cause it to transmit.
LMR	Land Mobile Radio.
Mute	To quiet or inhibit audio.
NXU-2A	Network Extension Unit. A JPS device that interfaces a radio or other 4-wire device to other communications devices over an IP network. An NXU-2A uses RoIP.
PBX	Private Branch Exchange. A telephone system that owned an operated by a private company (such as a manufacturing business) rather than by a telephone company such as ATT.
PCB	Printed Circuit Board.
PSTN	Public Switched Telephone Network - The world's public circuit-switched telephone network which provides connectivity to fixed-line and mobile telephones.
PTT	Push-to-Talk. An active PTT signal causes a transmitter to key.
RJ-11	Registered Jack 11 - A physical interface for connecting wires, often used to terminate telephone cables. It is a 6-position 4-contact (6P4C) connector. Although it can be used for other purposes, this is commonly referred to as a standard phone jack or connector.
RoIP	Radio over Internet Protocol. JPS proprietary protocol which sends voice plus radio control signals over an IP network.
RX	Receiver or Receiving.
SIP	Session Initiation Protocol – A flexible, standards-based, open protocol that initiates and manages communications between devices over an IP network.
Soft Phone	A computer that's used as a VoIP phone.
Squelch	A means of detecting audio and causing some action when it is present, such as keying a transmitter or unmuting an audio path.
TX	Transmit or Transmitter.
VMR	Voice Modulation Recognition. An algorithm which causes a transmitter to key or causes some other action when voice is present. This squelch type is activated by only by human voice, and not by tones, noise or other non-speech audio. Particularly useful for noisy signals such as HF.
VoIP	Voice Over Internet Protocol - Protocol for delivering voice communications over IP networks. Most network-phone providers (such as Vonage), use VoIP.
VOX	Voice Operated Xmit (Transmit). A circuit or algorithm which causes a transmitter to key or causes some other action when sound is present. This squelch type is activated by any audio signal, and is not restricted to voice only.

blank page

1 RSP-Z2 Overview

1.1 Scope

This document provides a description, specifications, and configuration and operating instructions for the Dual-Radio version of the RSP-Z2.

This section provides some essential background information that will assist in understanding the capabilities of the RSP-Z2.

JPS Interoperability Solutions has several decades of experience with voice communications interoperability, fielding their first devices in 1989. Over this time the company has encountered and resolved a wide array of problems that can hamper or complicate communications when disparate devices are patched together into interoperability nets.

The RSP-Z2 incorporates all this experience, in the form of a suite of sophisticated DSP algorithms that operate at its interfaces with any connected communications devices, as well as many custom radio interface cables, covering well over 300 different radio makes and models.

JPS interoperability devices are also known for simplicity and ease-of-use. The RSP-Z2's browser-based Graphical User Interface is carefully designed to make these sophisticated capabilities available when necessary. When the simple setup and configuration works well, an installer and operator need only be concerned with these elements. However, if the communications system includes any problematic elements, a JPS interoperability device (such as this RSP-Z2) has the features necessary to resolve the problems and optimize communications.

1.2 Important definitions:

> **COR:** *A signal that indicates when a radio (or other type of communications device, such as an RSP-Z2) is receiving a valid audio signal.*
>
> **PTT:** *A signal that tells a radio (or other communications device) to transmit the audio signal being sent to it.*
>
> **Full Duplex Communication System:** *Users can simultaneously talk to and listen (for example, a standard telephone call).*
>
> **Simplex or Half Duplex Communication System:** *Only one system user can be heard at a time.*
>
> **Interoperability Net:** *Communications link consisting of disparate devices (such as radios of different frequencies, telephones, VoIP phones, etc.) connected together, similar to a conference call.*

These definitions are essential in understanding the basic operation of an interoperability device, such as a JPS ACU Gateway or this RSP-Z2. That is: If multiple communications devices are engaged in an interoperability net, whenever one device detects active COR (valid audio input), that audio, along with a PTT signal, is sent to all other devices in the net to be transmitted. Also, if any device in an interoperability net is half duplex (such as are almost all radio systems), then all communications must be half-duplex. For this reason, the RSP-Z2 is a half-duplex device.

Among the unit's sophisticated features are various methods for determining active COR (as VOX or VMR are optimal or necessary for some types of devices), and adjustable audio delays to meet the timing requirements of the connected communications systems.

1.3   Context-Sensitive Help

The RSP-Z2 makes extensive use of context-sensitive help. On the upper right corner of each of the unit's web pages, click on the circular question mark ❷ to bring up page-specific help text.

Further specific help is also available on wherever appropriate. For example, the channel configuration pages include context-sensitive help for each settings box.

The image below shows the pop-up window for the "Connection Maintenance" settings. Note how the rest of the screen is darkened while the help text is being viewed.
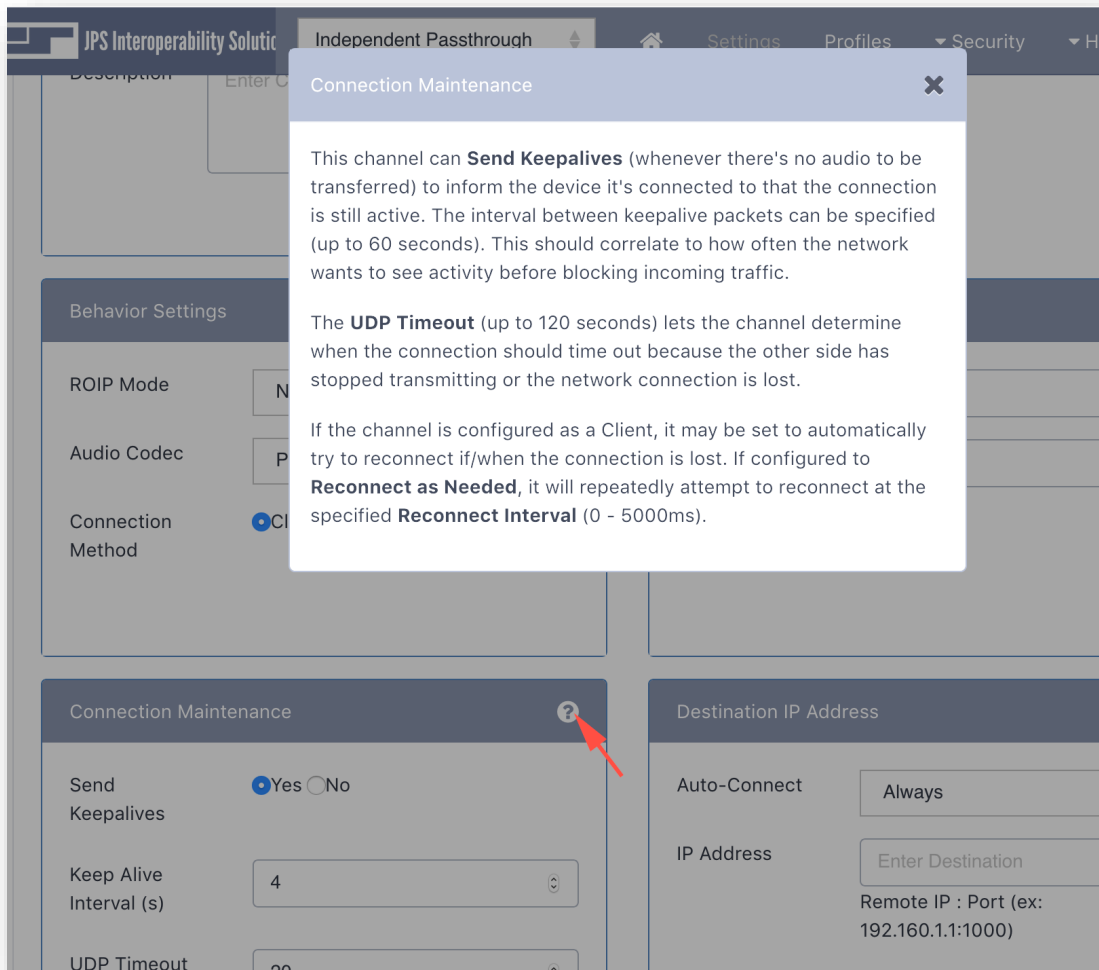
1.4 Possible RSP-Z2 Configurations

This RSP-Z2 provides a pair of analog-to-IP channels, along with a Headset Channel. The non-handset channels can be configured in multiple ways, best illustrated below by this partial screen shot from the Configuration Page of the unit's browser-based Graphical User Interface. It shows the three basic configurations. First step in setting up the unit is selecting the desired configuration. All three are explained in the following sections.
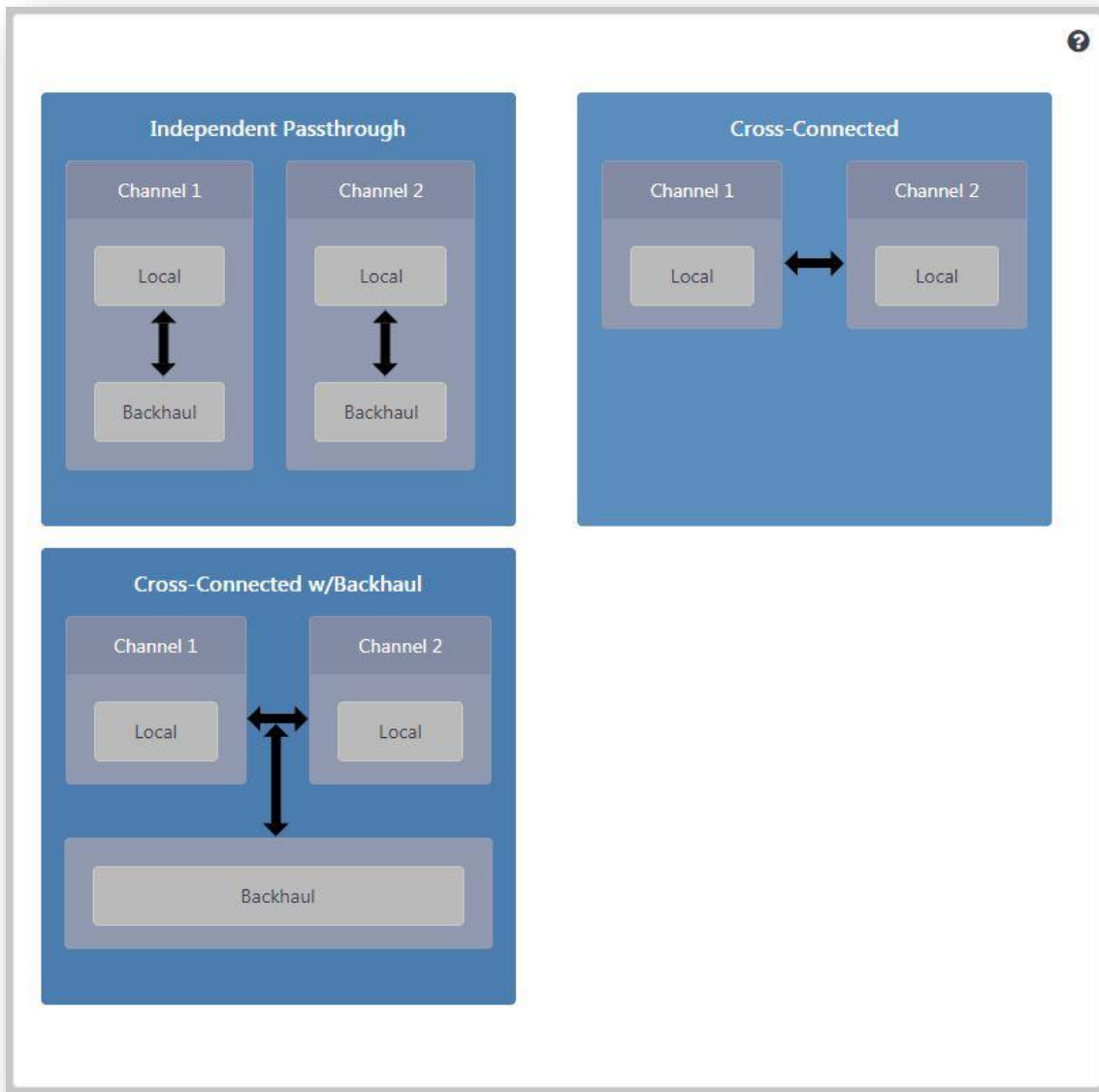
1.4.1 Independent Passthrough

This configuration provides two separate Analog to IP converters. For each, active COR on the analog side will send incoming audio out the IP backhaul interface, and vice-versa. Active COR occurs when the channel determines that "Valid" audio input has been detected. Available COR types (methods of determining valid audio) vary by channel type.

Note that four separate channels are depicted for this configuration – two local audio channels each tied to its own IP backhaul channel. A USB Headset can also be included, and connected to any communications channel.

Once a configuration is selected, right-clicking on any channel icon will bring up the *Settings Page* for that channel; this allows the channel to be set to a variety of Channel Types, with appropriate settings options for the selected type.

For this RSP-Z2, the analog options are *Radio* (appropriate also for other types of four-wire devices), and *Headset* (which allows the unit to me used as a small IP dispatch station). Future versions will include a PSTN analog channel.

Backhaul options include RTP, SIP (BSI compliant), RoIP (the JPS-proprietary Radio over IP protocol), VIA (for connection to the JPS VIA Smartphone PoC app), and Bridge Channels (for future applications when used in a system with other JPS devices).

Note that, if desired, the analog channels can also be configured as either of the RoIP, RTP, or SIP channel types.

Because the RSP-Z2 is a half-duplex device, the first channel with active COR is in control until its COR status goes back to inactive - unless another channel is configured to allow preemption. If so, that channel's incoming audio will take over. See the related context-sensitive help below, from the *Settings Page* for a Radio channel:
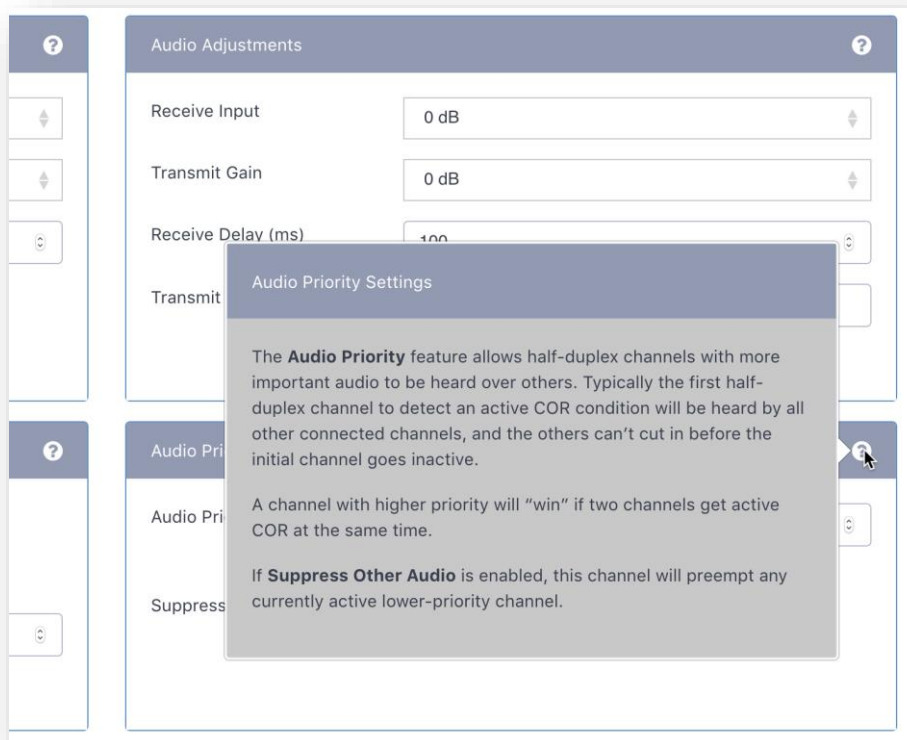
1.4.2 Cross-Connected

This configuration patches the two analog interfaces together, with no IP backhaul. When one of the two channels detects a valid audio input, the other will transmit this audio. See block diagram below. RSP-Z2 Channel 01 is connected to a VHF repeater system for the State Highway Patrol, and Channel 02 to the local Fire Department's 800 MHz trunked system. A channel/talkgroup on each system is set aside for emergencies when the two agencies have to talk to each other.
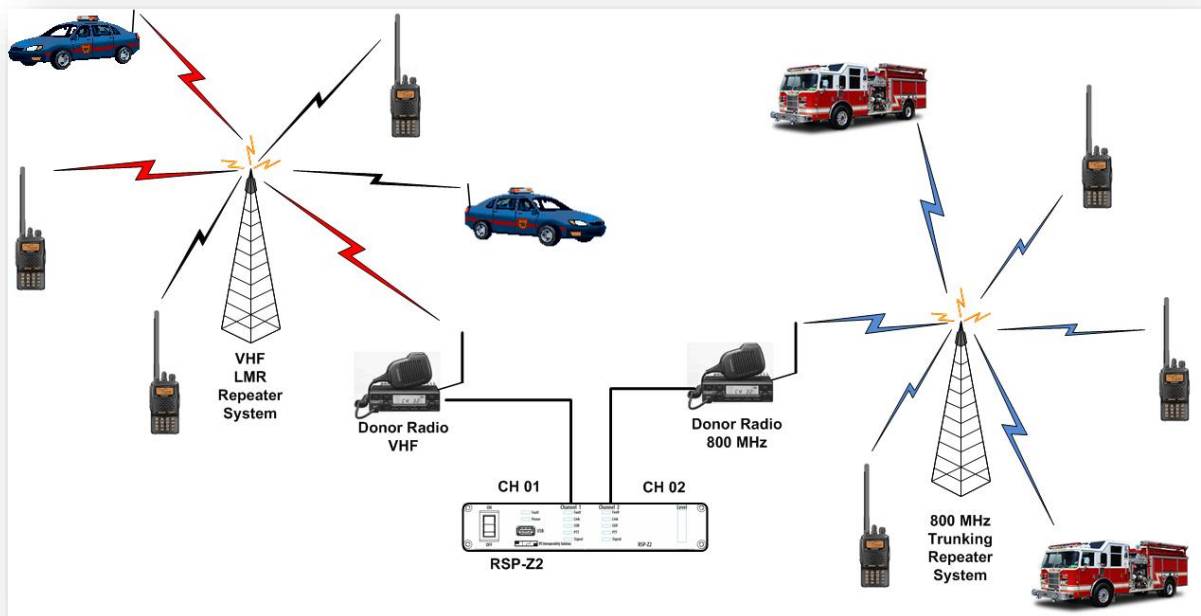
Whenever any user from either system transmits on the designated channel/talkgroup, all other users on both channels can hear. Because donor radios are used to interface the system, identically to all other radios in each system, the RSP-Z2 installation has minimal impact.

A note about the need for sophisticated radio interface algorithms: Any time a handheld radio on the 800 MHz trunked system keys up, that user needs to wait until a channel acquisition confirmation tone is heard before speaking; only then is the trunked system ready to transmit that user's audio.

When a patrolman in the vehicle in the upper left keys up, he that radio's user will begin talking without any concern for a tone.

