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SP-2005 Aviation Radio Interface Box

User Manual

Rev 2

1.0 INTRODUCTION

The SP-2005 interface box is a feature rich, passive (no batteries) device that allows the pilot and aircraft owner to interface any two-way radio, either hand-held or mobile, to an aircraft's intercom without extensive modifications or A&P inspection. Two radios can be connected at the same time. The unit provides isolation and impedance matching so that one or both radios can be heard on the intercom as well as enables the intercom to be used for the transmit audio to the radios. This means that the user no longer has to use a separate hand mic with the radio to transmit.

The unit comes with several built-in push to talks (PTT) and provisions for an optional external PTT switch that controls the transmission of the radios and can be given to the copilot, observer, or whomever is operating the mission radios in the flight. A front panel toggle switch on the unit determines which radio is selected for both receive and transmit.

The features of the SP-2005 are:

- Two radio interfaces (Radio 1 and Radio 2)
- Receive selection for either the selected or both radios (monitor both)
- All crew or operator only operation (isolate)
- Two- part design providing maximum flexibility
- Multiple Push to Talk controls (PTT)
- Line Out audio interface for use with an external recorder or sports camera
- Jumper selectable support for either hand-held or mobile radio push to talk activation
- Jumper selectable balanced or single-ended audio input (Radio 1)

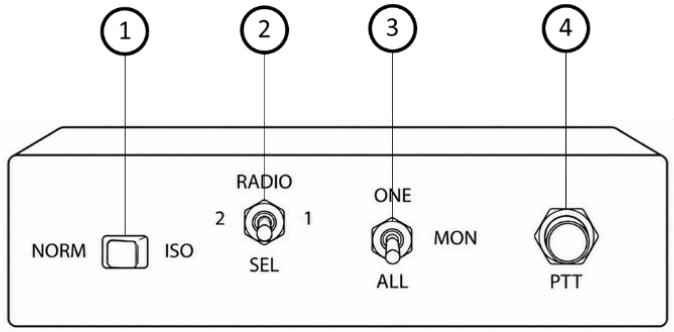
2.0 INSTALLATION

The SP-2005 comes as two main units: The Intercom Interface Box (IIB) and the Radio Interface Box (RIB). The IIB provides the interface to the aircraft's intercom and the radio operator's headset. The separate RIB controls the functions of the unit and provides the following functions:

- Radio Select
- Monitor (MON) Select
- Isolate (ISO) Select
- Push to Talk (PTT)

Both boxes have a PTT that functions identically. The unit comes with a 3 ft (1M) flexible interconnect cable that connects the RIB to the IIB.

Figure 1 The SP-2005 Radio Interface Box (IIB and RIB)



1 NORMAL (NORM)/ISOLATE (ISO)

Determines who can hear and transmit on the selected radio. In **NORMAL**, any crewmember plugged into the ship's intercom can hear and transmit from the selected radio. In **ISOLATE**, only the operator whose headset is plugged into the interface box can hear and transmit. Additionally, the operator is completely isolated from the ship's intercom and does not interfere with ATC or other communications.

2 RADIO SELECT (SEL)

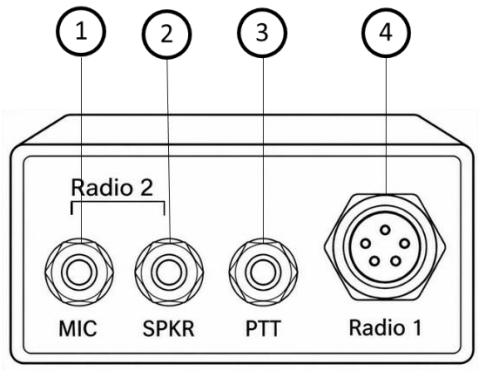
Selects which radio will be used for transmit and receive.

3 MONITOR (MON) SELECT

When selected to ONE, only the radio selected by the RADIO SELECT switch will be heard. When selected to ALL, both radios will be heard but only radio selected is used for transmit.

4 PUSH TO TALK (PTT)

When pressed, causes the selected radio to transmit

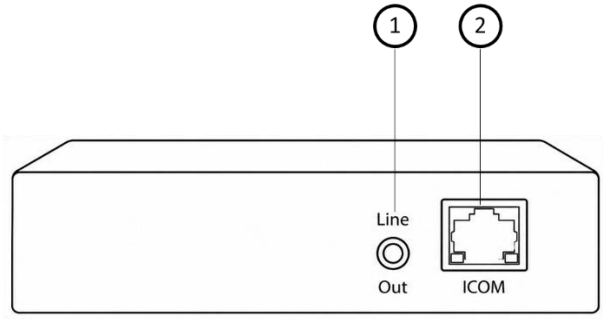


1 **RADIO 2 MIC** Jack
A 2.5 mm TRS jack used to provide output MIC audio and PTT to Radio 2. The pin connections are shown in section 2.2.

