

SPA-4S INSTALLATION INSTRUCTIONS

INTRODUCTION

ATTENTION INSTALLER: To assure a trouble free installation, please read the entire instructions through once before beginning.

SPA-4S SYSTEM SPECIFICATIONS

CONFIGURATION - The Sigtronics SPA-4S Intercom system is specifically designed for permanent, panel mounted installation in aircraft. The SPA-4S provides voice activated (VOX) intercom and music input for up to four headset positions in a small single chassis unit.

UPGRADE - A SPA-4S can upgrade an existing SPA-400 installation requiring minimal re-wiring.

STEREO MUSIC INPUT - Music input accepts standard portable music headphone or line level outputs. Automobile Speaker level outputs can be adapted for use with SPA-4S systems.

COMPATIBILITY - Sigtronics SPA-4S intercoms have been designed to operate with all standard general aviation aircraft radios and headsets.

SIZE: Panel 1" x 2.5". Chassis - 1" high x 2.5" wide x 4" deep. Can be mounted either horizontally or vertically in the aircraft panel.

WEIGHT: 5.5 ounces (SPA-4S intercom unit with panel and knobs). Jacks and wiring harness weigh 7.0 ounces

INPUT POWER: 11VDC through 32VDC. Maximum current drain 0.11 Amps

DISTORTION: Less than 1% total harmonic distortion.

WARRANTY: SPA-4S intercoms are constructed of high quality components and carry a five year parts and labor warranty.

MADE IN THE USA



HARDWARE SUPPLIED

Besides the intercom unit and instructions, each SPA-4S system comes with the following hardware:

Headphone Output Jacks - Accept standard 0.250" aircraft stereo headphone plugs.	4
Microphone Input Jacks - Accept standard 0.206" aircraft microphone plugs. (U93 plug compatible jacks can be used in place of the jacks provided – monaural installations only).	4
Mic Jack Insulating Washers, Flat	4
Mic Jack Insulating Washers, Shoulder	4
Intercom Panel - lettered on both sides.	1
Intercom Control Knobs	2
Mounting Screws 4-40 x 1/2	2
Drill Template - Adhesive backed hole size pattern for drilling aircraft panel.	1
Intercom/Aircraft Interface Cable (4 feet long)	1
Headphone/Music Interface Cable (4 feet long)	1
Stereo music input jack 3.5mm	1

MUSIC MUTE OPTIONS

FACTORY DEFAULT - PARTIAL MUSIC MUTE DURING ICS - When listening to music and someone speaks on the intercom the default factory operation is to partially mute the music so you can hear the conversation. The SPA-4S intercoms have two options that can be enabled if desired. These options are enabled with the intercom removed from the aircraft.

OPTION "A" - FULL MUSIC MUTE DURING ICS - The music can be completely muted during intercom conversations. To enable this option, small jumper wires are installed on the solder side of the circuit board.

OPTION "B" - NO MUSIC MUTE DURING ICS - The music will not be muted during intercom conversations. To enable this option, circuit traces are cut on the solder side of the circuit board.

NOTE - During radio transmission and reception, the music will always be fully muted. This is for communication safety reasons.

HIGH NOISE VERSION

Model SPA-4SN – The "N" version of the SPA-4S has all the above features but is specifically configured for very high noise



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environments such as open cockpit aircraft, warbirds, and ultralights. In addition to special circuitry that improves intercom performance in high noise aircraft, the SPA-4SN has a Push-to-intercom mode for applications where voice activated (VOX) intercom operation is not desired.

CHASSIS INSTALLATION

To upgrade an existing SPA-400 installation to a SPA-4S skip to the "UPGRADING A SPA INSTALLATION TO A SPA-4S" section on page 4. For a completely new intercom installation, continue below.