Now consider the two systems cross-connected. When that VHF user keys up, his radio will of course be in transmit mode, so there is no way to provide any feedback regarding the channel acquisition tone that the 800 MHz donor radio will receive. Further, the interoperability system doesn't want to alter normal operation of either system in any way. Instead, the RSP-Z2 deals with this through the TX audio Delay feature in the Radio Channel Settings. The RSP-2 stores the audio temporarily in an internal buffer and sends it out after the trunked system is ready to receive and retransmit it.

1.4.3 Cross-Connected with Backhaul

This is a combination of the Independent Passthrough and Cross-Connected configurations. Only a single backhaul interface is needed, because it is interfaced to the combined (cross-connected) audio of the two local channels.
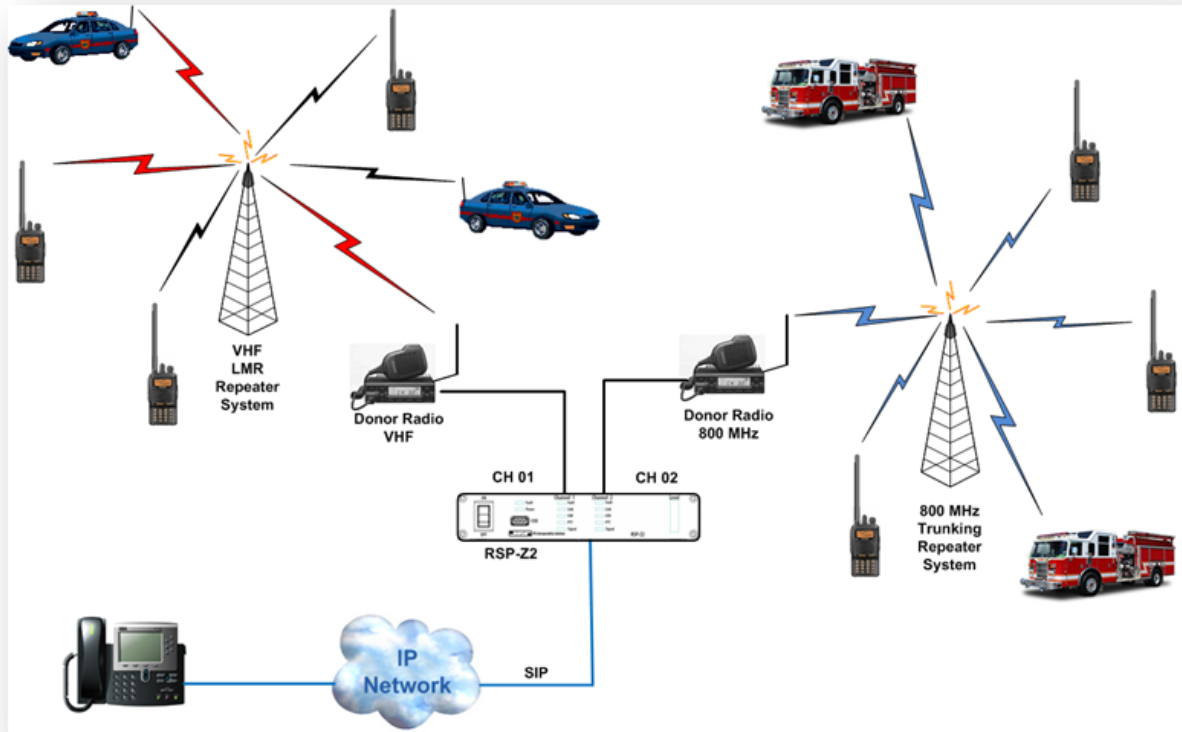
The diagram above shows one of the many ways the backhaul channel can be used, as a SIP channel allowing a supervisor to dial in by a VoIP phone. All three channels are connected together, so the caller will hear anything on either channel, and the supervisor's speech will be retransmitted in both radio systems.

1.5 Front Panel Level Indicator

The RSP-Z2 has a set of audio level indicating LEDs on the front panel; the LEDs can be applied to any one of the unit's channels. The level is measured after the channel's audio adjustment, that is, the measurement point includes the changes made by the channel's "Receive Input" audio adjustment. This allows the level indicator to give visual evidence of optimal adjustment. When properly set, a standard voice signal (a person on this channel speaking at a typical volume level) will flash red on occasional voice peaks.

Click on the icon with the rising bars in the upper right of each interface to select (only visible after configuration is set, see figures that follow). After selection, the level icon will turn green.

1.6 USB Headset

If a JPS-approved USB headset is installed at power-up, an icon will appear in upper right corner of CH1 and CH2. Click on one of these handset icons to select what audio source it will be connected to. This selection makes a difference only for the Independent Passthrough configuration, because with all other configurations, all the channels are tied together.
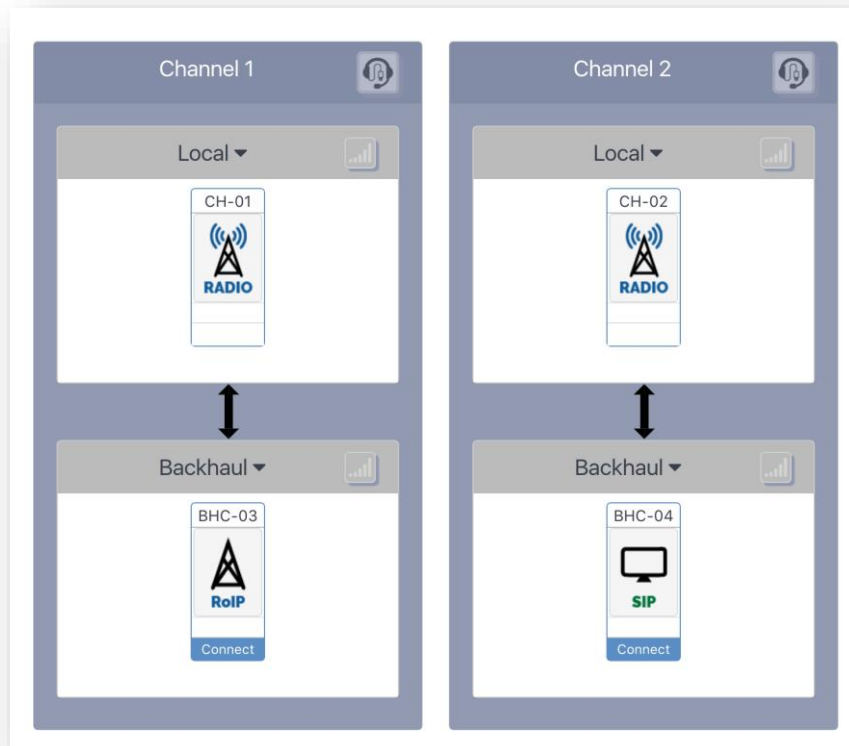
Figure above: Home Screen with Handset installed but not yet selected. Level Indicator also not yet selected.

In the screen shot below, the operator has connected the handset to the interoperability net made up of Channel One and its RoIP backhaul channel. The operator has also connected the RSP-Z2's front panel audio level meter to Channel 2's backhaul channel. These selections are made clear by the green shading.

Also, the operator is currently talking into the headset. Active COR by the headset is indicated by the green circle at the lower left corner of the headset icon. Because this is an active interoperability net, this active COR causes the headset operators speech to be retransmitted by the radio channel and also the RoIP backhaul channel.
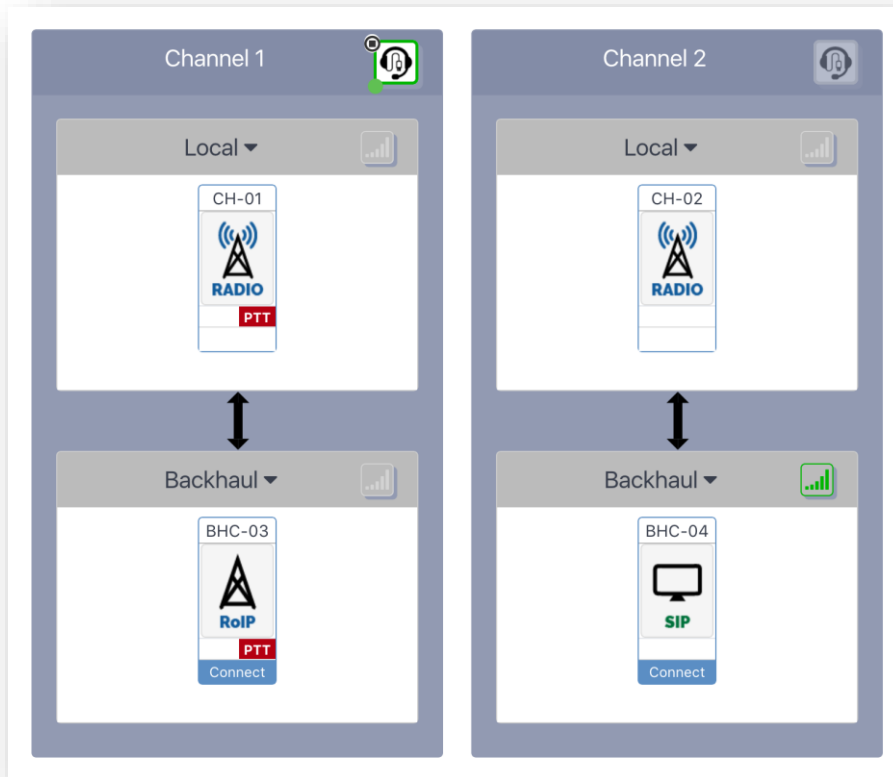
More about Headsets:

- If the headset is unplugged, a red exclamation point will be displayed on the headset icon.

- If none of the channels is selected to use the front panel level meter, it will indicate the headset audio level.

- When installed, the handset has its own settings page. Settings options include VOX sensitivity, changing to COR rather than VOX (useful in noisy environments) and applying higher priority to the handset channel relative to other system channels.

1.7   Configuration and Control Methodology

The unit is configured via its web-based GUI. There are no physical potentiometers or switches related to the analog interface configuration.

To allow a lower-priced unit for applications needing only a single radio interface, the RSP-Z2 may be purchased with a single active analog channel. If in the future, the second analog channel is desired, it may be purchased from JPS Interoperability Solutions and activated by a firmware update. See Section 3.3.3.

This manual is written for a 2-channel unit. In a single channel unit, Channel One is the active channel. All operational criteria and instructions are identical for the single channel version.

1.8   Specifications

Table 1-1 – RSP-Z2 Specifications	
Radio RX Audio Input	
Input Impedance	Balanced 2.2k ohms, transformer coupled
Input Level	Incoming signals adjustable in approx 4 dB steps from –26 to +12 dBm to set 0 dBm nominal input; +15 dBm clipping
Radio TX Audio Output	
Output Impedance	Unbalanced 600 ohms, AC Coupled
Output Level	Adjustable from –26 to +12 dBm in approx 4 dB steps, 0 dBm nominal factory default; +9 dBm clipping into a 600 ohm load
Distortion	0.5% or less (excepting Vocoder)
Radio COR Input	
Input Impedance	47k ohm pull-up to +5V / 22k ohm pull down to ground for active high/low
Polarity	COR: Selectable active low or active high; AUX Inputs: Active low
Threshold	Vin high (min)=2.3 VDC; Vin low(max)=1.0 VDC
Protection	Up to + 100 VDC
Radio PTT Output	
Output Type	Open drain
Maximum Sink Current	100 mA
Max Open Circuit Voltage	+60 VDC
Network Interface	
Interface Type	10/100BASE-T Ethernet, 10 or 100 Mbps; RJ-45 Connector
Protocols	SIP, SDP, RTP, STUN, HTTP, RoIP
Audio Vocoder	Selectable, PCMU/G711u, PCMA/G711a
General/Environmental	
Input Power (12 VDC Nom)	+11 to +15 VDC at 1.5A max. 12VDC power supply provided (100-240 VAC input)
Power Connector	Coaxial Jack, 2.5 mm ID, 5 to 5.5 mm OD; Center Pin Positive
Size and Weight	1.5"H x 7.75"W x 6.5"D (38 x 200 x 160 mm); 2.0 lbs (900 gr)
Temperature	Operating: -20 to +60 degrees C; Storage: -40 to +80 degrees C

1.9 Equipment and Accessories Supplied

<table>
<tr><td colspan="3">Table 1-2 – Equipment and Accessories Supplied, Both Channels Licensed</td></tr>
<tr><td colspan="3">RSP-Z2 Shipping Level (Dual Channel, both channels licensed) - P/N 5160-600000</td></tr>
<tr><td>Quantity</td><td>Item</td><td>JPS P/N</td></tr>
<tr><td>1</td><td>RSP-Z2 Final Assembly (Dual Channel, both channels licensed)</td><td>5160-610000</td></tr>
<tr><td>1</td><td>RSP-Z2 Dual Channel Quick Start Guide</td><td>2740-516060</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1</td><td>Accessory Kit</td><td>5160-600150</td></tr>
<tr><td></td><td>Kit consists of:

Qty   Part Number   Description
1   1620-240015   12 VDC Power Supply [100 to 240 VAC, 50/60 Hz]</td><td></td></tr>
</table>

<table>
<tr><td colspan="3">Table 1-3 – Equipment and Accessories Supplied, Single Channel Licensed</td></tr>
<tr><td colspan="3">RSP-Z2 Shipping Level (Dual Channel, one channel licensed) - P/N 5160-300000</td></tr>
<tr><td>Quantity</td><td>Item</td><td>JPS P/N</td></tr>
<tr><td>1</td><td>RSP-Z2 Final Assembly (Dual Channel, one channel licensed)</td><td>5160-310000</td></tr>
<tr><td></td><td>The above refers to initial factory order.
To do a field upgrade that licenses the second analog channel for a unit that was purchased with a single-channel license, Purchase the following:</td><td></td></tr>
<tr><td>1</td><td>RSP-Z2, License to add the second channel</td><td>5160-300100</td></tr>
<tr><td>1</td><td>RSP-Z2 Dual Channel Quick Start Guide</td><td>2740-516060</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1</td><td>Accessory Kit</td><td>5160-600150</td></tr>
<tr><td></td><td>Kit consists of:

Qty   Part Number   Description
1   1620-240015   12 VDC Power Supply [100 to 240 VAC, 50/60 Hz]
1</td><td></td></tr>
</table>

1.10 Optional Equipment: Not Supplied

Table 1-4 – Optional Equipment - Not Supplied	
Description	**JPS P/N**
USB headset – Plantronics C710	0150-200710
USB headset – Plantronics C720	0150-200720
USB headset – Plantronics W410	0150-200410
ACU Generic Radio Interface Cable; unterminated at radio end, D15 at other end; specify length: 15, 30, or 50 feet	5961-291115-15/30/50
Interface cables for a very wide range of commercial radios are available for purchase. Email JPS or consult the JPS Interoperability Solutions website for a listing: Email: sales@jpsinterop.com / support@jpsinterop.com www.jpsinterop.com	

End of Section 1

2 Installation

2.1 General

This section provides the instructions for unpacking, inspection, and installation. Configuration and operation are explained in subsequent sections.

2.2 Unpacking and Inspection

After unpacking the unit, retain the carton and packing materials until the contents have been inspected and checked against the packing list. If there is a shortage or any evidence of damage, do not attempt to use the equipment. Contact the carrier and file a shipment damage claim. A full report of the damage should be reported to the JPS Customer Service Department. The following information should be included in the report:

1. Order Number
2. Equipment Model and Serial Numbers
3. Shipping Agency
4. Date(s) of Shipment

The JPS Interoperability Solutions Customer Service Department can be reached by phone at (919) 790-1011, or by FAX at (919) 865-1400, or email at support@jpsinterop.com. Upon receipt of this information, JPS will arrange for repair or replacement of the equipment.

2.3 Reshipment of Equipment

If the RSP-Z2 must be returned, an RMA (Returned Material Authorization) number must first be obtained from JPS. This number must be noted on the outside of the packing carton and on all accompanying documents. When packing the unit for reshipment, it is best to use the original packaging for the unit; if this is not possible, make sure that adequate packing material is used to prevent excessive shocks during transport and handling.

Shipment should be made prepaid consigned to:

JPS Interoperability Solutions
Customer Service Department
5800 Departure Drive
Raleigh, North Carolina 27616
USA

Plainly, mark with indelible ink all mailing documents as follows:

GOODS RETURNED FOR REPAIR

Mark all sides of the package:

FRAGILE - ELECTRONIC EQUIPMENT

Inspect the package prior to shipment to be sure it is properly marked and securely wrapped.

2.4 Installation Considerations

The RSP-Z2 must be installed in a location that provides both protection from the weather and assurance of ambient temperatures between -20 and +60 degrees C. The unit is neither splash proof nor corrosion resistant and must be protected from exposure to salt spray.

The unit does not have nor need an internal cooling fan.

> **Note:** *When the RSP-Z2 is installed in a high RF environment such as repeater site, it is recommended that cable assemblies to each channel be individually shielded.*
>
> *Interface cables purchased from JPS are shielded.*

2.5 Mechanical Package

The RSP-Z2 is housed in an aluminum enclosure, 1.5"H x 7.75"W x 6.5"D (38 x 200 x 160 mm). The unit weighs 2.0 lbs (900 gr). The bottom panel of the unit includes a set of 6-32 flush nuts to allow the RSP-Z2 to be mounted to a tray or other flat surface. The width allows two units to be mounted side by side on a typical tray for a 19-inch rack.