2 **RADIO 2 SPKR** Jack
A 3.5 mm TRS jack used to input receive audio from Radio 2. The pin connections are shown in section 2.2.

3 **PUSH TO TALK (PTT)** Jack
A 3.5 mm TRS jack used to for an optional external PTT switch. The pin connections are shown in section 2.3.

4 **RADIO ONE** Jack
A 5-pin mini XLR jack used for the mic, receive audio, and PTT for Radio one. The pin connections are shown in section 2.1



1 **LINE OUT** Jack
A 3.5 mm TRS jack used to provide intercom and radio audio to an externa device such as an audio recorder or sports camera.

2 **ICOM** Jack
An Ethernet jack used to connect to the intercom interface box. DO NOT CONNECT TO A COMPUTER OR OTHER NETWORK OR SEVERE DAMAGE MAY OCCUR.

The SP-2005 interfaces with your aircraft's intercom by plugging directly into a set of intercom jacks. The main radio operator then plugs their headset into the provided intercom interface box. The intercom interface box has cables that are matched to the HEADSET and MIC jacks of the ship's intercom and cannot be installed incorrectly.

The IIB and the RIB are connected with the provided flexible cable.

The RIB is connected to the radio through either the Radio 1 or Radio 2 connectors using the appropriate cable.

The figure below shows the typical connection of the SP-2005 to the aircraft and two radios.

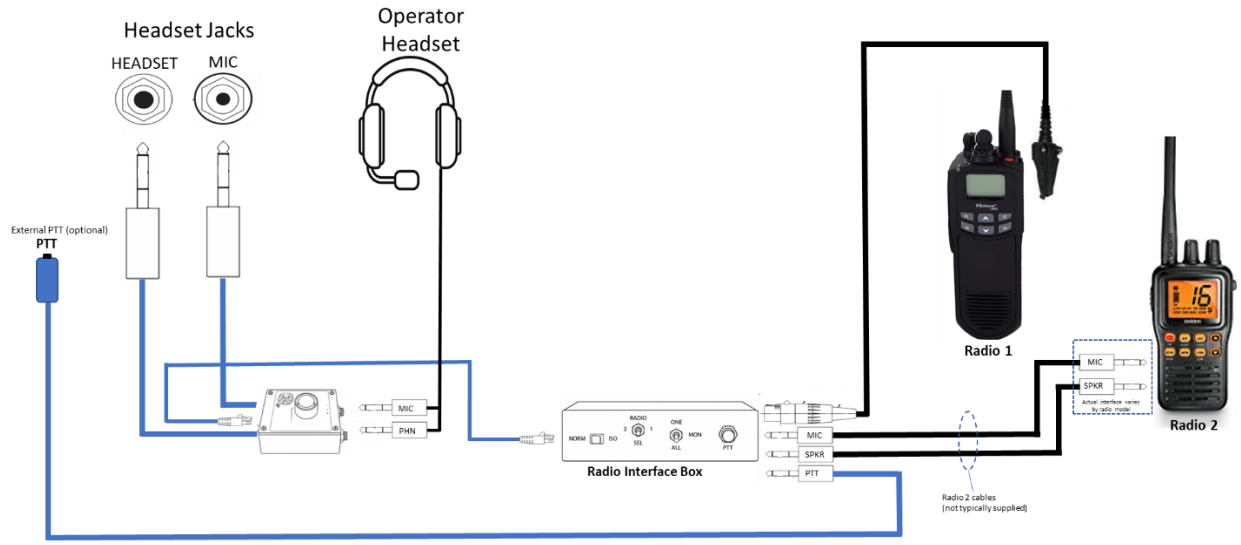


Figure 2 Typical Interface Configuration

For ease of interfacing, and to make the production of custom cables easier, all interfaces into the SP-2005 are industry standard connectors that are readily available. The following interfaces are provided:

Table 1 SP-2005 Interfaces

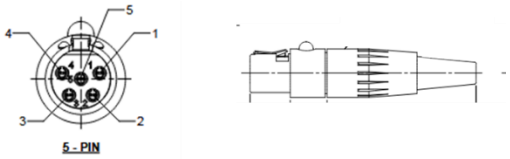
Interface	Use	Connector
Radio 1	TX, RX, PTT for Radio 1	5 pin Mini XLR, male
PTT	Push To Talk switch interface	3.5 mm TRS, jack
Radio 2 Speaker	Speaker audio output from Radio 2	3.5 mm TRS, jack
Radio 2 MIC	Mic TX audio and PTT to Radio 2	2.5 mm TRS, jack
Line Out	Line out audio to an external recorder	3.5 mm TRS, jack

Figure 3 RIB Radio Connections

2.1 Radio 1 Interface

The Radio 1 interface uses a single, robust, locking connector that has all required connections to control a standard transceiver. The mating plug is a 5 Pin Mini XLR Female, Switchcraft TA5F (or equivalent). Custom cable assemblies that mate with popular public safety radios such as the Motorola APX or the EF Johnson 5100 series radios are available separately.