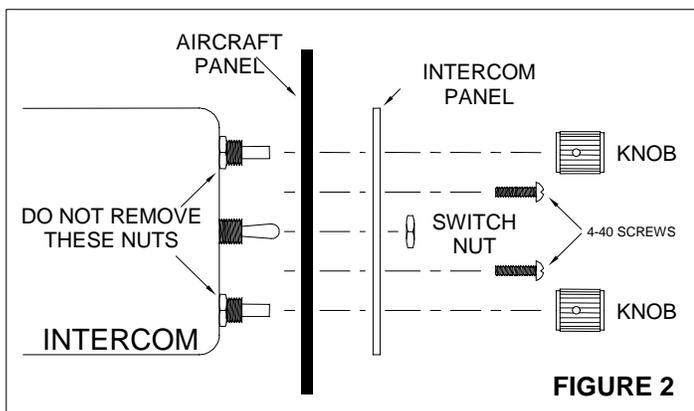
UNIT PLACEMENT

The SPA-4S unit has been designed to mount either horizontally or vertically in your aircraft panel. The location selected for the SPA-4S unit requires a minimum front panel area of 2 1/2" by 1". Depth required behind panel is 4" plus cable access.

CAUTION: Move the aircraft flight controls through the limits of travel while observing the selected area and making sure that the rear of the intercom and cable will not interfere with any aircraft control components.

PANEL PREPARATION:

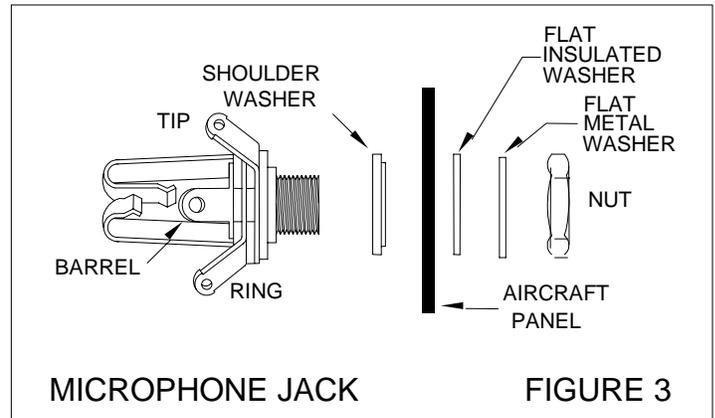
1. Position the adhesive drill template on the aircraft panel in the selected area.
2. Center punch each hole at the cross lines. (Five holes are in a straight line and equally spaced 0.4" apart)
3. Drill 1/8" pilot holes in all five places.
4. Enlarge holes to 1/4" and 3/8" per the template.



MOUNTING CHASSIS (See Figure 2)

1. Remove the knobs from the Volume and Squelch controls using a 0.050" Allen wrench. Remove the nut from the ON/OFF switch. NOTE: DO NOT REMOVE the nuts from the Volume and Squelch controls.
2. Insert the SPA-4S unit from the rear of the aircraft panel with the appropriate arrow on the unit chassis pointing upwards.
3. Install the printed SPA-4S panel and lightly thread the two 4-40 screws through the holes in intercom panel. The nuts on the Volume and Squelch controls will fit inside the 3/8" diameter holes.
4. Tighten the two screws and switch nut.

5. Install the knobs on the Volume (VOL) and Squelch (SQ) control shafts and tighten the Allen screws.



MOUNTING HEADPHONE AND MICROPHONE JACKS (See Figure 3)

1. Locate the mounting areas. (One mic and one headphone jack required for each headset). Again, make sure that the jacks will not interfere with any aircraft control components. (Note that the jack contacts will expand when a plug is inserted into the jack and must have clearance to prevent shorting.)
2. Drill 3/8" diameter holes for headphone jacks and install.
3. Drill 1/2" diameter holes for the mic jacks and install with the insulating washers supplied. (See Figure 3).