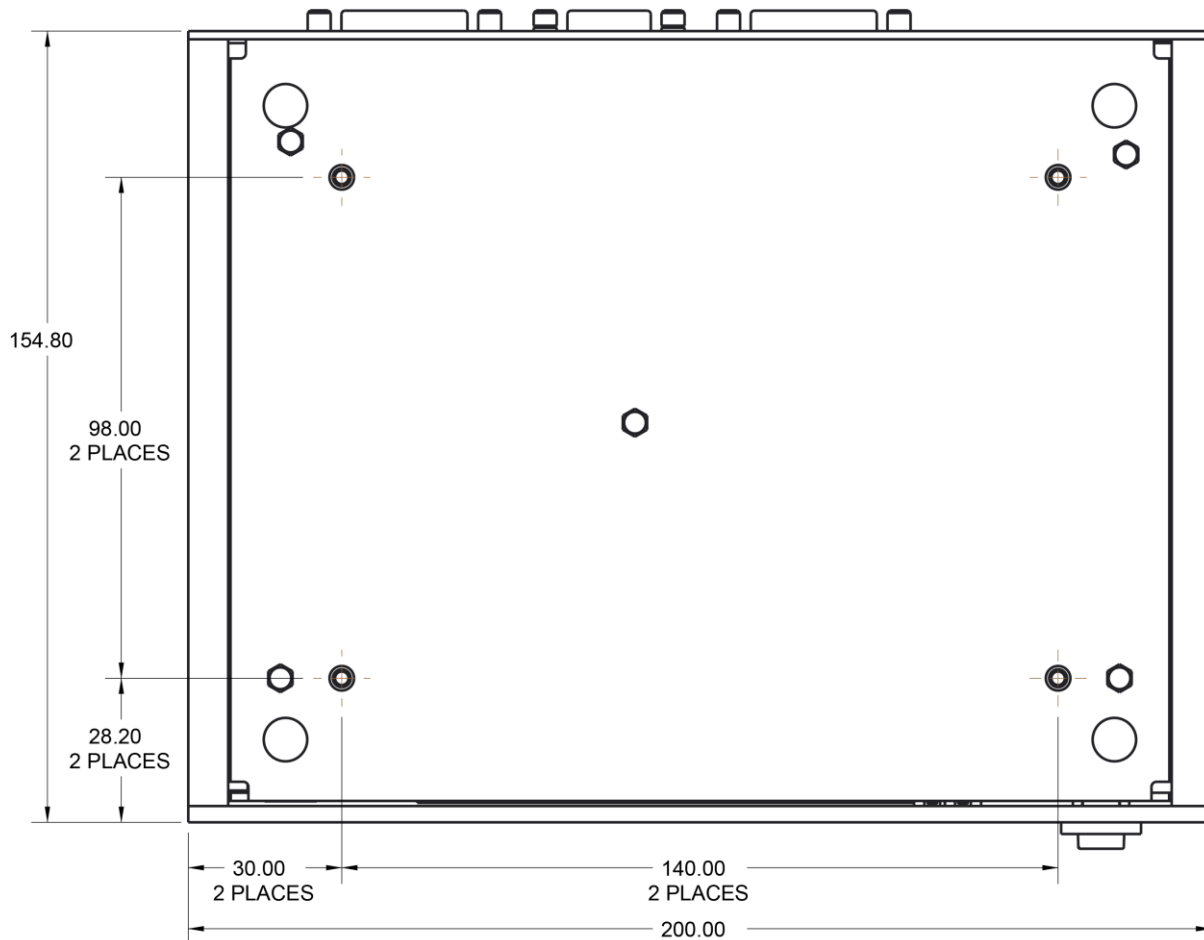See the documentation available under the **Help** tab for a 1:1 template to facilitate mounting.

Figure 2-1   RSP-Z2 Bottom View with Dimensions and Mounting Holes

2.6 Connectors, Controls, and Indicators

Basic configuration and control of this RSP-Z2 is via its browser-based GUI.

There is an LED audio level indicator on the panel that can be applied to any of the unit's channels; it aids setting & verifying proper volume settings.

Also on the RSP-Z2 front panel are:
- The power on/off switch
- A USB port that can be used for JPS-specified USB wired and wireless headsets. The JPS approved headsets have pre-installed drivers and the wireless headsets use a USB dongle.
- Power and Fault LEDs
- Indicator LEDs for each of the two analog channels: Fault, Link, COR, PTT, Signal

All connections to the unit, other than the USB port (for headset and USB thumbdrive), are made via the rear panel. This includes the RJ-45 Ethernet port, the +12 VDC power jack, a USB jack (same functions as front panel USB port), an HDMI port, a D9 RS-232 port, and a pair of D15 analog ports. The HDMI and RS-232 port are used with different versions of the RSP-Z2 that have the same hardware.

The two D15 analog ports conform to standard JPS radio ports, allowing them to use any of the custom cables that JPS has designed to interface hundreds of different radio makes & models - see next section for further information.
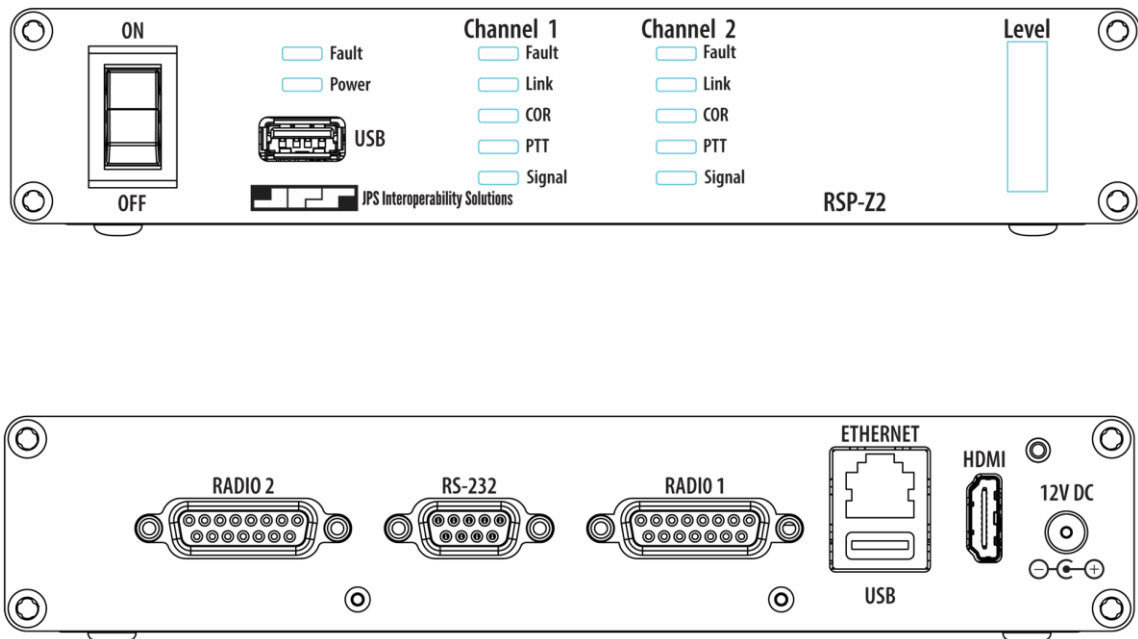
Figure 2-2   RSP-Z2 Front &Rear Views

2.7   Radio Interface and Cables

The physical interfaces for the radio ports (and other four-wire devices) are a pair of rear panel D-15 connectors. Radios are connected to the RSP-Z2 via a cable that is likely to include interfacing circuitry (such as is used with JPS-manufactured radio cables).

The RSP-Z2 is designed to allow the use of the very large library of JPS radio cables created for the ACU Gateway product line, including standard Military 5 and 6 pin microphone connectors. These cables allow connection to hundreds of commonly-deployed radios. See Table 1-4 – Optional Equipment - Not Supplied.

Other cables can be designed and built on request. An unterminated cable can also be purchased; this cable has bare wires on the radio end to allow a customer to create a cable. The JPS Customer Service Department can be reached by phone at (919) 790-1011, or by FAX at (919) 865-1400. A representative will explain what is required. Typically, JPS Systems Engineering will need a pair of operational radios and radio programming software to use while creating and testing a new cable.

2.8   Power Source

The power supply included with the unit operates from input voltages and frequencies of 100 to 240 VAC, 50 - 60 Hz. Other standard "laptop-type" supplies can be substituted, but must provide a nominal +12 VDC, and be capable of at least 1.5 amp output. Note that the power supply included in the RSP-Z2 accessory kit is a premium version with a 1500V isolation transformer.

2.9   Safety Precautions and Procedures

The RSP-Z2 is operated by a +12 VDC power supply and therefore any high-level power supply voltage exists only on the AC input side of the power supply. Standard precautions relative to 115 or 230 (nominal) AC wiring applies.

> *Note: The RSP-Z2 contains no user-serviceable components and there is no reason to disassemble the unit.*
> *Return the RSP-Z2 to the factory for servicing.*

2.10 Maintenance

The RSP-Z2 contains no user-serviceable internal components, and no maintenance is required.

End of Section 2

3 Web-Based Configuration

The unit is configured via its web-based Graphical User Interface (GUI). The GUI provides a range of easily accessible context-sensitive help information. Note: Due to ongoing upgrades and enhancements to the RSP-Z2, the unit's web pages may not be identical to those shown in this guide.

The RSP-Z2 is standards-compliant and therefore supports standards-compliant web browsers, including the recent and latest versions of Internet Explorer, Firefox, Chrome, Safari, and Opera. If Internet Explorer is used, only IE 10 (or higher) and Edge have the capability to access all RSP-Z2 features, so do not attempt to use earlier versions.

3.1 Set up IP Address and Subnet Mask

As with any device with a static IP address, it will be necessary to set up the RSP-Z2 to operate on the LAN where it is to be deployed. First step is to log in using the unit's factory default IP address of 192.168.1.200, with a default subnet mask of 255.255.255.0.

Connect the RSP-Z2 via CAT-5 cable directly to the Ethernet Port of the computer that will be used to access and configure it. Set the computer to a static IP address of 192.168.1.xxx (where xxx is a number between 2 and 199) and a subnet mask of 255.255.255.0.

Plug in the unit's power supply, and turn the unit on via its front panel power switch. The RSP-Z2's front panel LEDs will flash while the unit boots up (approximately 90 seconds). Then log in to the default. Follow through to Section 3.3 which will give instructions for changing the network configuration parameters.
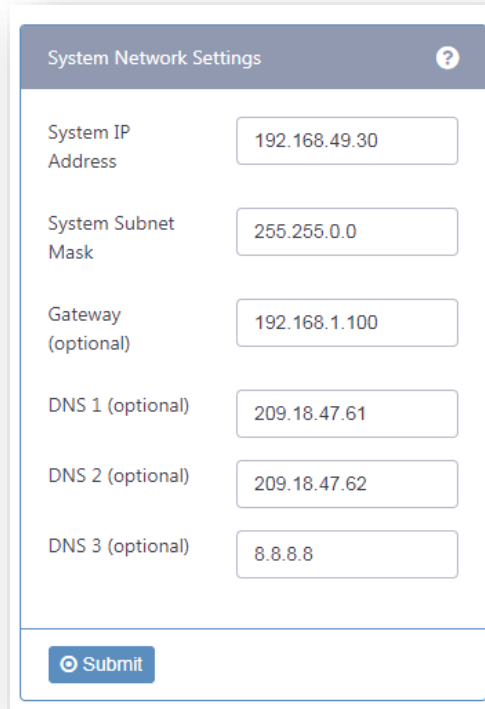
3.2 Log In

Figure 3-1 – System Log In

Upon browsing to the unit's IP address, the login screen above will appear.

Default name and password are both "su" for superuser with the superuser's full-capability permission set. See Section 4 for instructions about adding/changing user names and passwords, and associating appropriate permission sets with individual users.

3.3   Network Configuration

To change network settings, click on "Settings" and then "Network" – the following dialog box will be available for changing system parameters as shown below. (Note: These are not the system default settings).

Figure 3-2 – System Network Setting Entry Screen

After entering the new address and subnet mask, write them down for safekeeping (though the unit can be interrogated for its current settings, see next section). Then press *Submit*. The unit will have to reboot to integrate the new settings. Next, log in again at the new IP address.

3.3.1 IP Address Determination and Change VIA USB port

If unable to access the RSP-Z2 because you've forgotten its IP address and other network settings, the front panel USB port can be used to retrieve the needed information. Plug a thumb drive into the port and cycle the power. After power-up, the unit will store several files on the drive; these include diagnostic log files plus a short text file that lists the unit's network information. Most important will be its IP address and subnet mask. After the unit is fully rebooted the USB drive will be unmounted and can be unplugged. Use the USB drive's LED to indicate when it has completed downloading the log files.

On the USB drive, open the file named "networkinfo.txt" It will list the parameters shown in the figure above.

It's also possible to use a USB thumb drive to modify network parameters, including the IP Address.

Plug a thumb drive into either the front or rear panel USB port. Cycle the power; at power up, some files will be written onto the drive. Turn power off and attach the drive to a computer.

- For Windows PCs, use Notepad (and only Notepad) open the file "interfaces.from-device.windows"

- For computers running Apple's OSX, us Notes to open the file "interfaces.from-device.linux-or-OSX"

Change the desired IP Address or other network parameters and save with the new file name "interfaces" (no extension; if Notepad or Notes adds the extension "txt" to the file, remove it).

> *Note: If you do not use the specified program to edit the parameters, the file may not be formatted properly and this operation will not work.*

Plug the thumb drive back into the RSP-Z2 and turn the power back on; the unit will reboot but the Fault LED will continue to flash. Cut power, remove the drive, and turn power back on. The IP address of the unit will have been changed to match the revised addresses in the "interfaces" file.

3.3.2 Firmware Update

Firmware updates may occasionally be available for the RSP-Z2 to add features or to fix errant behaviors. Click on the set of three lines at the top right to bring up a set of icons pertaining to various "housekeeping" functions, then click on the wrench icon to bring up the green System Firmware Upload icon as shown below to the right side of the figure. Click on it to be presented with the Upload Queue.

The new firmware will be supplied by JPS Customer Service, or downloaded from the JPS website. Place the firmware on the computer that's being used to browse to the RSP-Z2.
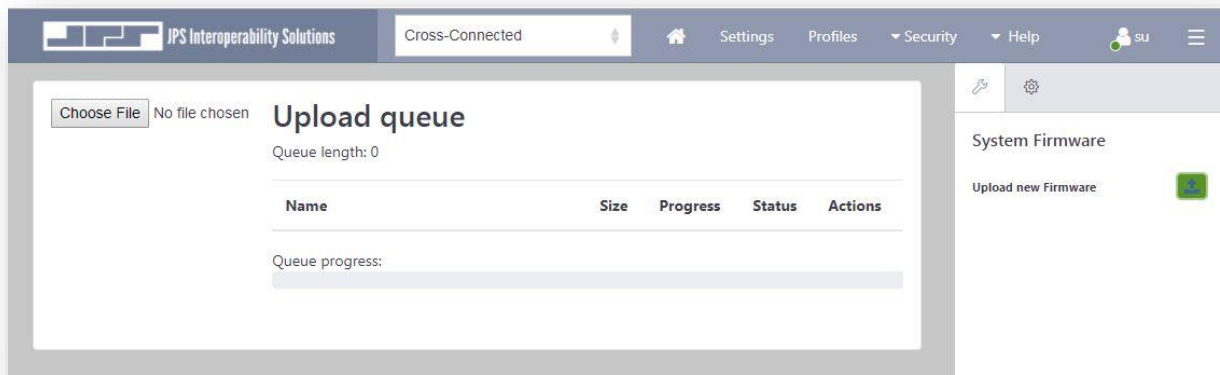
Figure 3-3- Uploading New Software

From the *Choose File* button, navigate to the update file, and select *Open*. Example shown below.
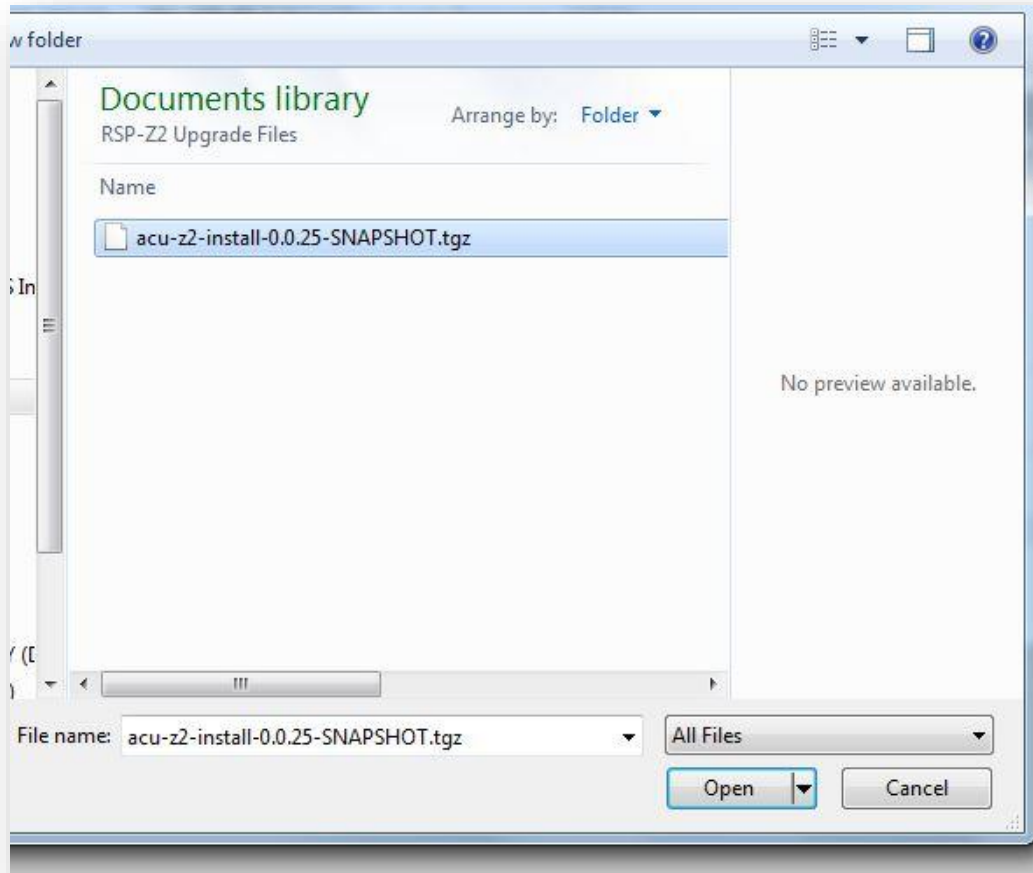
Figure 3-4- Installing New Software

You will next be presented again with the Upload queue. After selecting Upload, status of the operation will be provided.

3.3.3 License Update

A Dual Channel RSP-Z2, purchased at a discount with only a single channel operational, may be converted to full dual channel operation. After the license is purchased, the upgrade will be done by a firmware update in the same way as described in the previous section.

End of Section 3

4 Security - User Types & Permissions

Click on the Security tab to reach the pages that control *Users, User Passwords*, and *User Types* (user permission sets).

The *Users* Page is the place to go to add or delete users, change passwords, and assign User Types to the various users.

A User Type is associated with a set of permissions. The Super User role always has (of necessity) all permissions, because there must be one user who can perform the various roles, most particularly User Management. Without this, the system could be configured so that no one had the ability to change passwords or remove and add users. Therefore, while the name and password assigned to the initial factory default Super User can (and should) be modified for enhanced security, it is not possible to delete this user (as can be seen in the screen shot below). If additional users are given Super User status, it will be possible to delete these users.
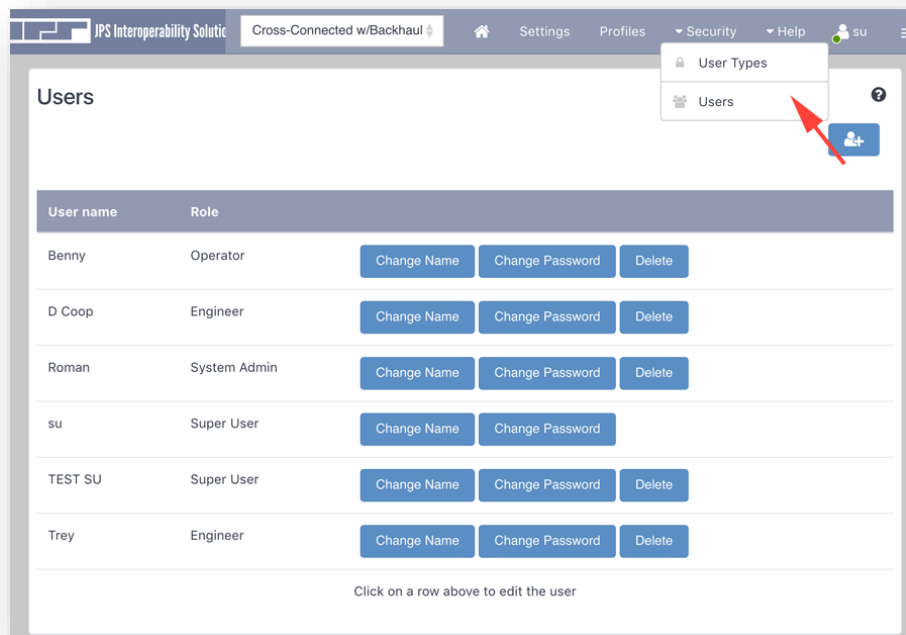
Figure 4-1- Creating and Managing User Accounts

The figure above depicts an RSP-Z2 with five users. Two have a custom User Type called Engineer. Note the initial Super User still has the name *su*. Again, for best security, always change this to another name.