The figure below depicts the pin out for the radio 1 interface.



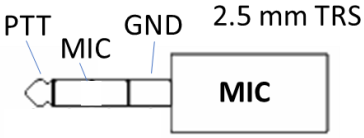
Mini XLR Pin	Signal
1	GND
2	MIC
3	PTT
4	RX Audio +
5	RX Audio -

Figure 4 Radio 1 XLR Pinouts

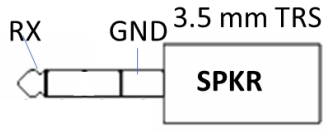
2.2 Radio 2 Interface

The interface cables to Radio 2 are not typically provided as the interface to these radios varies widely. The Radio 2 interfaces (2) use widely available 3.5 mm and 2.5

mm connectors to make custom cable design and build fast and easy. The figure below depicts the pin out for using the radio 2 interfaces.



2.5 mm TRS	Signal
Tip	PTT
Ring	MIC
Shield	GND



3.5 mm TRS	Signal
Tip	Receive Audio
Ring	N/C
Shield	GND

Figure 5 Radio 2 2.5/3.5 mm Jack Pinouts

Note: The Radio 2 SPKR input provides an easy mechanism to place audio onto the ship's intercom from most devices that have a standard 3.5 mm headphone jack output such as a scanner, MP3 player, or other audio source. Any standard 3.5 mm male to male cable can be used to connect the device. See figure below.

Figure 6 RIB Radio 2 SPKR Input Used with Scanner

The attached cable diagram and example diagram for a popular marine radio model can be used as a guide to build the needed cables.

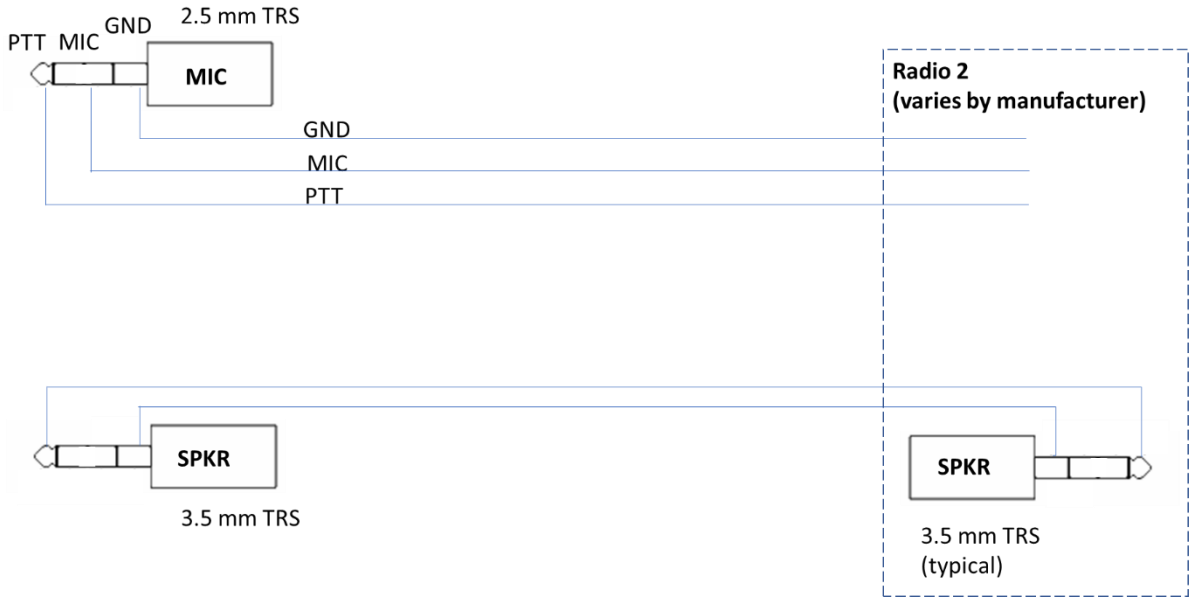


Figure 7 Radio 2 Interface (typical)