Note: If the aircraft already has pilot headset jacks, the location can be used for intercom with the following changes. The mic jack must be re-wired as follows:

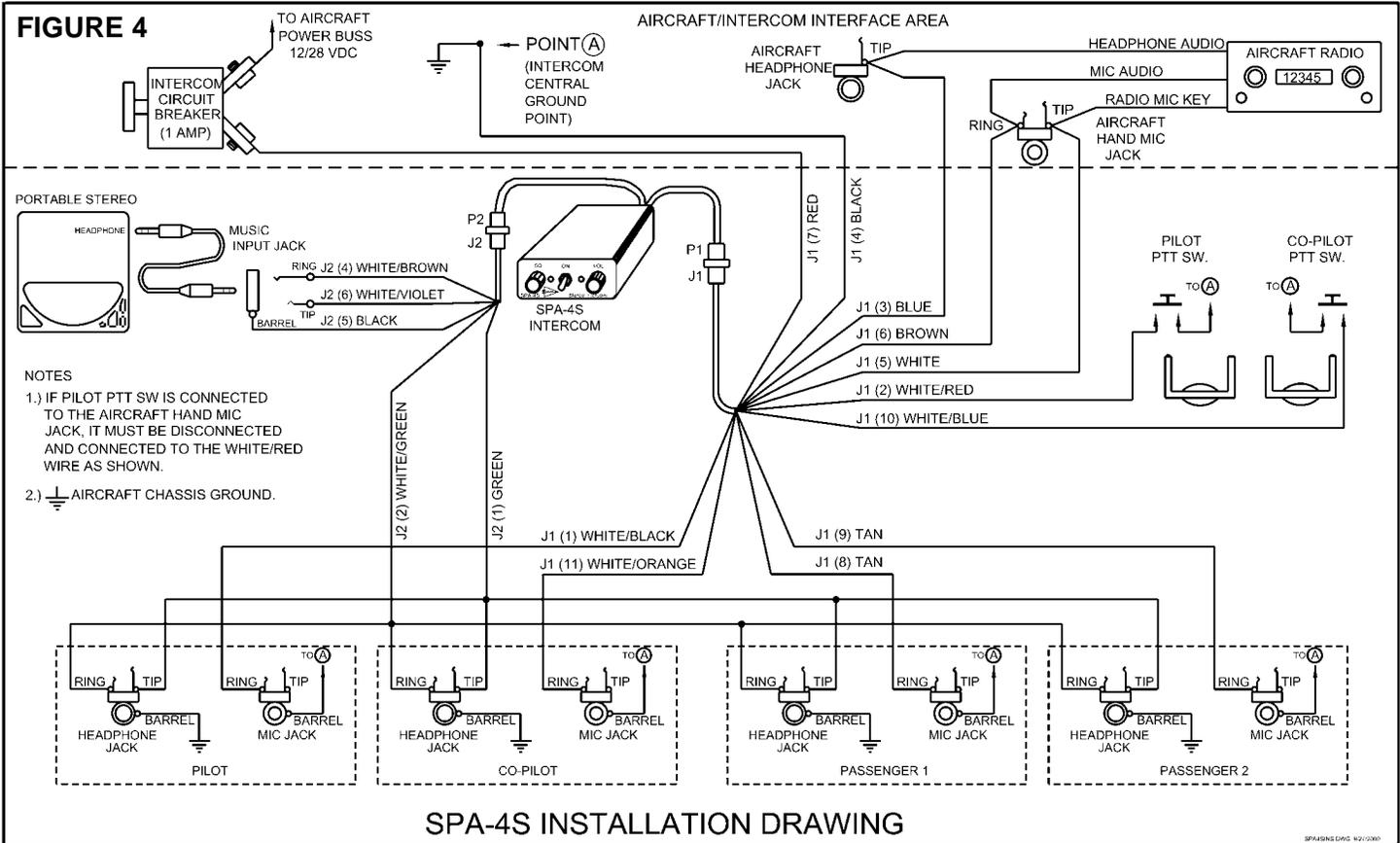
1. Remove any existing wires from the tip, ring, and barrel connections.
2. Connect the intercom white/black wire to the ring terminal.
3. Connect one end of a ground wire to the barrel terminal of the mic jack and connect the other end to Intercom Central ground Point "A".
4. Install insulating washers as necessary if the barrel of the mic jack is mounted in metal.

For the headphone jack, replace the mono headphone jack with the stereo headphone jack. Connect the green wire (P2 pin 1) to the tip connection. Connect the white/green wire (P2 pin 2) to the ring connection.