The *User Types* Page lists the sets of permissions that go along with each User Type. It is also possible to create new User Types and to change the permissions allowed to each User Type, except for the Super User role, which always includes all permissions. The figure below includes the custom role called "Engineer" – it was created by clicking on the *New Profile* button and selecting which permissions are allowed.
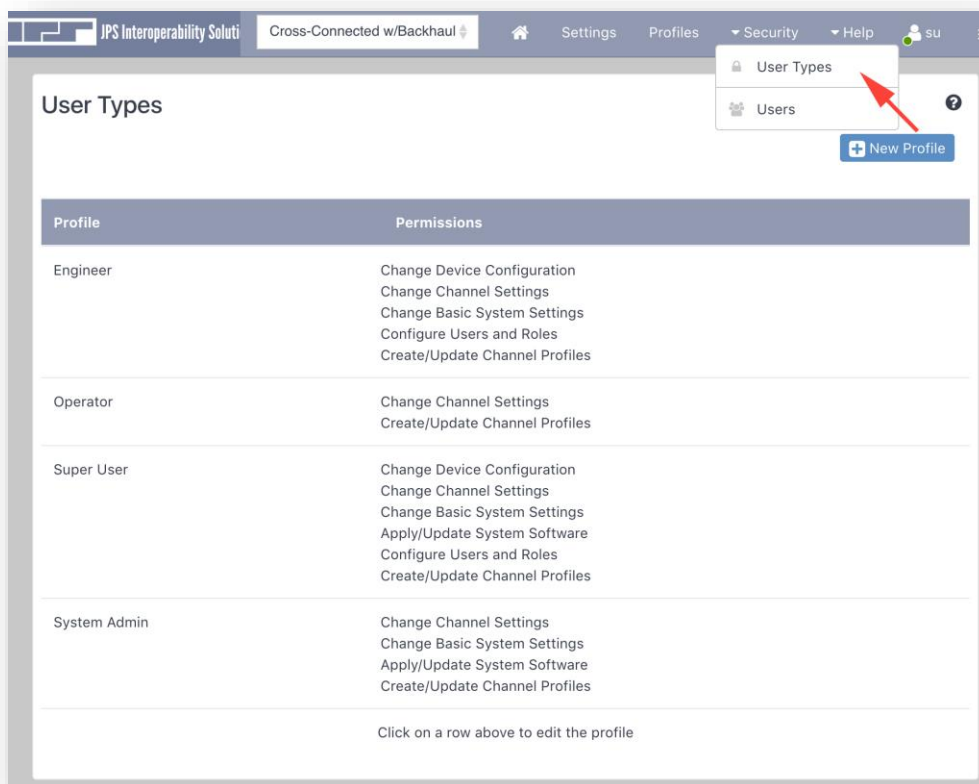
Figure 4-2- User Types – Permission Sets

The mechanism used to control related system security is to remove the tabs (along the top of the page) based on the User Type of the person logged in. Note below that user Benny, with Operator status, has access only to the Home, Settings, and (Channel) Profiles tabs.
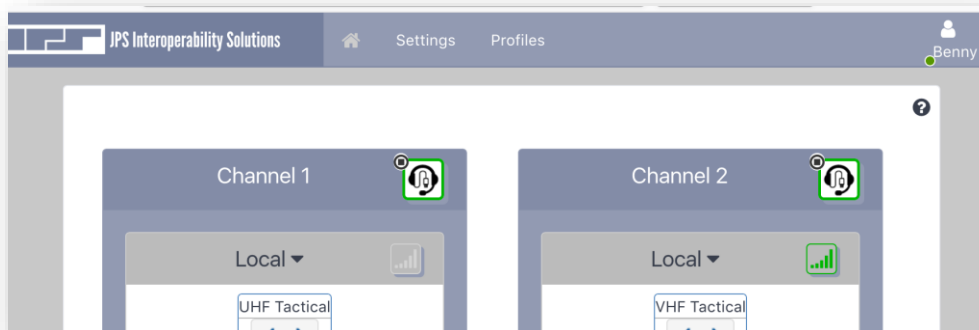
Figure 4-3- Access Limited by User Type

End of Section 4

5 RSP-Z2 Configuration

5.1 Basic System Configuration Selection

The RSP-Z2 supports three different configurations, as explained in Section 1.4, with a pictorial representation available from the Home Screen and repeated below. Select the desired configuration by clicking on the image or choose from the pulldown menu provided. Then click *Save* to apply the new configuration. The unit will do a quick reboot as it reconfigures itself, and then refresh the browser.
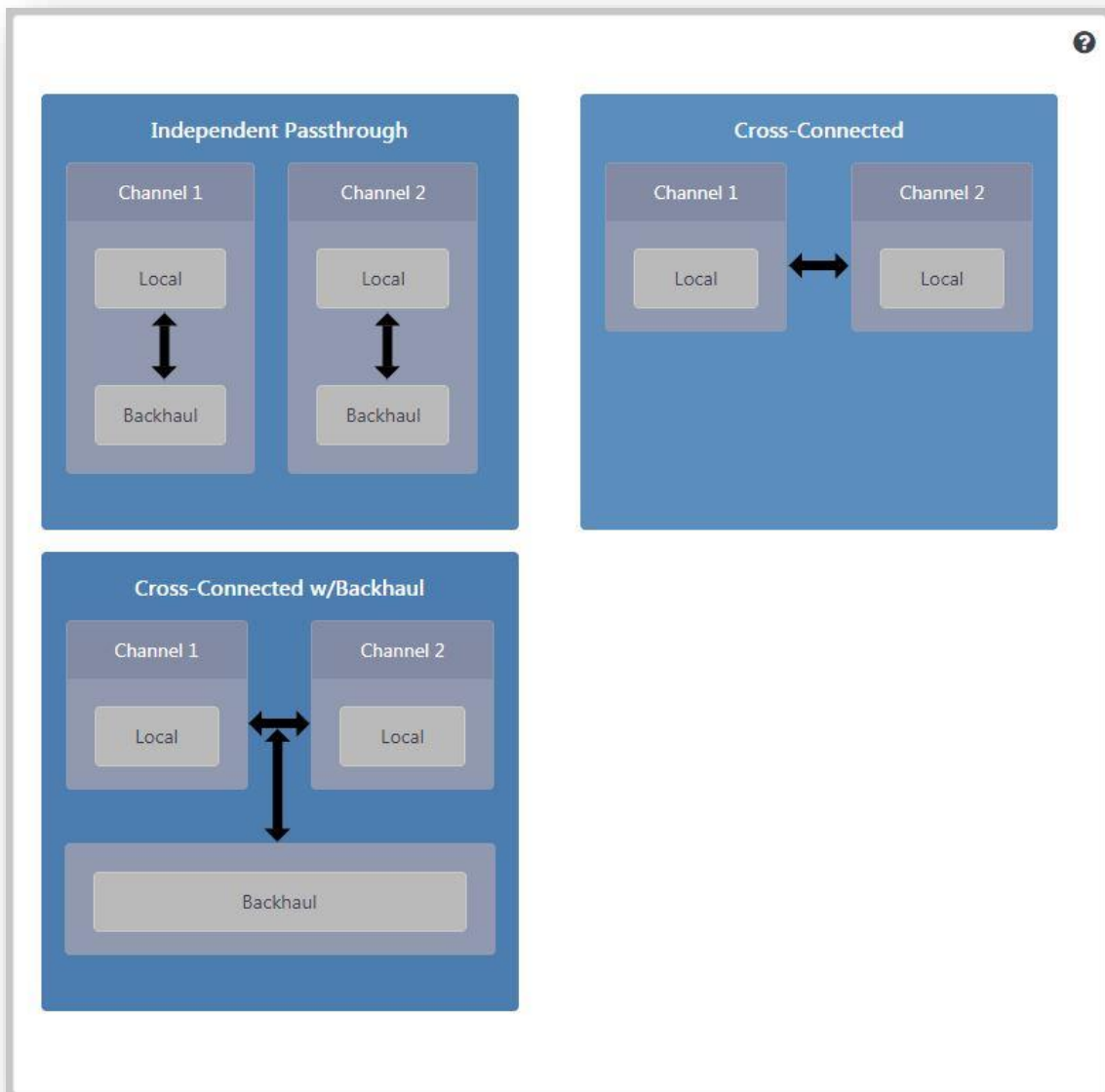
Figure 5-1 – Three Basic System Configurations

This section will illustrate basic setup, using the Cross-Connected with Backhaul configuration, with a final system that patches a pair of radios together and backhauls the audio via RoIP. After selecting and saving the Cross Connected with Backhaul configuration, the Home screen looks like this:
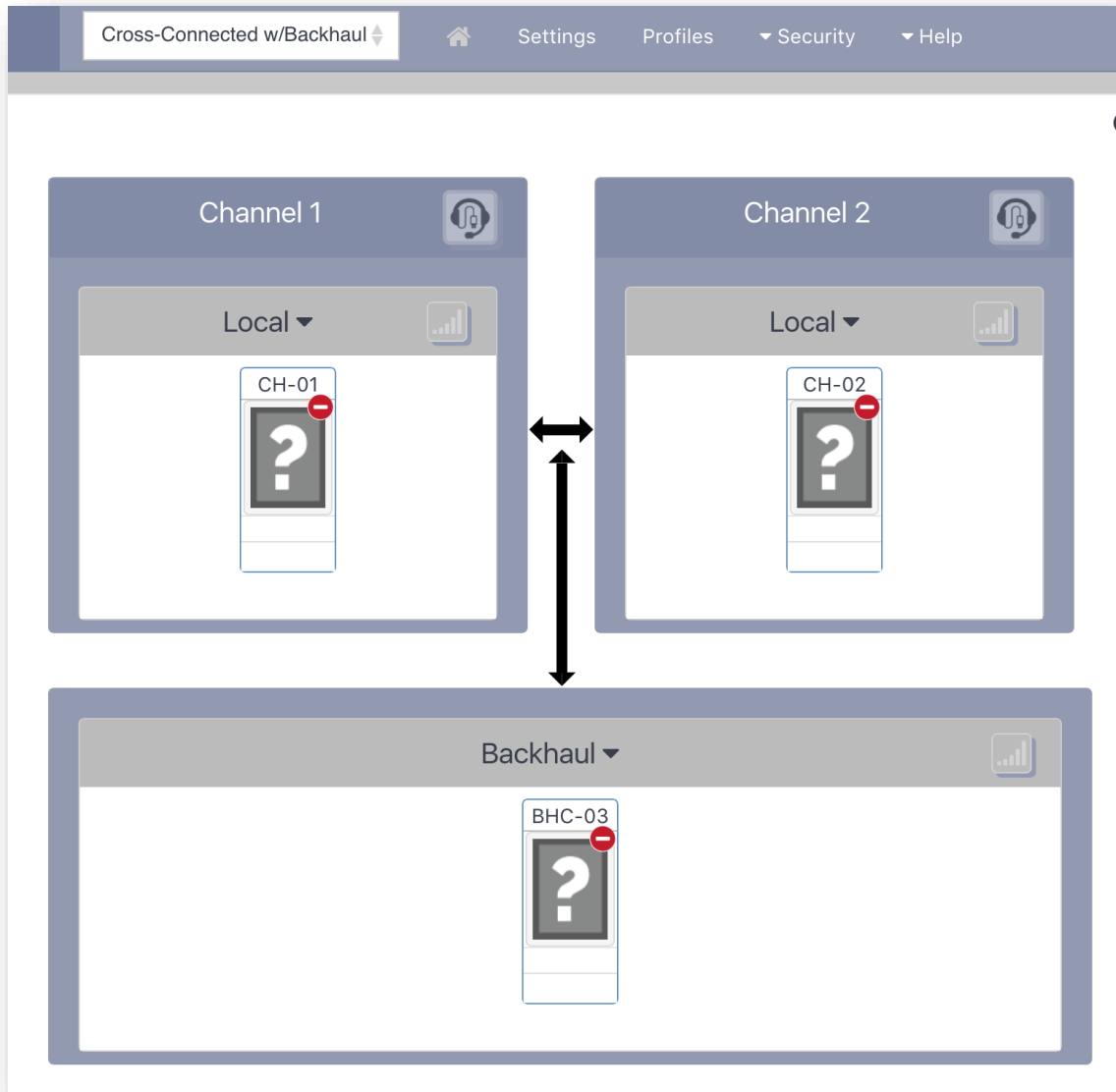
Figure 5-2 – System Configuration Prior to Channel Type Selection

Each channel shows a big question mark because we haven't yet selected what type of interface we want for each channel – that's the next step. Note the grey headset icons in the upper right corner of the two Local Channels. This shows that a USB handset was installed at power-up; if it hadn't been, these icons would not be present.

5.2 Channel Selection and Settings Configuration

The first step is choosing the channel type. To begin configuration of Local Channel one, right click on its icon within the System Configuration illustration, or simply go the *Settings Page* and click on the CH-01 icon. Either will bring up the *Basic Settings* options as shown below.
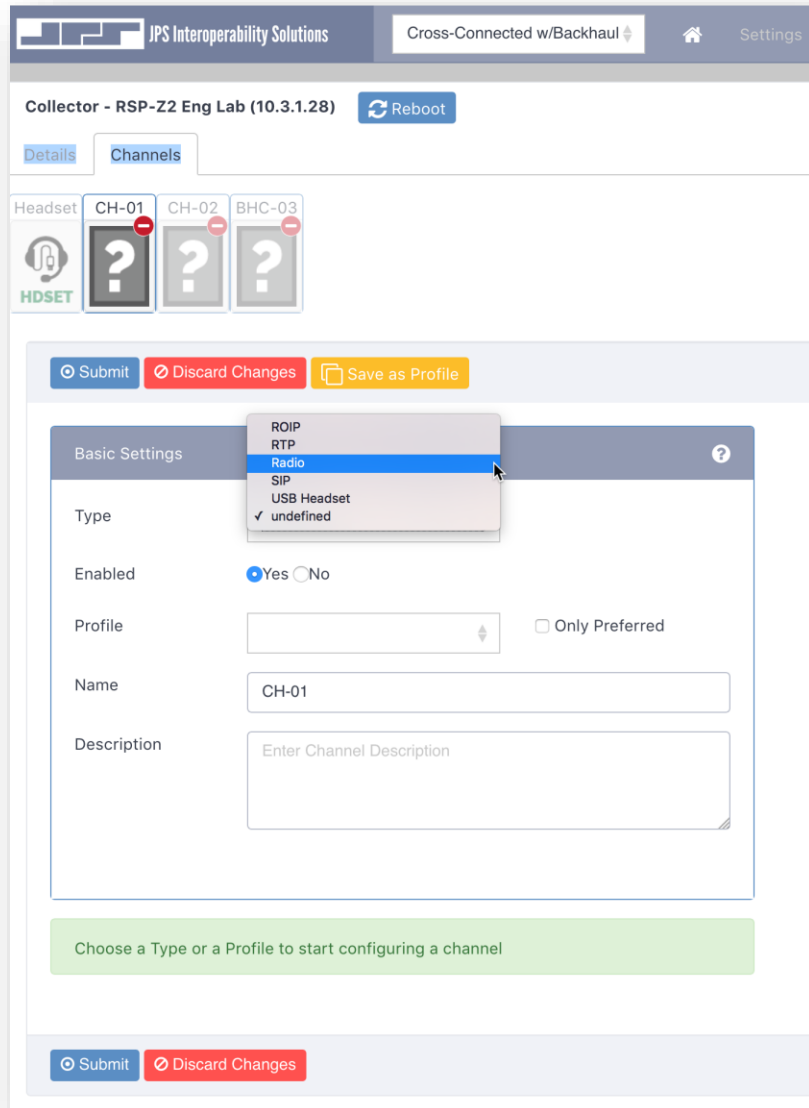
Figure 5-3 – Channel Type Selection

Note that the Headset channel is preset as a headset channel – it has no other Channel Type options. In the figure above, the operator has clicked on CH-01 to select it (note that it is highlighted relative to the other channels) and is preparing to select the Radio Channel Type from the options presented in the pull-down menu.

5.3   Channel Settings

Once the Channel type is chosen and saved via *Submit,* interface-specific settings appear. Our example is for the Radio Channel Type.