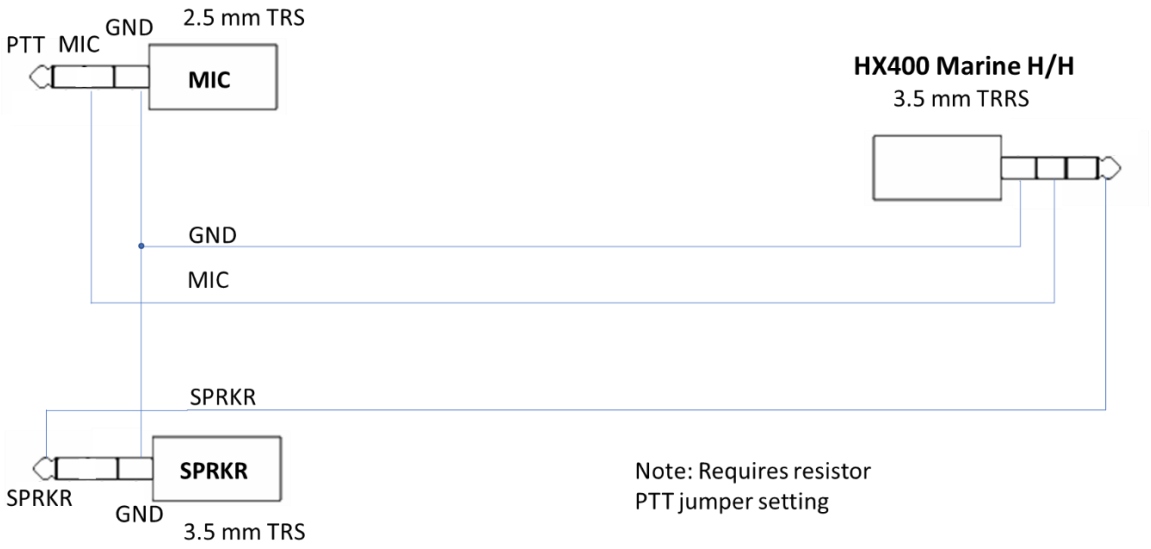
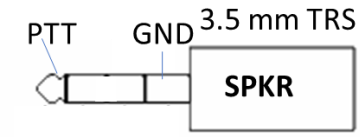


Figure 8 Radio 2 HX400 Marine Handheld Interface Cables

2.3 External Push To Talk Interface

In addition to the two built-in PTT's, the SP-2005 provides the ability to add an external PTT. Transmit is initiated when tip is connected to the shield on the 3.5mm jack. The figure below depicts the connections.



3.5 mm TRS	Signal
Tip	PTT
Ring	N/C
Shield	GND

Figure 9 External PTT Pinout

The cable diagram below may be used to build a custom PTT cable for the SP-2005

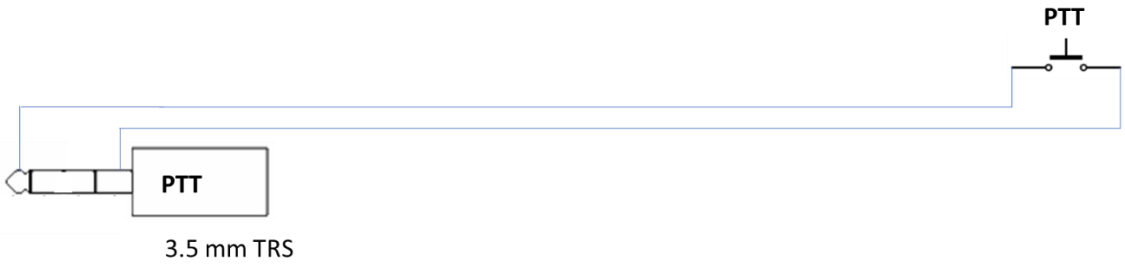


Figure 10 External PTT Cable Diagram

2.4 Line Out

The Radio Interface box has a 3.5 mm jack that provides a line out audio level of both radios receive and the intercom audio. This output is suitable for use with an external recorder or sports camera. The audio from both radios will be present regardless of the selected radio as well as the intercom audio will be present regardless if ISOLATE mode is selected.

2.5 Intercom Interface (ICOM)

The ICOM interface is used to connect the IIB to the RIB. This is a standard RJ45 connection that is used exclusively for connecting these two devices. **DO NOT**

CONNECT TO A COMPUTER OR OTHER NETWORK OR SEVERE DAMAGE MAY OCCUR.

The SP-2005 is provided with a 3 ft (1M) flexible cable, however, if a different length is required any high-quality Cat 6 Ethernet cable may be used. Lengths of up to 10 ft (3M) have been tested successfully. The cable must provide one-for-one pin connections, cross over cables must not be used.