WIRING INSTRUCTIONS

Connections should be made as shown in Figure 4 and indicated in Tables 1 and 2. Read also the referenced notes following Table 2. If longer wire lengths are required, use a good quality multi-stranded hook-up wire - 22 gauge or larger. Although not necessary, shielded audio wire can be used if desired.

FIGURE 4



SPA-4S INSTALLATION DRAWING

TABLE 1 - P1/J1 - See Wiring Instructions

PIN	WIRE COLOR	FUNCTION	CONNECT TO
1	White/Black	Pilot Mic Input	Ring Terminal of Pilot Mic Jack
2	White/Red	Pilot Transmit Switch Input	Pilot Transmit Switch (PTT) (Switch to Ground to Transmit)
3	Blue	*1 Radio Headphone Input	Radio Headphone Output
4	Black	*2 Intercom Central Grounding Point "A"	Aircraft Chassis Ground
5	White	Radio Transmit Key Output	Tip Terminal of Aircraft Hand Mic Jack, or Key Input of Aircraft Radio or Audio Panel
6	Brown	Transmit Mic Audio Output	Ring Terminal of Aircraft Hand Mic Jack or Mic Input of Aircraft Radio or Audio Panel
7	Red	*3 12 through 28 VDC Power Input	Intercom Circuit Breaker
8	Tan	*4 Passenger #1 Mic Input	Ring Terminal of Passenger #1 Intercom Mic Jack
9	Tan	*4 Passenger #2 Mic Input	Ring Terminal of Passenger #2 Intercom Mic Jack
10	White/Blue	Co-Pilot Transmit Switch (PTT) Input	Co-Pilot Transmit Switch (PTT) (Switch to Ground to Transmit)
11	White/Orange	Co-Pilot Mic Input	Ring Terminal of Co-Pilot Mic Jack
12	Violet	*7 ICS PTT	ICS PTT Switches

TABLE 2 - P2/J2 - See Wiring Instructions

PIN	WIRE COLOR	FUNCTION	CONNECT TO
1	Green	*6 Intercom Right Headphone Output	Tip Terminal of Headphone Jack
2	White/Green	*6 Intercom Left Headphone Output	Ring Terminal of Headphone Jack
3	N/C	None	No Connection
4	White/Brown	*5 Music Input Left Channel	Left Music Source Headphone or Line output
5	Black	*5 Music Input Common	Music Source Common Headphone or Line Output
6	White/Violet	*5 Music Input Right Channel	Right Music Source Headphone or Line Output

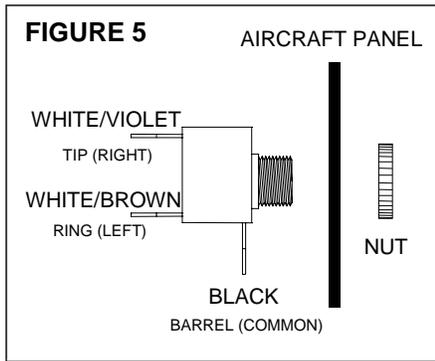
1. The blue wire from Pin 3 must be connected to the aircraft radio headphone output - NOT the speaker output. NOTE - If aircraft radio volume heard in the headsets changes significantly when switching the ON/OFF switch a minor modification to the installation will fix this. Just install a small 1/4 watt resistor inline with

the blue wire. Select a value between 220 and 560 ohms for best results.