Channel Profiles are a useful tool and effective shortcut in channel setup. Settings options always start with the Default Profile for the selected Channel Type. The Radio Default Profile puts in place settings that work for a wide variety of radios, and the many JPS custom radio interface cables are designed to be in harmony, whenever practical, with these default settings. The default settings are only a start in a complete channel set up process.
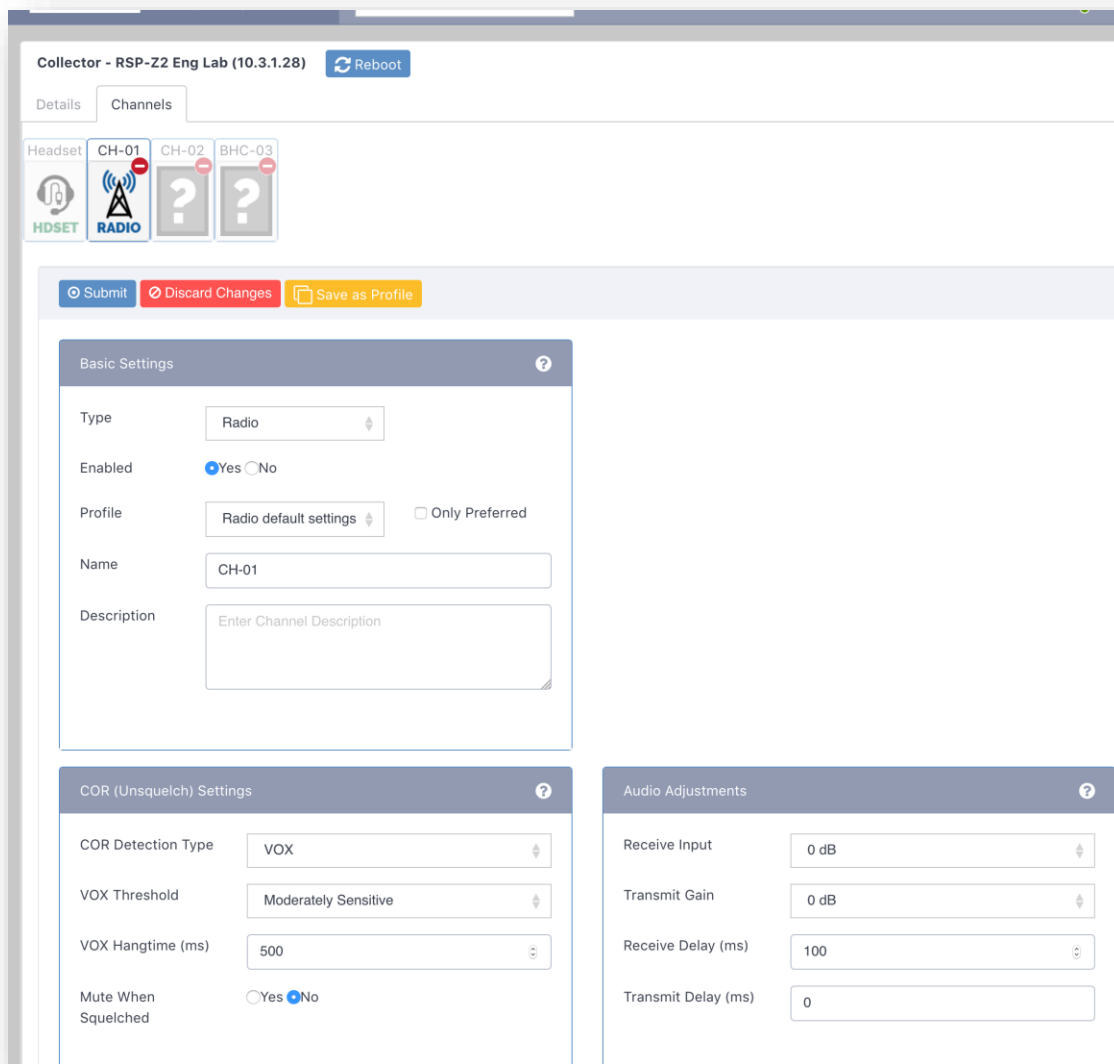
Figure 5-4 – Basic Channel Configuration

As is true throughout the system, context-sensitive help is available by clicking on the question marks found in the upper right corner of pages, and where appropriate, in individual sections. Note that all Channel Settings boxes have context-sensitive help.

Below is the Help Text for the COR (Unsquelch) Settings
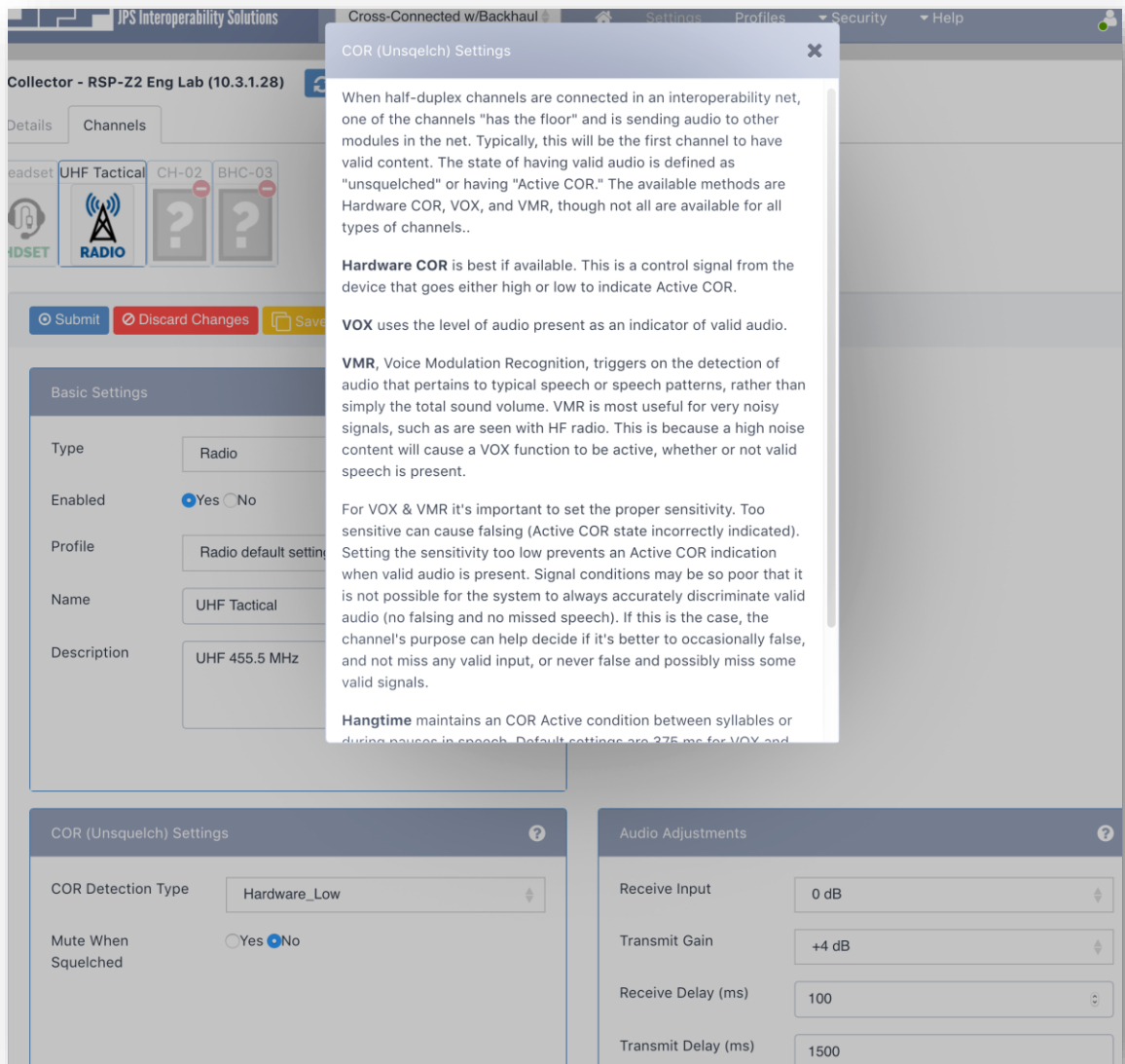
Figure 5-5 – Channel Settings Help Text

Note also that various manual changes have been to optimize this channel beyond the default settings. The particular radio used has a hardware COR output signal, so the Applications Notes provided with the JPS custom radio interface cable specify Hardware COR. The radio belongs to a trunked system, and testing confirmed that one and a half seconds is an appropriate delay to make up for the system's channel acquisition time. Testing has also shown that the radio transmitter needed a small amount of gain for full modulation. The channel has been given a name "UHF Tactical."

The figure below shows the Home Page for the fully configured system. Both Radio Channels have been set up, and the RoIP channel is configured and linked to a distant endpoint (as indicated by the green dot in the channel icon). Channels that have potential channel operations (such as *Disconnect* for the RoIP channel) show that action beneath the channel icon: clicking on the that action causes it to take effect.

Because the local channels are cross-connected, the headset is connected to both. In this configuration, all interfaces are connected in an interoperability net – both radio channels, the RoIP channel, and the headset. Audio from any of these is heard by all.

The front panel LED audio meter is measuring the internal audio input to Local Channel 2.

Figure 5-6 – Home Page for Configured System

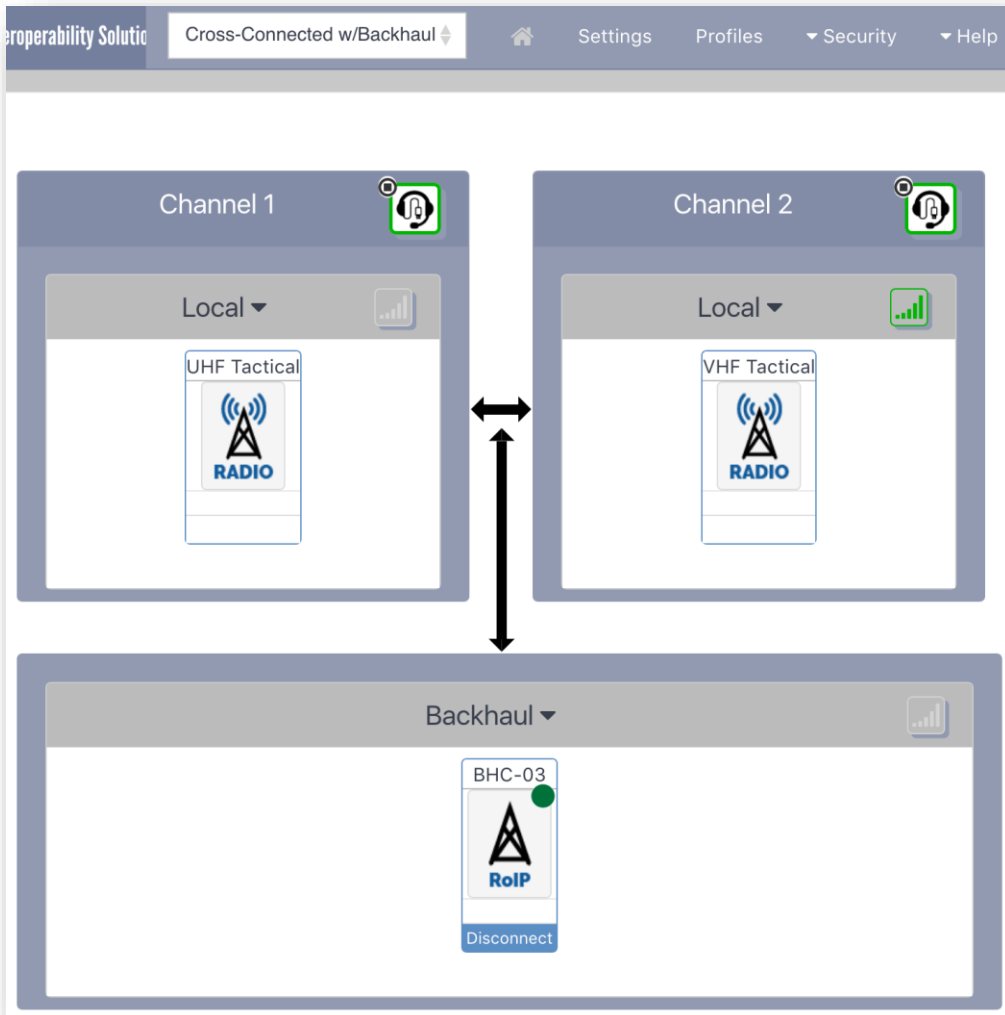See Section 6 for additional system setup instructions.

See Section 7.1 for additional information related to use of the USB headset.

See Section 6and Section 1.5 for information about the front panel audio level meter.

5.4 Channel Profiles

A Channel Profile is a predefined template for a channel's configuration settings.

One *Default Profile* exists for each channel type. They provide a basic, typical starting point for all the channel's settings for which this is possible (e.g., there is no such thing as a typical IP address). The Default Profiles provide only a good starting point for Channel setup and they are not intended to constitute a complete setup.

Radio Channel Profiles are particularly important due to the large number of different radio makes and models available. A set of Radio Profiles for commonly used radios is included within the unit. Each is made up of the settings that work best for a typical radio of the designated make/model – as tested by JPS Systems Engineering and as set up per the instructions in the JPS App Notes included with that cable, *when using the JPS cable designated for that radio*.

The App Notes can be vital for proper performance as they may include necessary instructions for adjusting the radio or modifying radio programming. Additional copies can be downloaded from the JPS website.
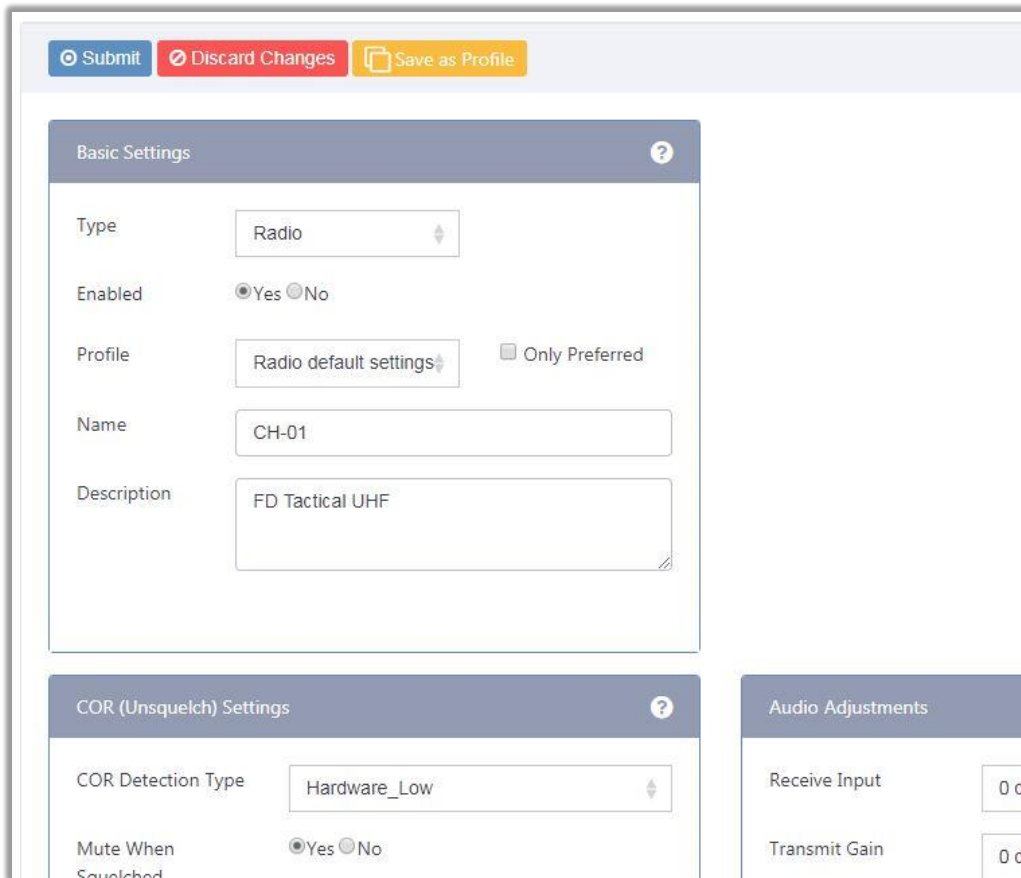
Users may also create their own *Custom Profiles.* This designation can be useful when a channel has been optimized for the user's system. The Custom Profile can be applied to another channel of the same type for quick identical setup. They can also be kept as a known working set of configuration settings that can be reapplied after temporary or exploratory settings changes are made for any reason, such as the need for longer audio delays during periods of congested radio traffic.

To make important or frequently-used profiles easy to find, some profiles may be designated as *Preferred Profiles.* For example, if an agency typically uses four different types of radios, Preferred Profiles can be created for these four. The system allows a search that saves time by including only Preferred Profiles.

Channel Profiles come into play on two of the RSP-Z2's pages, the Channel Settings page and the Profiles page.

On the Channel Settings page, when a Channel Type is first assigned, the Default Profile for that type of channel will be applied, along with the settings associated with that Default Profile.

We'll use Radio Profiles as an example, since profiles are most helpful for radio channels and many are included in the system database. If the device operator knows the type of radio that is being interfaced by JPS Custom Cable to the rear panel radio port, the operator can search for that cable's profile using the drop-down menu. *Note: The only profiles that will show up in any search are those that correspond to the selected channel type – in this example, Radio Profiles only.* If the operator knows that some Preferred Profiles have been designated, a selection box allows the profile listing to be limited to Preferred Profiles.

Figure 7 Channel Settings Page - Radio Channel Type

When the desired profile is found, select that profile and the associated settings will automatically be populated throughout the settings screen. Be sure to SAVE to make the changes take place. Also keep in mind that setting up per a Channel Profile is not the end of channel optimization. See Chapter 6 or the Help Document "RSP-Z2 Field Optimization Guide."

An operator may also save the current settings as a Custom Profile. Select "Save as Profile" and a version of the Profiles page will come up, giving the operator the means to associate useful and/or important information with the new profile. This includes a name, description, and version number for this profile. The operator may also designate this as a preferred profile and associate various devices (or other keywords) with the profile. This is particularly useful for radio profiles as it is common for multiple radio types of a given manufacturer to operate identically.
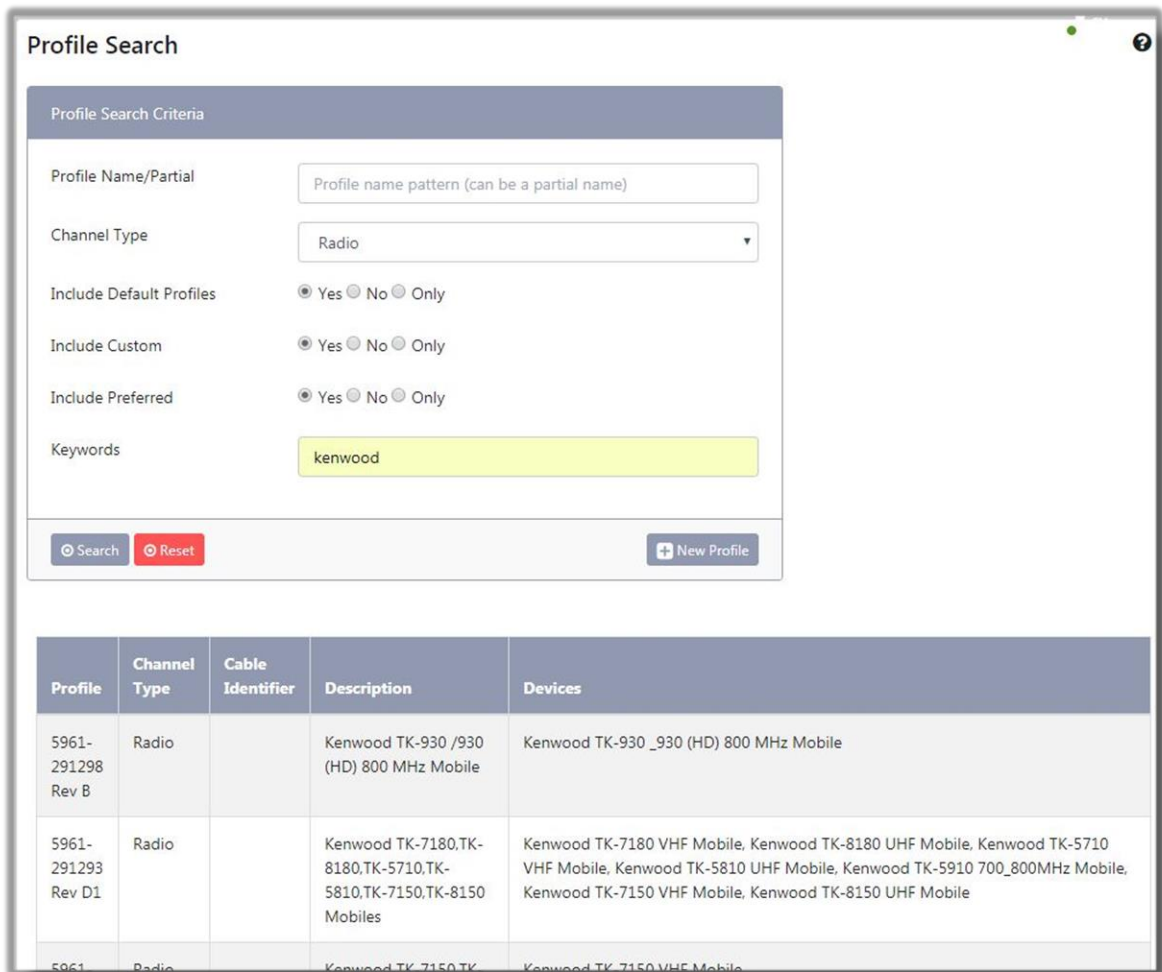
Figure 2 Profiles Page – Search for Existing and Create New Profiles

The Profiles Page provides a convenient search engine to locate a desired profile. The first step is to select the Channel Type. If the Search button is clicked at any time, all names of Profiles that fit the chosen criteria will be displayed. For example, if the only criteria selection made is to choose the Radio Channel Type, all radio channel profiles stored in the unit will be displayed.