3.0 OPERATION

The operation of the SP-2005 is very straightforward as there are only three controls: Radio Select, Monitor, and Isolate.

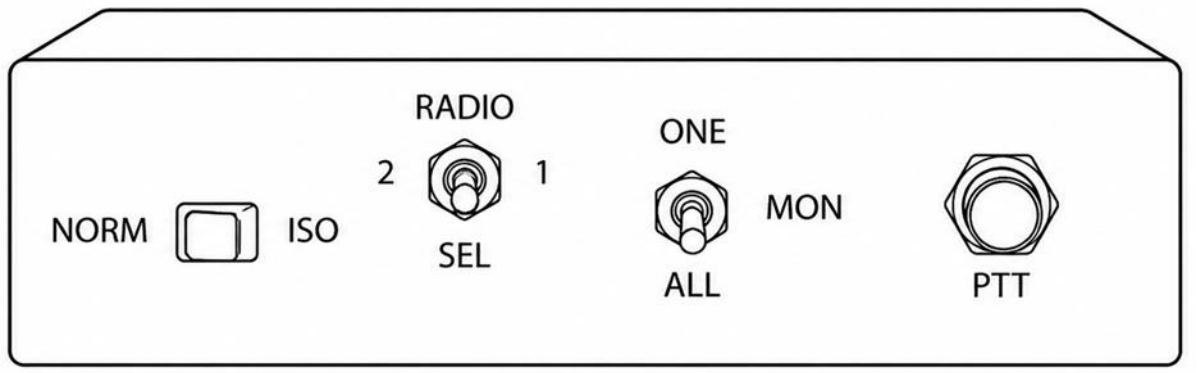


Figure 11 RIB Front Panel Controls

3.1 Radio Select (RADIO SEL)

Radio Select determines which of the two attached radios will be used. This setting determines both the receive and transmit functions. When any of the PTT's is pressed, the selected radio will transmit and the intercom and/or operator's audio will be sent.

3.2 Monitor (MON)

Monitor determines if only the selected radio is heard or both. When ONE is selected, only the selected radio will be heard. When ALL is selected, both radios will be heard; however, only the selected radio transmits when PTT is pressed.

3.3 Isolate

In NORMAL mode, any crewmember who is using the intercom can receive and transmit from/to the selected radio using any of the PTTs. ISOLATE mode isolates the radio operator and only the operator connected to the Intercom Interface Box can receive and transmit. Additionally, the operator is completely isolated from the ship's intercom and can operate the radios without interference from or to the ship's crew or ATC radios.

Note: In ISOLATE mode, another member of the crew can cause the radio to transmit using any of the PTT's, however, their audio will not be transmitted.

CAUTION

When selected to NORM, all audio heard on intercom (ATC radio, PAX, etc.) will be transmitted when PTT pressed

4.0 ADJUSTMENT

The primary method to adjust the SP-2005 for the aircraft is by means of setting the Radio 1 volume, the Radio 2 volume, the aircraft intercom's volume and the intercom's squelch.

When set to NORM, the SP-2005 places all received audio from the two radios directly onto the ship's intercom and uses the intercom audio as the source for the transmit audio. The front panel toggle switch labeled RADIO SEL determines which of the two radios transmits when the any of PTT's are pressed.

Figure 12 RIB Front Panel

4.1 Receive Adjustment

Setting the receive audio levels for use with the SP-2005 requires setting the individual volume controls for each radio plus adjustment of the ship's intercom squelch. Ideally, the intercom squelch should be set just above ambient ship's noise such that it remains off when the intercom is not being used (no crew conversation) but is still easily broken when either radio is receiving. Particular care should be given to setting either radio when being used in P25 or any other digital mode. Due to the nature of digital audio, the normal background white noise that accompanies an analog FM signal that can aid in opening the intercom's squelch is absent. This, combined with the wide dynamic range that can be observed in digital audio from operator to operator, makes setting the intercom squelch particularly challenging.