2. Connect all intercom mic jack grounds to a single aircraft chassis ground point - Intercom Central ground Point "A" - as shown in Figure 4. (Use the black washers supplied to insulate the intercom mic jacks from aircraft chassis ground). Note this intercom central grounding point is used to eliminate any unwanted electrical noises, such as alternator whine or strobe noise, from being induced into the intercom system through the grounds. All intercom mic jack barrels must be insulated from ground where they are mounted and connected back to Intercom Central Ground Point "A" on their own individual ground wire. Similarly, both intercom ground wires (J1 pin 4) and the push-to-transmit switch grounds must also be connected back to Intercom Central Ground Point "A". It is not necessary, however, to connect the headphone jack barrels to Intercom Central Ground Point "A". They can either be grounded where they are mounted or some place nearby.
3. The red wire may be connected to either 12V (14V) or 24V (28V) power source. No switching or adjustments are required to operate from either source.
4. Tan wires (J1 pins 8, 9) are only used on installations that require the two rear intercom positions.
5. The SPA-4S system provides a stereo music input. This music input accepts portable music Headphone or Line level music sources. The wiring diagram shows how to wire the SPA-4S for use with a portable stereo music source. A small stereo input jack is supplied for this purpose. Connect the White/Brown, White/Violet, and Black wires to one jack as shown in Figure 4. Identify the jack terminals using Figure 5. Drill a 1/4-inch hole for the jack and mount on the aircraft panel. To use, connect an adapter cable between the music input jack and the output of

the portable stereo. Suitable cables are available at your local Stereo or electronics store as well as from Sigtronics.

Speaker level output car stereo music sources can also be used with the SPA-4S system. A Floating Ground Adapter or a four wire to three wire converter will have to be used between the Stereo and the SPA-4S music input. Figure 6 shows such an adapter and how it is wired into the SPA-4S.



switch. NOTE: DO NOT REMOVE the nuts from the Volume or Squelch (VOL/ SQ) controls.

2. Insert the SPA-4S unit from the rear of the aircraft panel with the appropriate arrow on the unit chassis pointing upwards.
3. Install the printed SPA-4S panel and lightly thread the two 4-40 screws through the holes in intercom panel. The nuts on the Volume/Squelch controls should fit inside the aircraft panel holes.
4. Tighten the two screws
5. Put the knobs on the Volume and Squelch control shafts, tighten the Allen screws, and switch nut.

Wiring Change

The wiring changes to an existing SPA installation are as follows. Re-wire the pilot, co-pilot, and passenger(s) headphone lines. You will not need the 4-foot intercom/aircraft interface cable (12 pin) that comes with the SPA-4S system. You will use the SPA harness already in the aircraft and the 4-foot headphone/music interface cable (6 pin).

In a SPA-400 installation, the tip terminals of the pilot, co-pilot, and passenger headphone jacks are wired to the blue wire (pin 3). They need to be disconnected from there, the mono headphone jacks need to be replaced with the supplied stereo headphone jacks and connected to their respective pins on the headphone/music interface harness. (See Figure 4 on page 3) Make sure that the blue wire (pin 3) is still connected to the tip of the radio headphone line. Wire the music input as shown in Figure 4 on page 3.

MONO MUSIC

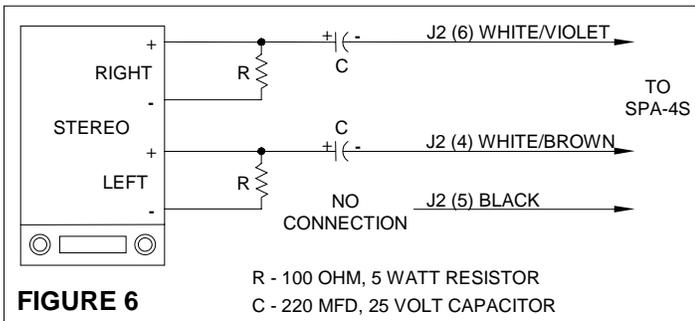
Rewire the headphone jacks as shown in the installation wiring diagram. For mono music you can use the existing jacks. Connect the green P2(1) and the white/green P2(2) to tip terminal of the phone jacks.

NOTE: Make sure that the blue headphone wire from the original SPA-400 installation is not connected to the headphone jacks tip connection and is connected to the aircraft audio panel or radio as shown in figure 4 on page 3.

INSTALLATION CHECK-OUT AND ADJUSTMENTS

After the unit is installed, again check that the SPA-4S unit chassis, jacks, and wiring harness are clear of all aircraft operating controls and cause no interference with them. Next, to check out the SPA-4S unit installation, plug in all the headset mic and phone plugs into the respective intercom jacks. Put on the pilot's headset and position the boom mic close to the mouth. Voice clarity is best when the mic is at one side of the mouth and 1/4" from the lips.