It may be useful to limit the search by removing from consideration, or searching only for *Default, Custom,* or *Preferred* profiles. If you know any part of a desired profile's name, enter it in the top selection box. Keywords (such as device type, or the JPS cable part number) can be entered in the lower selection box. Pressing *Search* at any time will bring up all profiles that match the designated criteria. The figure above shows all Radio Channel profiles whose descriptions or device names include the word *kenwood*.

New profiles can also be created here. This allows you to provide a new name and/or other changes to an existing profile. This can entail simply making a profile easier to find (by custom name or designating as preferred) or including minor settings changes that optimize a profile for better operation in a given environment.

5.5 *Channel Profiles Basic Information*

- Profiles are templates of configuration settings for the RSP-Z2 channels and can greatly speed the setup process. Applying a profile configures the channel to match the profile's stored settings.

- Profiles can't include all settings for every channel, or the optimal settings; additional setup is required.

- Application of a profile is the best first step in configuring a channel, but further optimization on an individual channel basis is vital for best operation

- Default Profiles exist for each channel type, and, where possible, configure a channel to reasonable initial settings.

- A large set of Radio Channel Profiles is included. The profiles conform to the radio interface cables, sold by JPS, and optimized for use with over 300 radio makes and models.

- System users can create and save their own Custom Profiles.

- Custom Profiles can be given Preferred status to simplify profile searches.

- Default Profiles and JPS Radio Profiles cannot be deleted or modified. It's important that if JPS Customer Service assists with channel setup, there is a known basis. *However:*

- Custom Profiles can be created that are based on Default Profiles or JPS Radio Profiles, and modified as desired, but the Custom Profiles cannot replace the Default or JPS Radio Profiles.
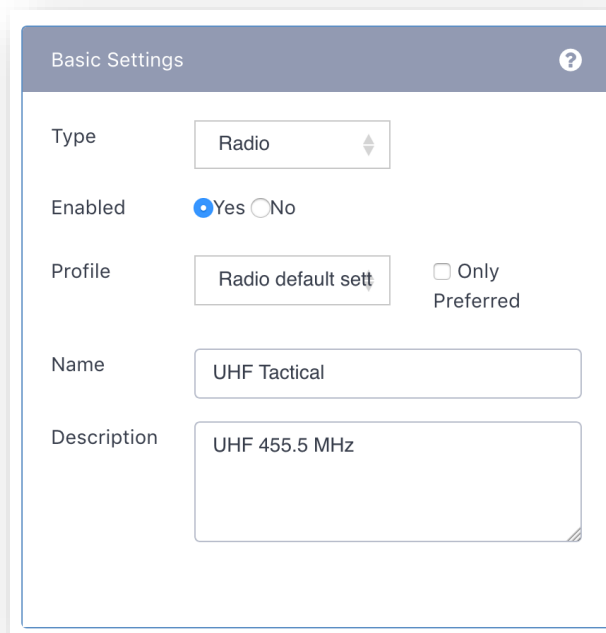
Note: No settings are applied until the Save Configuration button (at the bottom of each Channel Configuration page) is pressed.

5.6   Channel Settings – Universal

The *Basic Settings* and *Audio Priority* settings boxes are used with all Channel Types.

5.6.1 Basic Settings

The Basic Settings are universal for all channel types, mainly they define what type of channel it is, what it will be named, and whether it is currently enabled.

Basic Settings

Type — Radio

Enabled — ● Yes ○ No

Profile — Radio default sett   ☐ Only Preferred

Name — UHF Tactical

Description — UHF 455.5 MHz

Figure 5-8 – Basic Settings

The Radio Type must be the first selection when setting up a channel. Available types for the Local Channels (which can be associated with the two rear panel analog ports labeled *Radio 1* and *Radio 2)* include Radio, USB Headset (both analog) and also RoIP, SIP, RTP, and VIA (for the JPS VIA Smartphone PTT over Cellular app). Backhaul Channel options are RoIP, SIP, and RTP. A future version of the RSP-Z2 will also provide a PSTN channel option on the analog side, giving telephone users the ability to dial in to the RSP-Z2 and be patched into either or both of the radio ports. All of these Channel Types will be fully explained in subsequent sections.

A *Disabled* channel is set to non-functional. Reasons for disabling so could be, for example, to remove a non-functional radio that is stuck keyed, or simply to remove a radio system temporarily from an interoperability net made up of other unit interfaces.
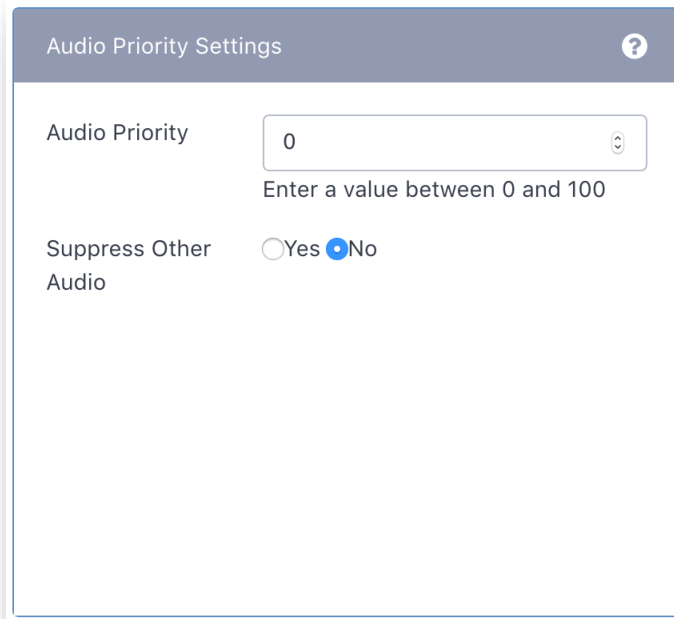
Channel Profiles are explained in Section 5.4.

The *Channel Name* will appear in the Channel Icon on the Home Page (or a truncated version if the name is too long).

Consider the *Channel Description* as simply a place to keep notes about a channel.

5.6.2 Audio Priority

For individual RSP-Z2 units, use the *Audio Priority Settings* only for a situation like the example sited below. This feature has much more utility for wide area interoperability systems that include this RSP-Z2 along with many other JPS Interoperability Solutions radio gateways.

Figure 5-9 – Audio Priority Settings Box

The *Audio Priority* feature allows half-duplex channels with more important audio to be heard over others. Typically, the first half-duplex channel to detect an active COR condition will be heard by all other connected channels, and the others can't cut in before the initial channel goes inactive.

A channel with higher priority will "win" if two channels get active COR at the same time.

If *Suppress Other Audio* is enabled, this channel will preempt any currently active lower-priority channel.

A potential use would involve an RSP-Z2 in the Cross-connected with Backhaul configuration, using a USB headset, where the headset channel has higher priority. The headset user can break into an ongoing transmission from a radio user. Note that the radio user, whose radio is in TX mode, will not be able to hear the audio from the headset until the radio is taken out of TX mode. However, all other system interfaces (the other radio channel and the backhaul channel) will hear the headset audio.

5.7 Local Channel Settings – USB Headset

The USB Headset requires only a few settings options, all controlled via the single settings box shown below. The USB headset default settings should be appropriate in most circumstances.

The USB Headset has two *COR Types*, VOX (as shown below) and PTT. The *COR Type* determines what type of control signal will indicate that a valid audio signal is present. This is important because whenever COR is active, the headset audio will be retransmitted from all RSP-Z2 channels that the headset is cross-connected with.

VOX uses the level of audio present in the microphone to determine when COR is active. When PTT is selected instead, the VOX Threshold and Hangtime settings don't come into play. PTT may be useful in noisy environments where the background noise might cause errant transmit sequences. PTT mode requires that the user click & Hold on the Headset icon to key.

See the operating instructions of Section 7 for full information related to USB Headset operation.

The proper *VOX Threshold* depends on mic audio level. More sensitive will pick up lower level audio while less sensitive will require louder audio before tripping the VOX. Adjust Microphone Gain first, as it affects where the threshold should be set.

VOX Hangtime holds the VOX indication active between syllables or during pauses in speech. It should be set no lower than around 350 ms.

Set the *Microphone Gain* and to proper levels. The front panel Level Meter should occasionally flash red on voice peaks, and the *Earphone Gain* earphones should be at a comfortable level.
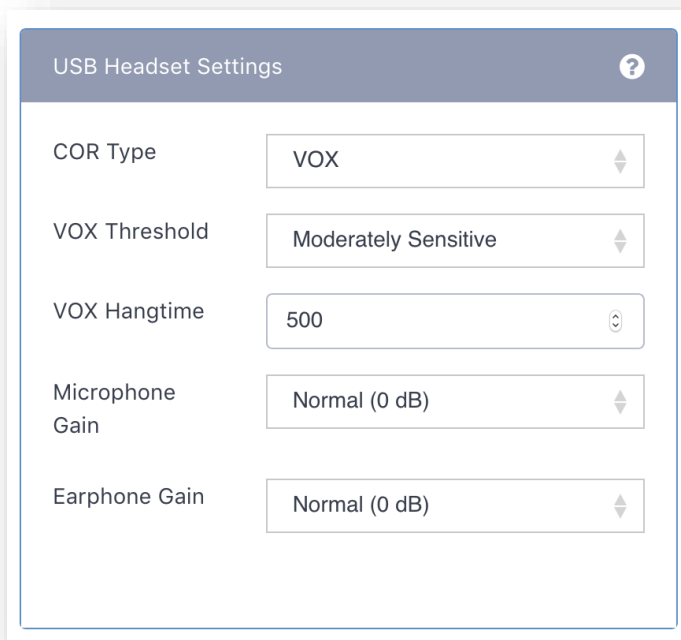
Figure 5-10 –Headset Channel Settings

5.8   Local Channel Settings – Radio

Again, the first step in setting up a radio Channel is Channel Profile selection. If the radio being used has an associated profile, follow the settings in that profile and perform any instructions in the Radio Applications Notes. See Section 6 for more details.

The instructions below assume that there is no specific profile or Applications Note being used, and the operator is starting with the Radio Defaults Profile.

The Radio Channel has more settings options than does the USB Headset. Most important is the *COR Type* setting. The Radio Channel has three COR Types, adding VMR to the VOX and PTT available with the USB Headset.

These three options are selectable from the *COR Detection Type* pulldown menu. When any one is selected, the related options are made available below it. The figure below shows how the COR (Unsquelch) Settings box looks after each of the three detection type selections.

Again, the *COR Type* determines what type of control signal will indicate that a valid audio input signal is coming in from the radio. This is important because whenever COR is active, the radio receive audio will be retransmitted from all RSP-Z2 channels that the Radio Channel is cross-connected with.

Note: The radio channel interface can be used for any four-wire audio device, not only radios.
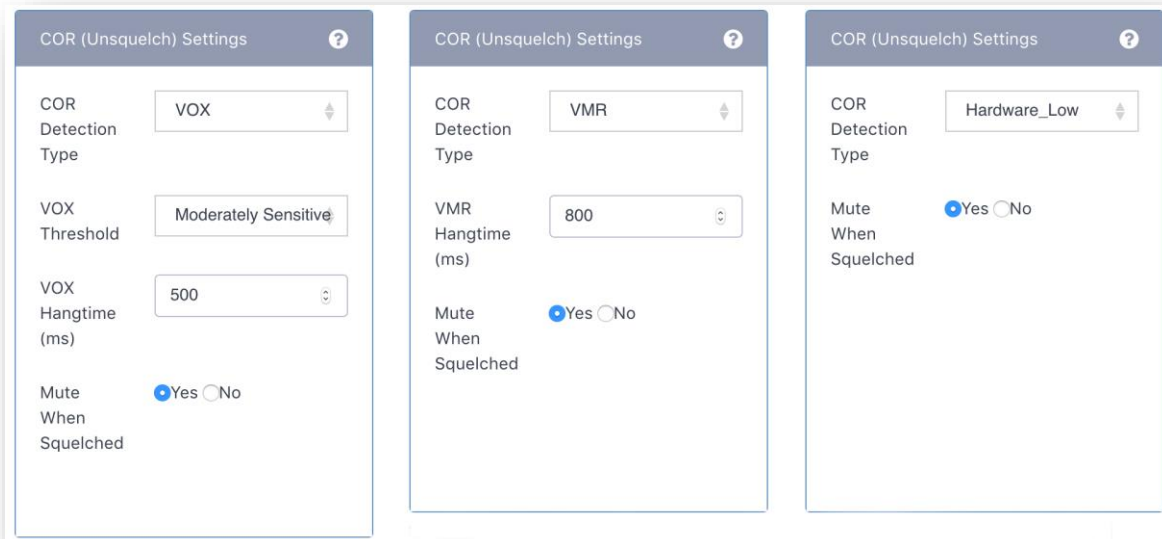
Figure 5-11 –Radio COR Settings Options

The first step is to select the appropriate COR Detection Type.

Hardware COR: If the radio (or other four-wire device) has a COR (unsquelch) output, this should be used as it's the surest and easiest to set up method. The RSP-Z2 can handle either an active low (typical) or active high Hardware COR signal.

VOX: This COR Detection type uses the level of audio signal present to determine if a valid signal is present. When a Hardware COR signal is not available, VOX is the best method, as long as most of the audio coming in consists of speech (or other signal that you want to be detected as valid).

VMR: Voice Modulation Recognition triggers not simply on the audio level, but on the values of various speech-related components available within the audio. VMR is the best COR Detection method for noisy audio, such as is present with HF radio signals. The sophisticated VMR algorithm takes longer to make a determination of valid audio than does VOX, therefore it requires additional RX audio delay.
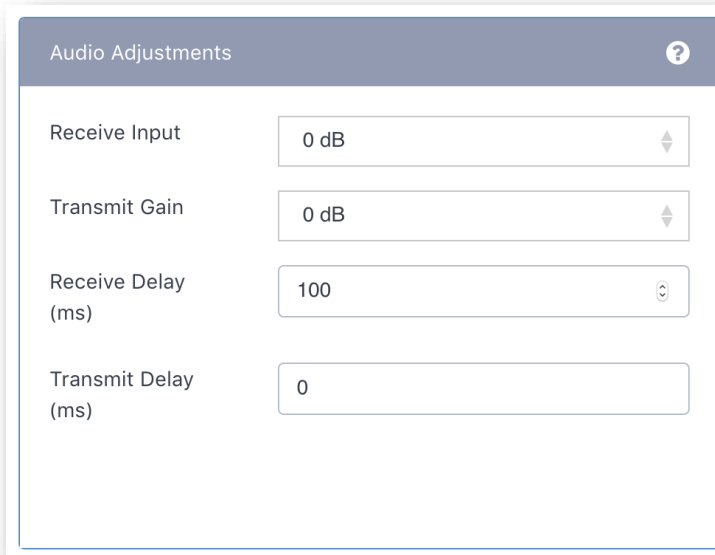
Both VOX & VMR require some hangtime, which maintains COR active between syllables or pauses in speech. Without hangtime the retransmission of this incoming audio would be choppy. Differences in the VOX & VMR algorithms necessitate different minimum hangtimes; 180 ms for VOX and 800 ms for VMR. Minimum allowed hangtime is 3 seconds for each. Default settings are 500 ms for VOX and 800 ms for VMR. Maximums are 3 seconds for both.

VOX also has a threshold setting. The default setting should typically work, but if incoming speech doesn't consistently trip the VOX, increase the sensitivity. If the sensitivity is set too high, the system may activate on environmental noise.

The *Mute When Squelched* option determines whether audio is available for monitoring even if active COR is not detected. This is a future feature option.

The context-sensitive help information provides further information and guides proper

Radio Channel settings also include *Audio Adjustments.* These vary the levels of the receive and transmit audio and allow delays to be applied to them. Again, if there is an associated Radio Channel Profile, refer to it for initial settings (but further optimization may be helpful).

Figure 5-12- Radio Channel – Audio Adjustments

Receive Audio Input adjusts the level of audio coming into the RSP-Z2, with the intention of raising or lowering to achieve the optimum internal level of approximately 0 dBm. Note that the level settings for the RSP-Z2 are identical to those of other JPS gateways.

To verify proper setting, set the RSP-Z2 front panel audio level meter for the radio channel being set up; monitor it and/or the front panel Signal LED for that channel. While receiving audio from someone speaking at a normal level, the signal level should flash red on occasional voice peaks. It shouldn't be lit continuously while speech is coming in, but a normal speaking level should create occasional flashes. If the incoming speech never causes red flashes, drop the Receive input level setting until it does. Conversely, if all speech causes red Signal LED flashes, raise the Receive input level until the flashes are occasional only.

Transmit Gain raises or lowers the nominal 0 dBm TX output audio signal as needed for full transmitter modulation.

Receive Audio Delay buffers up the incoming audio until the set time passes, and then begins spooling it out. Its purpose is to hold up incoming audio until the system is ready to use it. Most important is to hold up the audio until COR Detection can occur, otherwise some of the incoming audio can be clipped.

Different types of COR Detection require different minimum Receive Audio Delays. There is no minimum for Hardware COR. The VOX minimum is 100 ms and the 300 is the minimum delay for VMR mode. These are the default settings also. Maximum allowed delays are

Similarly, the *Transmit Audio Delay* holds up the outgoing audio until the *external system* is ready to use it. A good example is when the donor radio cabled to one of the RSP-Z2 outputs is part of a trunked radio system (see Figure the illustrations in the overview in Section 1-3). When this radio is keyed, nothing happens until the trunking system acquires a channel for that transmission. Transmit Audio Delay should be set long enough to hold up the outgoing audio until the donor radio has acquired the channel and is ready to transmit it. Similarly, for a conventional repeated system, a shorter delay is needed; enough to hold up the audio until the repeater can key up.

See Section 6 for field system optimization instructions.

5.9 Backhaul Channel Settings – RoIP, SIP, RTP, JPS VIA

Each of these channels has extensive context-sensitive help to assist with channel setup. All also have a Default Channel Profile, but unlike for the Radio Channel, no custom profiles are prestored on the RSP-Z2 (but can be created by system users if so desired).