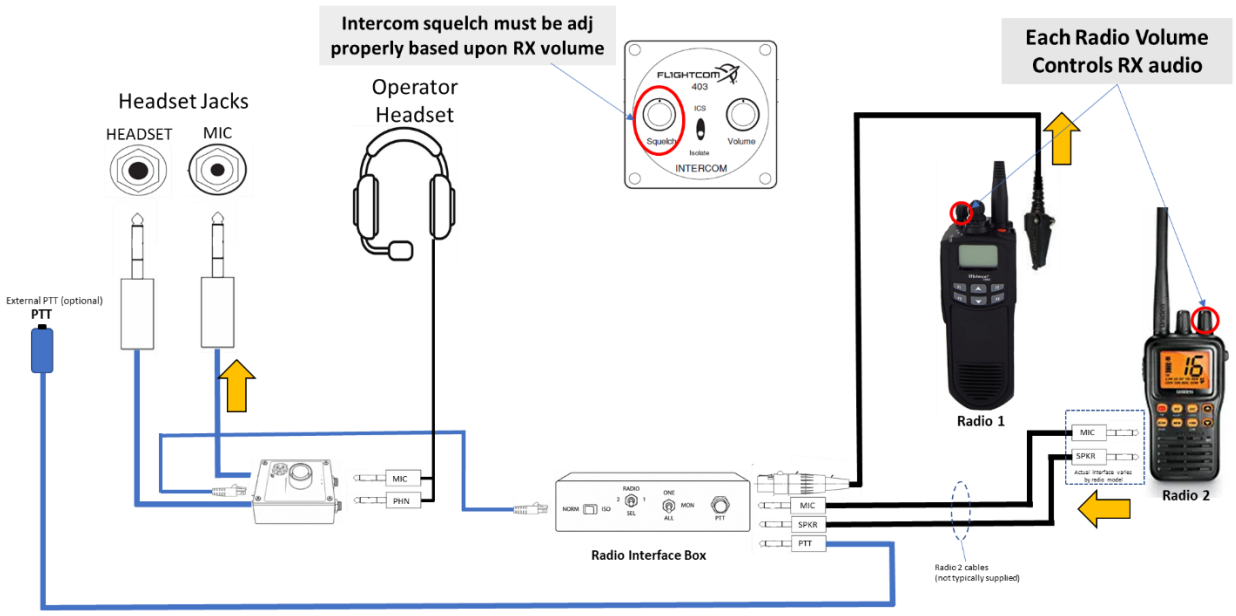


Figure 13 Receive Path and Adjustment

4.2 Transmit Adjustment

As noted above, when in NORM mode the transmit audio is taken directly from the intercom audio and is controlled by the intercom's volume control. To properly set this, it is usually desired to transmit on an unused channel with the selected radio and receive using a hand-held radio or scanner. While transmitting, adjust the intercom's volume control and set the quality and loudness of the audio received on the other radio to the desired level. Once this is complete, it may be useful to make a small mark or place a sticker on the volume control of the intercom to note the correct setting.

> **Caution: When the Isolate switch is selected to NORM, all audio that is present on the intercom, such as ATC radio or crew conversations, will be applied to the selected radio and transmitted when the PTT is pressed; thus, it is important to mute all other audio sources and observe cabin silence when the Radio 1 or Radio 2 is transmitting.**