To assure that the aircraft radios, pilot's headset, and PTT switch are connected and functioning properly, switch the SPA-4S ON/OFF switch to the "off" position. If applicable, set the aircraft audio panel to "Headphone" position. Then turn on the aircraft radio(s) as usual, and verify that the pilot can hear the radios and can transmit using his push-to-transmit switch and headset. Aircraft radio(s) and audio panel should operate exactly as they did before the SPA-4S system was installed. Aircraft radio reception should also be heard in the co-pilot and passenger headsets. There should be no intercom between headsets with the SPA-4S unit "off".



6. The Sigtronics SPA-4S system can be installed as shown for use with Stereo headsets. Alternatively, monaural general aviation type headsets can be used. To use monaural headsets follow the installation instructions as normal except for the wiring of the stereo headphone jacks. Use the stereo headphone jacks supplied with the Sigtronics SPA-4S but leave the "RING" connections open. Instead connect both headphone wires to the "TIP" of the respective jacks. Connect both the WHITE/GREEN and GREEN on to the TIP of the headphone jack.

7. The Violet wire (J1 pin 12) is provided on SPA-4SN models only for an optional Push-to-intercom function. For wiring and additional instructions on the SPA-4SN see the "SPA-4SN PUSH-TO-INTERCOM INSTRUCTIONS" section on page 5.

Make sure any unused wires are properly insulated and kept from shorting to any other wires or aircraft ground. Skip down to the "INSTALLATION CHECK OUT AND ADJUSTMENT" section on this page.

UPGRADING A SPA INSTALLATION TO A SPA-4S

Chassis Mounting

The SPA-4S is specifically designed to easily replace a SPA-400. The intercoms are exactly the same dimensions (1" x 2.5" x 4"). Five mounting holes are exactly in the same positions. To upgrade, first remove the SPA-400 unit from the aircraft panel. This is done by unscrewing the two Phillips head screws and the nut on the ON/OFF switch. Remove the printed SPA-400 panel. Pull the SPA-400 unit out and unplug the white connector from the wiring harness. Finally mount the SPA-4S chassis (see Figure 2 on page 2):

1. Remove the knobs from the Volume and Squelch controls using a 0.050" Allen wrench. Remove the nut from the ON/OFF

Next turn the SPA-4S unit "on". Set the SPA-4S volume control to mid-position. Set SPA-4S squelch control fully clockwise. Verify that the Pilot and co-pilot can operate the aircraft radio(s). As before, all headsets on the intercom will hear the aircraft radio(s). Check that all headset positions can intercom.

It may be necessary at this time to adjust the SPA-4S unit mic output to the aircraft radios. A small adjustable potentiometer is provided inside the unit for this purpose. It is accessible through a hole in the side of the SPA-4S chassis. It is marked "Mod. Adj.", and can be adjusted with a small blade screwdriver. In the event of over-modulation (garbled) or reports of weak transmissions over the aircraft radio, an appropriate adjustment can be made. Clockwise rotation increases the output level to the aircraft radio mic input. Counter-clockwise rotation decreases modulation level. This adjustment sometimes needs to be made after the initial installation of the intercom or if a new radio is installed. (The output is set for unity gain at Sigtronics).

You are now ready to check for proper wiring of the music source. First, make sure squelch is off (full counter clockwise) and intercom is ON. Turn on the music source and listen for music through pilot and co-pilot headsets, and passenger headsets. There should be music.

If everything checks out, refer to the SPA-4S OPERATING INSTRUCTIONS sheet for proper use and other operating modes of the Sigtronics SPA-4S intercom system. If something does not work as described, carefully go over the intercom wiring again. If something is still not right or you have any questions regarding the installation and operation of the Sigtronics SPA-4S intercom or any other Sigtronics product feel free to contact us directly or email us at tech@sigtronics.com. Technicians are available Monday through Friday 8 am to 4:30 PM Pacific time.

See the separate SPA-4S OPERATING INSTRUCTIONS sheet for complete operation information.