For JPS VIA, keep in mind that outbound port forwarding must be set to match the VIA port.
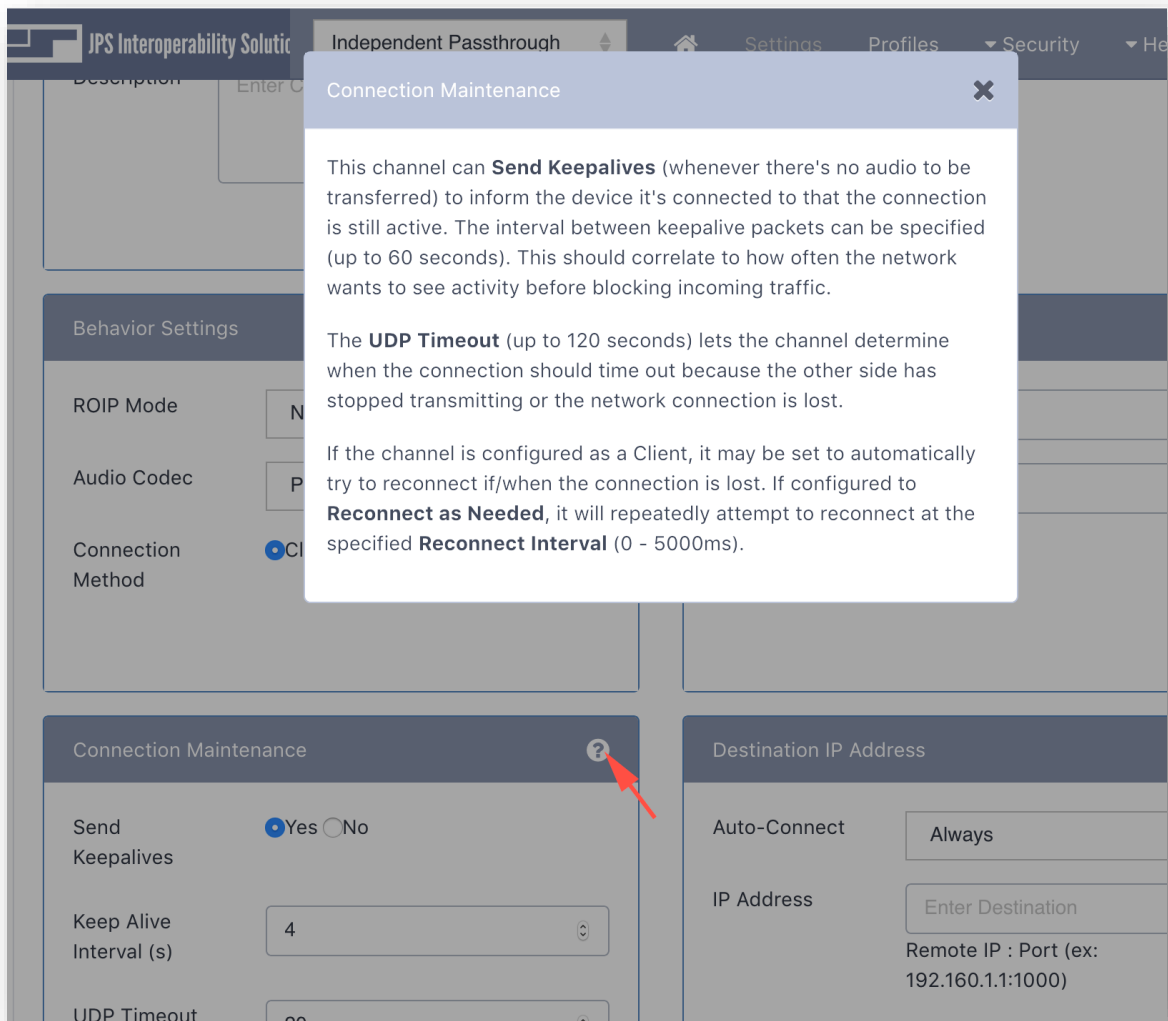
Figure 5-13- Context Sensitive Help Example – RoIP Channel Settings

5.10 Returning Configuration and Channel Settings Back to Factory Defaults

It's possible to return the basic unit configuration back to the factory default settings. This action can only be performed by a *Super User* user type. The action resets the channel configuration and all of the channel types and settings back to "undefined" – it does not erase any custom profiles, user types, or the user database.

The operation is fairly simple – select the *Undefined* configuration. Note the *Save* button and the cautionary text at the bottom of the figure. These are available only when a *Super User* user type is logged in. After selecting *Save,* the unit will reboot with the undefined channel configuration.
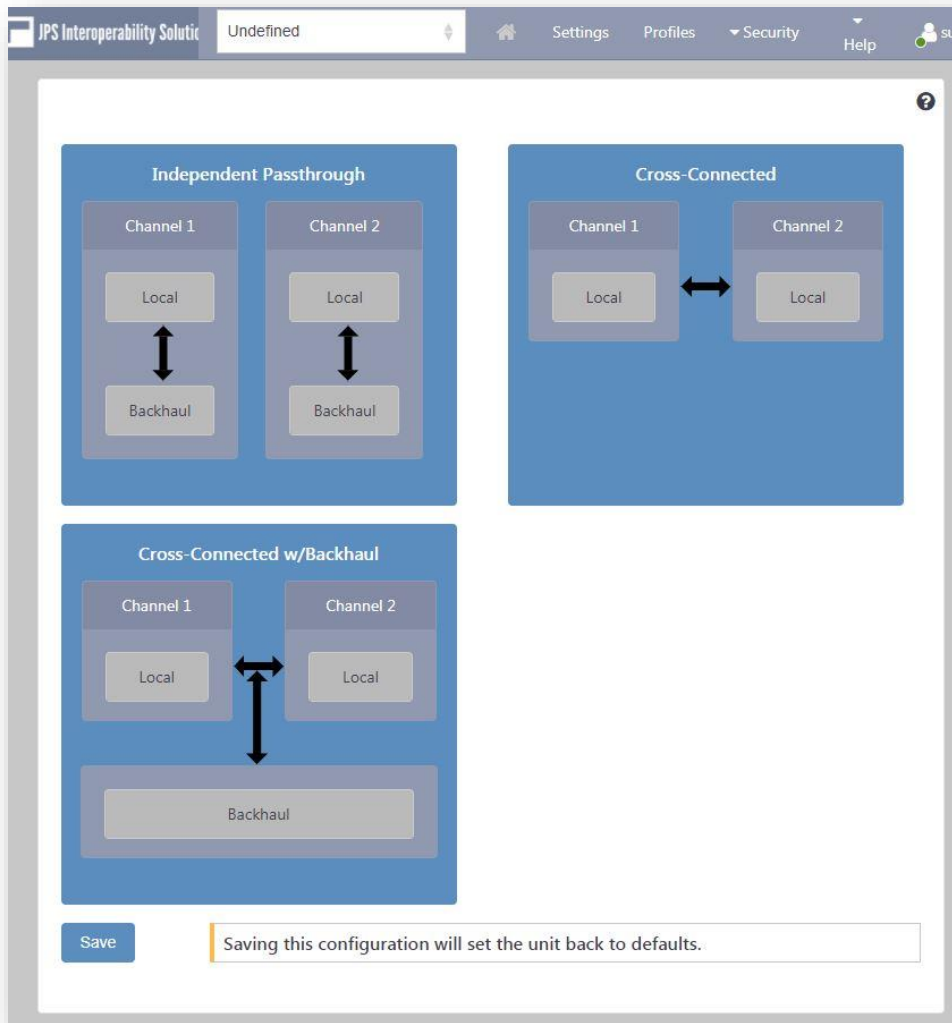
Figure 5-14 Returning Configuration to Factory Default Settings

End of Section 5

6 Field Setup & Optimization

The purpose of this section is to assist with the adjustments and "tweaks" of the analog for best performance with the varying radio systems encountered in the field.

There are several paths to optimization, based on the following. Most important is:

- Are you using a JPS Custom Radio Interface Cable or creating your own interface cable?

Of lesser importance:

- Are you able to locate a JPS Channel Profile within the RSP-Z2 that corresponds to the type of radio being interfaced?

- Are you also using one of the Plantronics USB Headsets certified for operation with the RSP-Z2? *See Table 1-4 – Optional Equipment - Not Supplied*

Some explanation of these options/paths:

The ***JPS Custom Radio Interface Cables*** were designed by JPS Systems Engineers who investigated the radio's analog interfaces, then designed an appropriate interface between the radio and the JPS equipment, and verified it in the lab. Some interfaces are simple, others not so. Some require DC blocking capacitors or unusual level-setting networks. The JPS cables include a small circuit board that contains every type of matching/interface network ever required while interfacing hundreds of different radio makes & models.

Along with each JPS radio interface cable is an Applications Note specific to the type or types of radios associated with that cable. The Application Note lists the basic settings to optimize the interface within the JPS equipment in tandem with the cable. Just as importantly, it lists any radio programming, or switch/level settings required at the radio for proper operation. It is always the best option for interfacing a radio to the RSP-Z2 or other JPS equipment

The ***JPS Channel Profiles*** speed this process by automatically setting the RSP-Z2's radio interface configuration options to those listed in the Application Notes that accompany the cable. These settings are only correct when using the JPS cable. Note: Users can also create & save their own profiles.

A ***USB Headset*** can be helpful because it can be used when setting up any other interface – a known good interface (the headset) to a (yet unproven) interface. For example, assume there a problem is encountered when interfacing a pair of radios to the RSP-Z2, or interfacing a radio to an RoIP backhaul channel. Use of the headset, connected individually to each of the channels in turn, will quickly identify the problematic channel. Best is to initially set up and optimize each channel while it's connected to just the headset – and only then connect the other two (now fully proven) channels to each other.

It's easy to see how the headset can help, particularly if difficulties are experienced, but it is certainly not required.

6.1 Radio Interface Using JPS Custom Radio Cables

This section will assume that a JPS radio interface cable is used. See the next section if not.

The cable should easily connect to the radio; many are built by splicing a cable manufactured for the specific radio to the appropriate signal lines on the JPS cable.

Follow the instructions of the Application Notes that came with the cable. If the notes are missing, simply download a new set from the JPS Interoperability Solutions website. Included in the Application Notes are:

- Configuration settings for the Radio Channel, optimized for the JPS Cable when used with the associated radio. Note that Applications Notes were created for use with a variety of JPS gateways; pay attention only to the configuration settings available on the RSP-Z2 Radio Channel Settings Page.

- Changes that may be required or suggested for the radio itself; either in its configuration or programming.

If you apply the Channel Profile for the radio, the profile will automatically apply the appropriate configuration settings.

Next step is to take care of optimization and/or settings that must be set in the field. Most of the following are best accomplished using a test count from another radio that's communication with the donor radio cabled to the RSP-Z2. Listen in a USB headset or to another device cross-connected via the RSP-Z2 with the donor radio.

6.1.1 RX Audio Level (Receive Input):

Some minor adjustment may be required, mainly due to radio-to-**radio variations. A way to make sure the level is correct is to:**

- Associate the RSP-Z2 Front Panel Level meter with the donor radio interface.

- Use a second radio to communicate with the donor radio. Speak into the microphone of that radio in a normal voice level. The RSP-Z2 level meter should flash its red (top) LEDs occasionally on voice peaks. Adjust if it never or constantly flashes red.

- Note: The Receive Input levels in the RSP-Z2 GUI indicate the actual level of audio being received. If the incoming level is -12 dBm, the Receive Input setting of the Radio Channel should be set to -12dB. This must be understood to know which way to change the audio level for proper operation. If the Radio Channel, when set to -12 dB, is not receiving enough audio, the number in the GUI must be set to a lower number to correspond to the actual input level. The RSP-Z2 will then apply additional gain/reduced attenuation

6.1.2 TX Audio Level (Transmit Gain):

Set to properly modulate the donor radio transmitter. Audio coming from the donor radio, when doing a normal voice volume radio count, should be heard in the field radio at the same level as received conversations from other radios in the system (as heard in the field radio).

- If you have a headset, cross-connect it with the radio interface so that speaking into the headset causes the donor radio to transmit.

- If you do not have a headset, the you will need to cross connect another channel that has its RX audio level properly set up (the second radio channel, or a backhaul channel.

Note: Doing the RX level adjustment before setting the TX audio level (or using a headset) and verifying it via the level meter will help prevent a mutually-erroneous condition where a too-low RX audio input is compensated by a too-high TX audio input on a cross-connected channel. This condition is particularly troubling whenever a third interface is introduced to the system − its incoming audio will be too low for one of the mutually erroneous interfaces and too high for the other.

6.1.3 VOX or VMR threshold:

Either threshold may benefit from optimization (either more or less sensitive) due to system variations or user preferences. More sensitive means less audio level (VOX) or characteristics related to human speech (VMR) must be detected for the incoming audio to be declared valid. Less sensitive is of course the opposite. Increased sensitivity makes it more likely that falsing (declaring the input valid when it is not) will occur; decreased sensitivity increases the potential that valid speech may be missed. Changes may be desired due to level of static on the channel, quiet talkers, or desire to never miss any audio, even if some falsing occurs.

6.1.4 Transmit Audio Delay

If the donor radio is used with a trunked radio system, it may be necessary to adjust the TX audio delay. If initial syllables are missing in the RX audio of the field radio (when listening to transmissions from the RSP-Z2/donor radio) increase the TX audio delay of RSP-Z2 analog interface connected to that donor radio.

Explanation: When a radio user initiates a transmit sequence for a trunked radio, that user depresses the PTT switch on the radio, which sends a signal to the system's trunking controller, asking to be assigned to a free (not currently busy) channel. The trunking controller sends a signal back to the user's radio that automatically sets the radio to a free channel, and signals this to the radio user by tone called a *channel acquisition tone* or simply a *go-ahead* tone. The trunked system radio user is trained to not begin talking until this tone is heard.

Unfortunately, this tone can't be heard by users on other systems that are cross-connected by the RSP-Z2 to the trunked radio system. They simply begin talking, if n a non-radio device, or if using a non-trunked radio, they simply press PTT and begin talking. TX audio delay on the donor trunked radio channel holds up the audio, storing it in a buffer, until enough time has gone by for a typical channel acquisition time to have elapsed. See Section 1 of the Operations and Installation manual for a more complete explanation, including diagrams.

This test is best done when talking into a USB headset that is cross-connected with the radio interface. The reason is that use of the headset precludes any chance that any audio is missing initial syllables *before* being sent to the donor radio to be transmitted to the trunking system.

RX Audio Delay must be increased if initial syllables are clipped on incoming audio of a Radio Channel; see below. If you are using a cross-connected radio channel instead of a headset, and additional increases in TX Audio Delay have no effect on missed first syllables in the field radio, then it may be necessary to increase the RX Audio Delay in that cross-connected Radio Channel. An uncommon but possible condition.

6.1.5 RX Audio Delay

Delay in the RX audio occurs by processing the COR detection immediately, but holding the incoming audio in a buffer and spooling it out after the set delay time. This resolves the (uncommon) condition for a Radio Channel where the COR indication or detection occurs late and initial incoming syllables are therefore clipped.

The RSP-Z2 Radio Channel interfaces are designed to prevent this as well a practical, through proper design of the various COR Detection algorithms and by including a minimum 100ms RX Audio Delay, but additional delay can be added if needed.

6.1.6 Audio Levels and Delays for Transport Channels

There are no associated configuration options for RX or TX level settings, or to change RX or TX audio delays for the digital transport channels – RoIP, SIP, RTP, VIA. These channels send the digital representation of the audio signal at whatever level it was in the sending (TX) side. Modifying the levels or delays is done at the audio input or output channels.

For example, if a pair of RSP-Z2s is used to connect radios via IP that are on opposite sides of the world, if the RX input of each radio is correct, the level received by the distant radio on the other side of the RoIP link will be correct

6.2　Radio Interface Using Customer-Designed Radio Cables

For customers who plan to create their own radio interface cables, JPS strongly recommends using the Unterminated Radio Cable, JPS P/N 5961-291115. This shielded cable includes the D15 end of the cable that plugs into either of the RSP-Z2 analog ports, along with the small PCB that's in other JPS cables – this circuitry has a variety of variable attenuating, terminating and DC-blocking components; essentially everything that JPS Systems Engineers have deemed necessary to interface any of the several hundred types of radios they have created custom cables for. This seven-pin cable is unterminated on the radio side, allowing radio specific portion of the cable to be spliced on.

The Application Notes for this cable, available for download like all other JPS Custom Radio Cables Application Notes, contains information to help in the cable design and, in particular, explains how to determine which of the various configuration options is best (e.g. how to decide how to choose between the COR options of VOX, VMR, or Hardware COR?).

This useful information will not be repeated in this document.

Note: Older versions of the Unterminated Radio Cable Application Notes relate to its use with the ACU-1000 or ACU-T gateways. All relevant information applies to the RSP-Z2.

6.3 Radio Interface Troubleshooting Tips

6.3.1 Symptom: User in Field Complains of Missed First Syllables

Cause: Donor radio is trunked, need to compensate for Channel Acquisition Delay

Cause: Slow-to-key transmitter on donor radio

Cause: Secure donor radio, need to compensate for encryption or scrambling

Solution: Increase TRANSMIT AUDIO DELAY of the RSP-Z2 Radio Channel supporting the donor radio

6.3.2 Symptom: User in Field Complains of Missed Syllables Mid-Conversation

Cause: Dropout from Radio Channel using VOX or VMR COR Detection Type

Solution: Increase VOX or VMR HANGTIME of the Radio Channel supporting the donor radio

Solution: Increase VOX or VMR THRESHOLD of the Radio Channel supporting the donor radio

6.3.3 Symptom: Continuous Ping-Pong of COR / PTT between Cross Connected Radios

Cause: "Ping-Pong" is caused by the tendency of some radios to temporarily unsquelch at the end of a transmit sequence. This momentary Active COR condition in a donor radio (Radio 1) will cause a momentary transmit sequence in any devices that are cross-connected to that donor radio. If one of the cross-connected devices is another donor radio (Radio 2) with the same "momentary unsquelch at the end of a transmit sequence, then the Radio 1 momentary unsquelch keys Radio 2, whose resulting momentary unsquelch keys radio one in a continuing sequence.

Solution: Change COR DETECTION TYPE to VMR

6.3.4 Symptom: *False Keying of* Donor Radio by Radio Channel

Cause: Extraneous RFI emissions present at frequency/level that keys a donor radio

Solution: Eliminate RFI emission source

Solution: Transit power of other, nearby donor radios may be excessive, so if possible. reduce to just enough to link to repeater

Solution: Modify antenna placement

Solution: Change COR DETECTION TYPE to VMR

6.3.5 Symptom: Radio Channel Experiencing Continuous Active COR State

Cause: Donor radio is introducing continuous noise to Radio Channel

Cause: Donor radio is an unsquelchable Amplitude Modulated receiver (i.e. HF, aircraft radio, etc.)

Solution: Change COR DETECTION TYPE to VMR

6.3.6 Symptom: Audio Sounds Too Weak

Cause: Received audio level from donor radio (or other device type) is too low; verify using RSP-Z2 front panel Level meter.