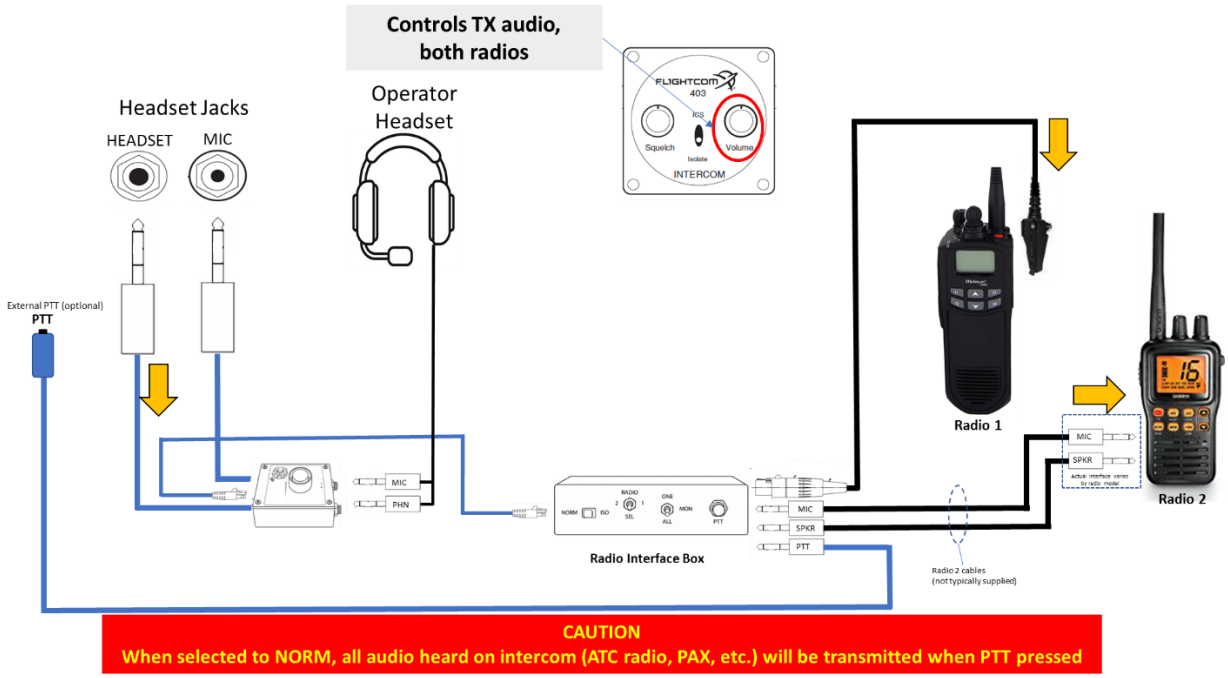


Figure 14 Transmit Path and Adjustment

4.3 Internal Adjustments

4.3.1 Intercom Audio Levels

To provide additional flexibility for widely varying installation environments, the SP-2005 has level adjustments for the intercom receive and transmit paths to both radios. These adjustments are accessed by removing the four screws holding the enclosure together and gently removing the PC board from the RIB.

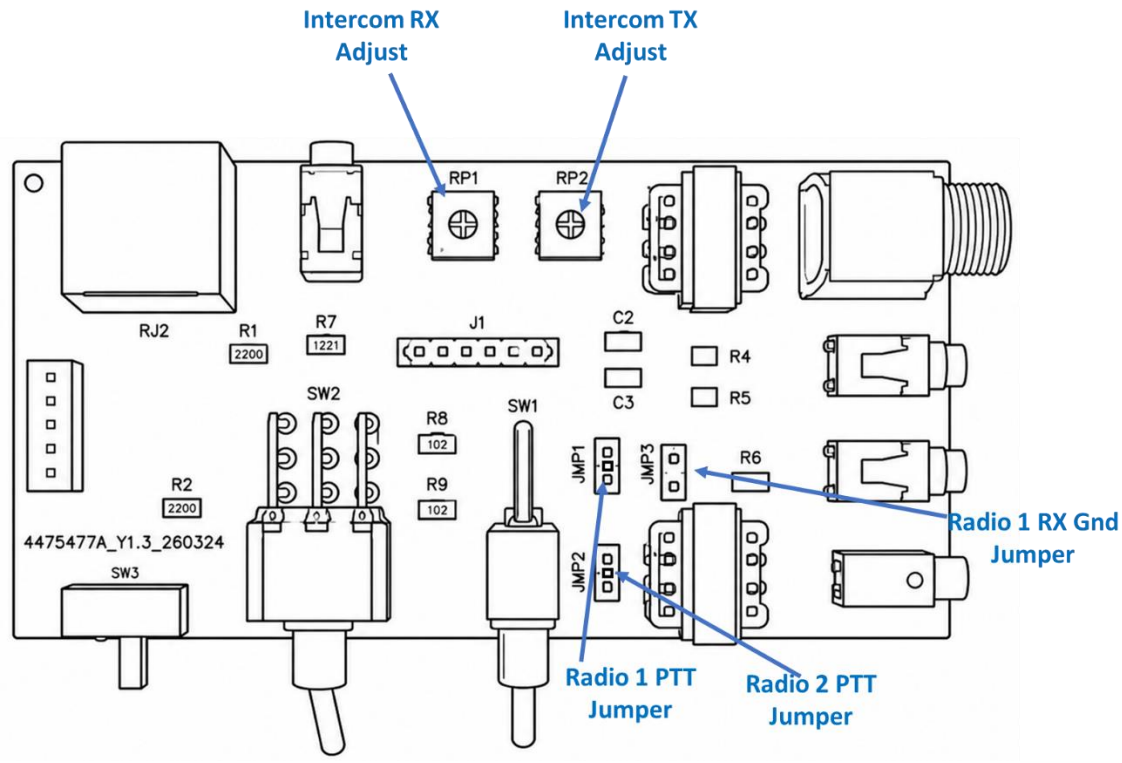


Figure 15 Internal Adjustments

The adjustments provide a means to control the receive audio into the intercom and the transmit audio coming from the intercom. Potentiometer RP1 controls the receive audio and RP2 controls the transmit audio. The audio levels to and from the operator when set to ISOLATE mode are unchanged.

At the factory, the intercom receive (RP1) audio level is set to approximately the same level as when the ISOLATE mode is selected. As aircraft intercom volumes vary considerably, this adjustment may need to be changed to suit the current installation.

4.3.2 PTT Jumper Settings

The SP-2005 can support a wide variety of transceiver types from hand-held “Walkie Talkie” style radios to full power mobile radios. To accommodate this, the unit has the ability to configure the push to talk control for either a discrete, dry contact control line, typically used for mobile radios, or PTT by means of applying a resistance across the MIC line, typically used in hand-held radios. As shipped from the factory, the SP-2005 is jumper set for a discrete PTT for Radio 1 and a 6.4 k ohm mic line resistance for Radio 2. The figure below depicts this jumper setting.