HOW TO SELECT MUSIC OPTIONS

To select either full music mute during intercom the unit must be removed from the aircraft. This is done by first removing the volume and squelch control knobs with and 0.05 inch Allen wrench. Then remove the two mounting screws and switch nut that hold the unit in the panel. The unit is now free for removal from the aircraft after disconnecting the cables at the plugs.

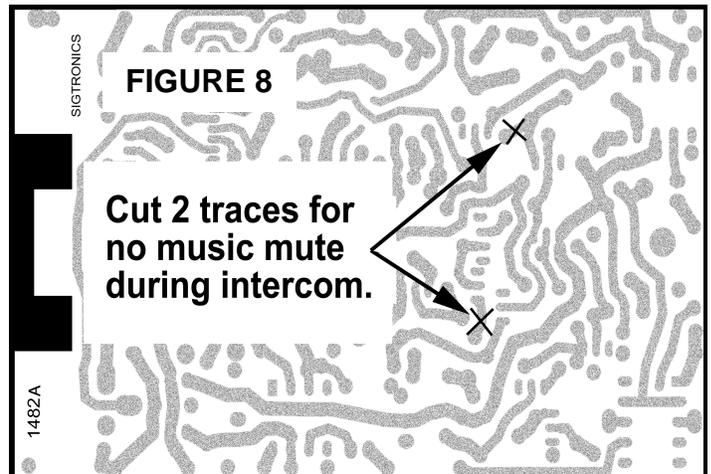
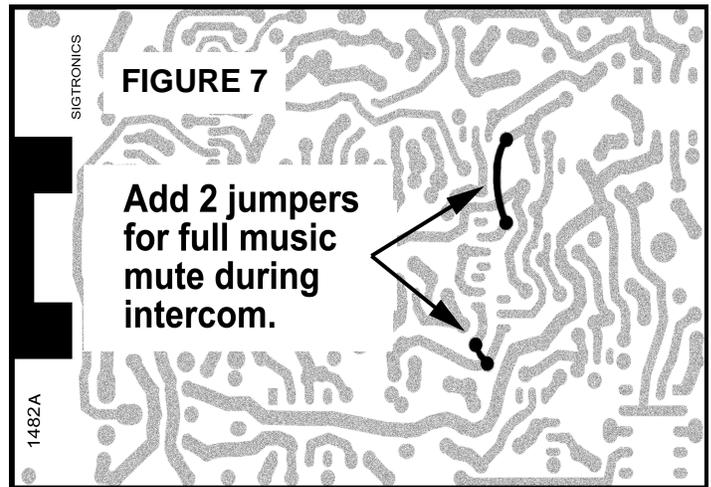
To enable either of these options, modification to the bottom of the units' circuit board is required. **CAUTION** – a qualified technician should perform this modification. First remove the three screws securing the bottom cover to the case and carefully lift and remove the cover. Note that the circuit board does not have to be removed from its case to complete the modifications.

To select full mute during intercom solder the two small-insulated jumper wires at the locations specified in Figure 7.

OR...

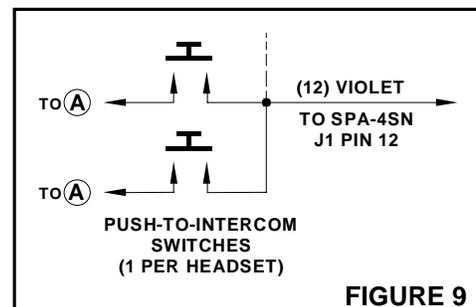
To select no music mute during intercom cut the circuit traces with a small sharp blade at the X's per Figure 8.

Replace the cover and secure it with the three screws as before. Install the unit back into the panel and plug in the two cables.



SPA-4SN PUSH-TO-INTERCOM INSTRUCTIONS

Install a separate momentary switch at each headset position. Connect per Figure 9. To use the push-to-intercom feature, turn the squelch control on the intercom fully counter-clockwise. Then to activate, press the push-to-intercom switch(s). Alternately, to use the intercom in voice activated (VOX) mode set the intercom squelch as normal. See the separate SPA-4S OPERATING INSTRUCTIONS sheet.



...when it counts!

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