Solution: Change RECEIVE INPUT audio setting of the receiving Radio Channel (or other type of channel) until RSP-Z2 front panel Level meter red LEDs flicker with voice peaks of incoming speech. Note: The number in the RSP-Z2 GUI indicates the actual level of audio being received. If the incoming level is -12 dBm, the Receive Input setting of the Radio Channel should be set to -12dB. This must be understood to know which way to change the audio level for proper operation. If the Radio Channel, when set to -12 dB, is not receiving enough audio, the number in the GUI must be set to a lower number to correspond to the actual input level. The RSP-Z2 will then apply additional gain/reduced attenuation.

Cause: Transmit audio level delivered to donor radio is too low (verify/rectify cause above first!)

Solution: Increase TRANSMIT GAIN of transmitting Radio Channel until donor radio is properly modulated.

6.3.7 Symptom: *Audio Sounds Too Loud* or Distorted

Cause: Receive audio level from donor radio (or other device) is too high.

Solution: Change RECEIVE INPUT audio setting of the receiving Radio Channel (or other type of channel) until RSP-Z2 front panel Level meter red LEDs only flicker with voice peaks of incoming speech; not on at all times when speech is being received. Note: The number in the RSP-Z2 GUI indicates the actual level of audio being received. If the incoming level is -12 dBm, the Receive Input setting of the Radio Channel should be set to -12dB. This must be understood to know which way to change the audio level for proper operation. If the Radio Channel, when set to -12 dB, is receiving too much audio, the number in the GUI must be set to a higher number to correspond to the actual input level. The RSP-Z2 will then apply less gain/more attenuation.

Cause: Transmit audio level delivered to donor radio too high (verify/rectify cause above first!)

Solution: Lower the TRANSMIT GAIN of transmitting Radio Channel until donor radio is properly modulated.

End of Section 6

7 Operating Instructions

This section describes the RSP-Z2 operational procedures. The unit is designed for "stand-alone operation" - that is, it can be properly configured and then left unattended to operate full time in any of its three basic configurations, operating transparently to its users, with no user intervention required. It's also possible to perform some "on-the-fly" operations via the web interface as described in this section.

7.1 USB Headset Operation

The most common "on-the-fly" operations for an RSP-Z2 involve use of an operator local to the unit, communicating via a USB headset.
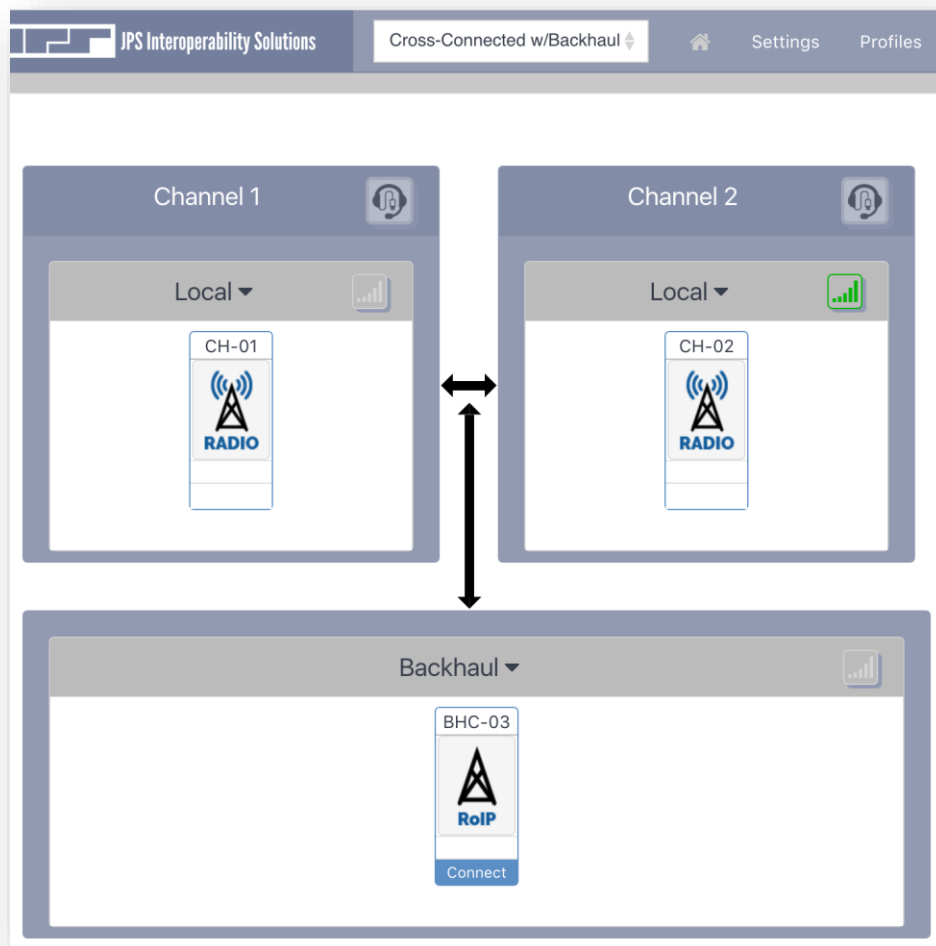
Figure 7-1 – Headset Not Yet Associated

The figure above shows the Home Screen when the RSP-Z2 is in Cross-Connected with Backhaul configuration. It was powered up with the USB Headset attached, but it has not yet associated with either channel.

In the following figure, the operator has clicked on the Headset icon, associating it with the channel. However, since CH-01 and CH-02 are cross-connected, an Active COR for a headset associated with either channel will cause both channels to go into PTT mode and retransmit the incoming audio from the headset. Therefore, the headset icon is shown as being active – ready to use for both channels simultaneously.

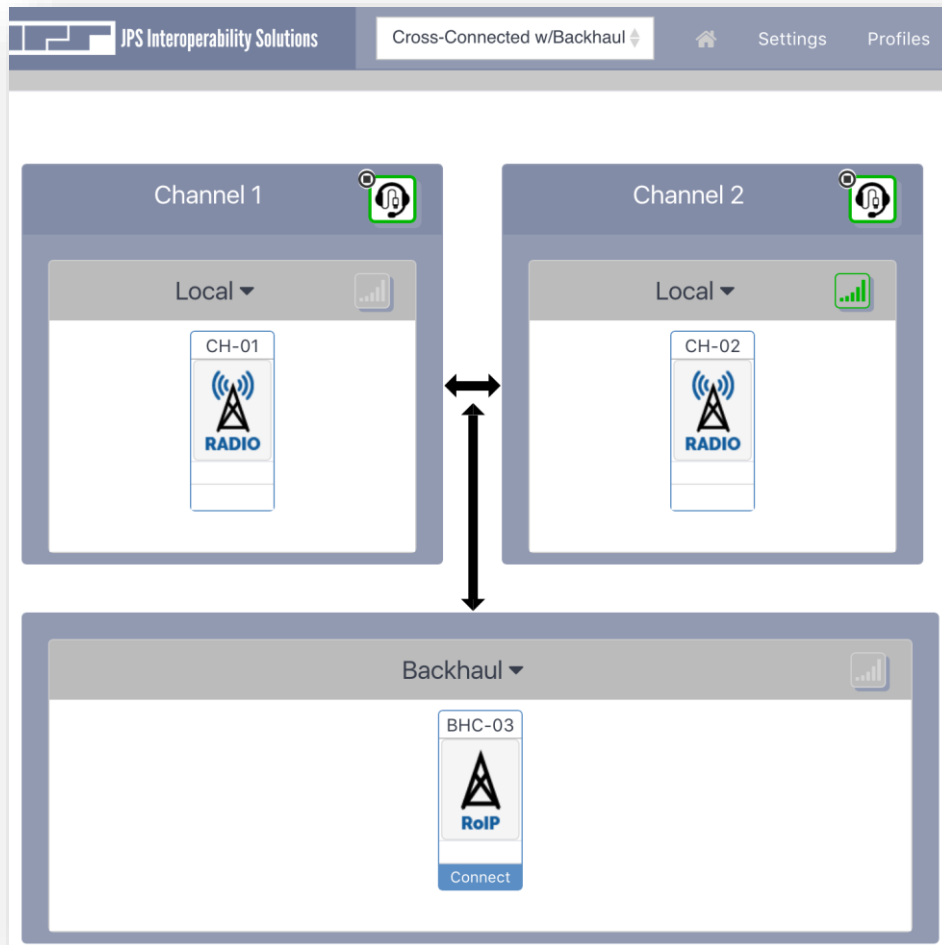Note that the icons are no longer grayed out and now have bright green outlines.

Figure 7-2 – Handset Associated with Radio Channels

Because the USB headset is configured for VOX operation, any time the headset operator speaks, the operator's audio will be retransmitted out any connected channels. In this particular system configuration, all channels are linked together, so all will retransmit the headset audio, See the next figure.

Active COR is indicated for the Headset by the green circle in the lower left of the headset icons. Transmit mode is indicated for all three channels by the red PTT decals in the lower right of the channel icons.
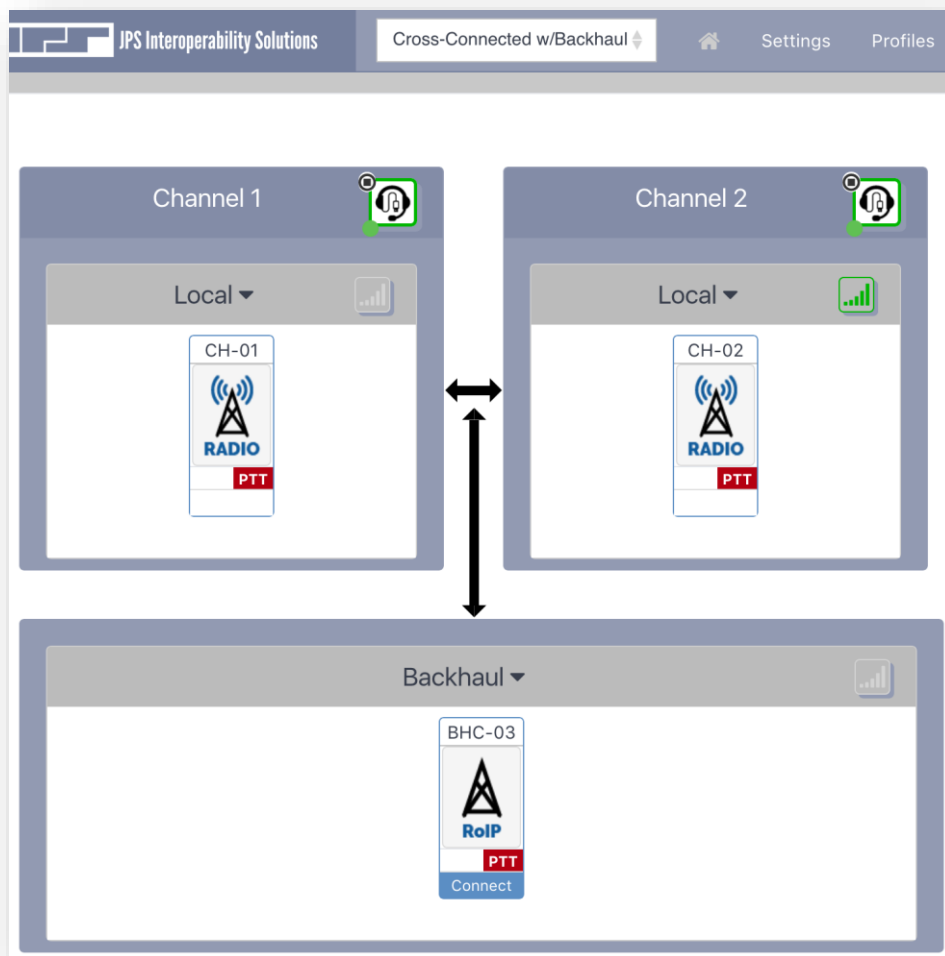
Figure 7-3 – Headset Keyed in VOX Mode

If operator speech doesn't always cause the system channels to transmit, first check the audio gain. In the above images, the front panel LED volume indicator is associated with Channel 02.

Click on the green meter icon at the top right of the Channel 02 icon so that it is also grayed out (just like in CH 01 and BHC-03). Then watch the meter while speaking at a normal volume and note whether the meter is occasionally flashing red on voice peaks. If it isn't, increase microphone gain until it does. Don't forget to click on *Submit* to make the gain changes take effect.

Once the gain is set correctly (*always optimize gain before making threshold changes)* if the headset doesn't key on normal speech, increase the USB Headset VOX Mode sensitivity until it does. Again, remember to click *Submit.*

 Conversely, reduce sensitivity if the headset is always keying on speech, but also on local low level environmental sounds.

7.1.1 USB Headset Operation, PTT Mode

When configured to PTT, the Headset will key only when the computer's mouse or other pointing device does a click and hold procedure on the active (green) headset icon. In the figure below, the RSP-Z2 is in the Independent Passthrough system configuration. While the mouse cursor is clicked and held on the CH 01 headset icon, the Headset provides an Active COR signal to the unit, causing any connected channels to transmit the headset audio. In this system configuration, the Channel 01 Local and Backhaul interfaces.
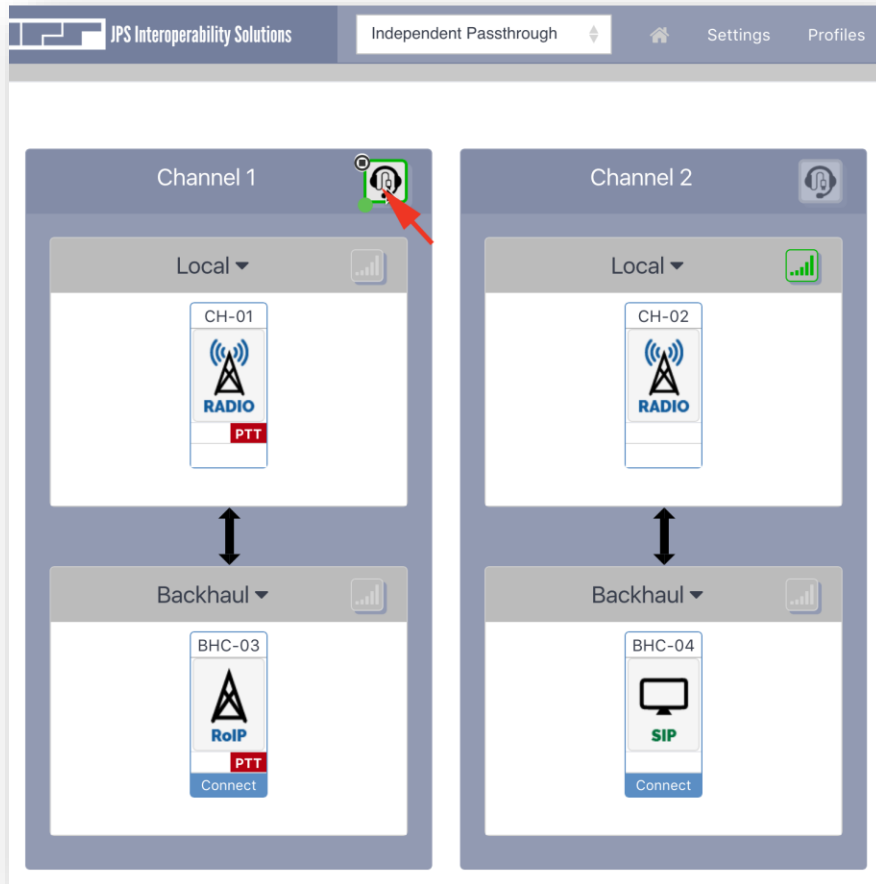

Figure 7-4 – Headset in PTT Mode, Keyed by Mouse Click on Channel 01

Note that a single click on the grayed-out headset icon on Channel 2 will switch the headset to be connected to that channel – then click and hold to have the headset mic input transmitted from Channel 2 Local and Backhaul interfaces.

7.2 Dial Out Operation

All Backhaul channels may be set to automatically connect at power-up to their designated endpoints at the URL or SIP URI in Automatic Connections box their Settings page. It's also possible to make connections at any time from the Home Page, by clicking on the Connect text below the channel icon. You will be prompted for a destination, and this can be typed in or selected from the dropdown menu which will store recent call history. Once the desired destination is in the text box click *Submit*.

Figure 7-5 – RoIP Dial Out

Note 1: Destination IP addresses in dropdown menus persist across power cycles.

Note 2: Destination IP addresses are specific to users. That is, "User A" does not have the same pulldown Destination IP addresses as "User B."

As can be seen in the figure below, the channel icons provide an indication of current status. The yellow circle with bull's eye center indicates that this SIP channel is attempting a connection. Once the connection is completed, this will change to a solid green circle. If the connection fails, the "Currently Idle" state will be indicated by a lack of any indicator in this area.
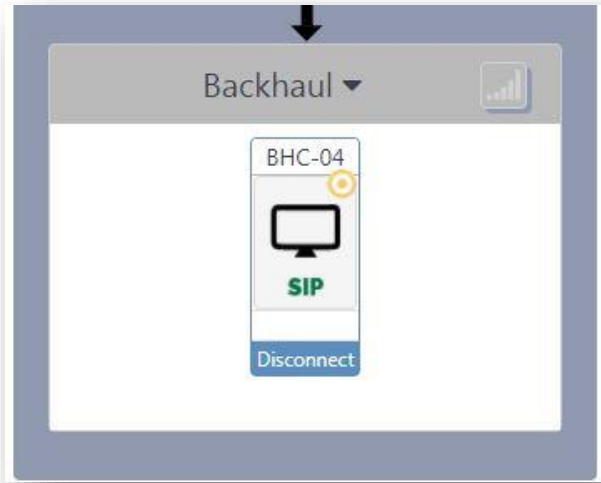

Figure 7-6 – SIP Dial Out In Progress

Notice also that the *Connect* text at the bottom of the channel icon has changed to Disconnect. Clicking on *Disconnect* will terminate the call.

7.3 Live Status Information

A summary of the small status indicators that will be present in the upper right of the channel icons (except when idle):

Status	Image	Call State
Unknown	⊖	N/A; status at start-up [see also below]
Idle	none	Ended, Incoming, Bye, Timeout, Unable to Connect, Unable to Connect, Unable to Set Up, Channel Active
Processing	◉	Dialing, Disconnecting Link Established
Ringing	🔊	Ringing, Far End Ringing
Active	🟢	Connected
Error	❗	Busy, Decline, Failed Authentication, Fast Busy, No Answer, No Connected Device, No Dial Tone, No DNS, Unavailable
Offline	⊖	Channel Inactive, headset channel w/o headset plugged in at boot up
Disabled	⚠	Any unknown/unexpected

End of Section 7

8 Recent Upgrades to the RSP-Z2

This section lists and explains updates and new features that have not yet been fully integrated into the text of this Operations Manual. These upgrades may result in differences in the current RSP-Z2 web pages from what has provided in previous chapters. Additional improvements may have been made that are not included in this section.

8.1 New/Updated Features

This version of the Operations Manual is fully up to date at the time of its release, corresponding with RSP-Z2 firmware version 1.0.

End of Document