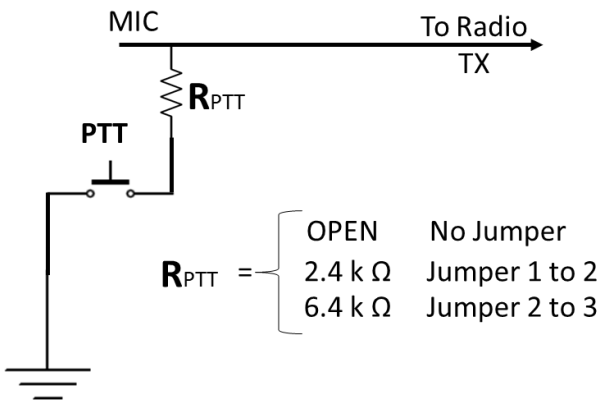
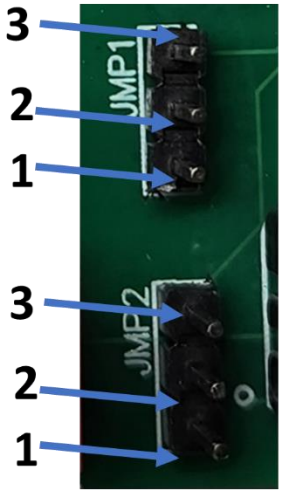


Figure 16 PTT MIC Line Resistor Configuration

To change either setting, open the RIB enclosure as noted above and place the provided jumpers as noted below.



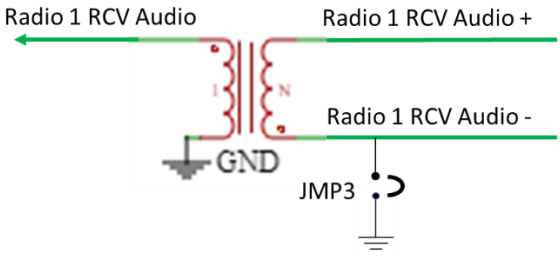
Jumper	Radio
JMP1	Radio 1
JMP2	Radio 2

Jumper Setting	PTT
None	N/C PTT to MIC
1 to 2	PTT 2.4 kΩ MIC to GND
2 to 3	PTT 6.4 kΩ MIC to GND

Figure 17 PTT Mic Line Jumper Settings

4.3.3 Balance/Unbalanced Audio Input Select

The receive audio input for Radio 1 can be configured by jumper setting for either balanced, or unbalanced input, as needed. As shipped from the factory, this is set as a balanced input.



Jumper JMP3	Setting
none	Balanced Input
1 to 2	Unbalanced Input

Figure 18 Balanced/Unbalanced RX Radio 1 Jumper Setting

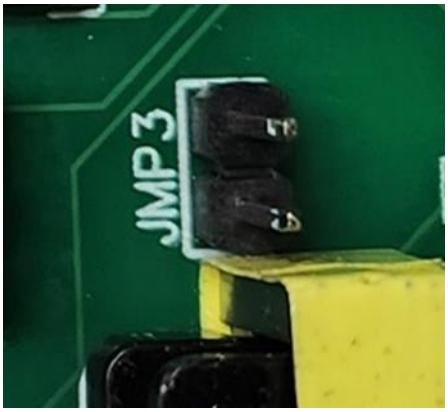


Figure 19 Balanced/Unbalanced RX Radio 1 JMP 3 Jumper

5.0 HINTS

The most common issue encountered with the SP-2005 in actual flight is the potential to miss calls due to the intercom squelch setting. This is especially true while operating in a digital mode. This can happen when changing from one channel to another or even from one watch stander to the next as the audio levels received can vary greatly. If you begin to suspect that you are missing calls, first, lower the squelch on the aircraft's intercom until background (cabin) noise is heard and wait for the next call. Second, confirm that audio is properly being routed from the radio to the intercom through the interface box by breaking the squelch or pressing the MONITOR button (if applicable) on the radio to open the squelch and verify that white noise is heard. Finally, if audio is heard, adjust the radio volume so that calls properly unmute the aircraft's intercom.

6.0 DISCLAIMER

This device is not endorsed by the US Coast Guard, the Auxiliary, or any other agency. This device is not TSO'd, PMA'd or otherwise stated to be accepted by the FAA for any particular use aboard an aircraft. Although it is widely accepted that, due to the temporary nature of the installation of this device, no additional installation authorization is required; the user is encouraged to check with their local A&P for clarification. No

claims or warranties regarding suitability of use or performance are either stated or implied.