

# PS ENGINEERING<sup>®</sup> INCORPORATED

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## PMA6000B

Audio Selector Panel with Intercom System

and

Marker Beacon Receiver

**Installation and Operation Manual**

*Flying never sounded so good™*

FAA-Approved TSO C35d TSO C50c

EASA ETSO 2C35d, ETSO C50c

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*Revision History*

<b>Rev</b>	<b>Date</b>	<b>Change</b>
New		New release of PMA6000B
1	6/23/2009	Update after review
2	10/21/2009	Improve wiring diagram
3	10/31/2009	General clean- up
4	2/2/2010	Added ETSO Approval
5	1/11/2011	Improved installation of grounding lug Appendix B
6	2/13/13	Changed §2.5 to show new cover and adjustment locations
7	8/27/2020	Changed connector back shells

## Section I GENERAL INFORMATION

### 1.1 INTRODUCTION

The PMA6000B family of Audio Selector Panels are revolutionary products. Never before has there been so much capability and utility in such a compact package. These units are designed for ease of use and installation, as well as to facilitate cockpit resource management and improve passenger entertainment.

Before installing and/or using this product, please read this manual completely. This will ensure that you will take full advantage of all the advanced features.

### 1.2 SCOPE

This manual provides detailed installation and operation instructions for the PS Engineering PMA6000-series of Audio Selector Panel/Intercom Systems. This includes the following units:

Model	Description	Part Number
PMA6000B	Audio Selector Panel with Marker Receiver	6000B
PMA6000B Option 2	same as above, less marker receiver	6000B-2

Where the functions are identical to all units, it will be referred to herein as a PMA6000. Otherwise, the applicable units will be specified.

### 1.3 EQUIPMENT DESCRIPTION

The PMA6000-series is a state of the art audio isolation amplifier and audio selector that contains a voice activated (VOX) intercom system. It can switch up two transceivers (Com 1, Com 2) and six receivers (Nav 1, Nav 2, ADF, DME, MKR and AUX). In addition, there are two unswitched inputs, for priority audio sources such as TAWS or altimeter warning. Push buttons select the receiver audio source provided to the headphones. A SPR button allows the user to listen to the receiver(s) selected on the cabin speaker. Except for the unswitched inputs, all speaker audio is muted during transmit. Push buttons select one of the transceivers for the pilot and copilot position in transmit. In "Split Mode" the PMA6000 has the ability to allow the pilot and copilot to operate different transmitters independently.

A fail-safe mode connects the pilot headphone and microphone to COM 1 and unswitched input #1 if power is removed for any reason, or if the audio panel is turned **OFF** by pushing the volume control.

A four-station voice activated (VOX) intercom is included in the PMA6000. Pilot isolate and crew modes, two mono music inputs with "Soft Mute," and transmit indications. Intercom control is through front panel mounted knobs. Dual concentric knobs control intercom volume and intercom squelch.

A 3-light Marker Beacon receiver is integral to the PMA6000B (without option 2). This provides the necessary Marker Beacon light and audio indications necessary for an Instrument Landing System (ILS) approach.



**Figure 1-1 PMA6000B**

## 1.4 APPROVAL BASIS – FAA & EASA

### TSO/ETSO Approval.

The PMA6000-series are FAA approved under TSO C50c (Audio Amplifiers) and TSO C35d (Marker Beacon Receivers).

The PMA6000-Series is EASA Approved under ETSO C50c and ETSO 2C35d, ref EASA.IM.210.10028565

All systems comply with RTCA DO-143, DO-160B DO-170, and EUROCAE WG No. 7/70.

Operation is subject to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

## 1.5 SPECIFICATIONS

GENERAL SPECIFICATION	TSO COMPLIANCE:
<i>Marker Beacon:</i>	C35d, Class A
<i>Audio Selector/Intercom:</i>	C50c, Class A
APPLICABLE DOCUMENTS:	RTCA DO-160b, RTCA DO-170 and RTCA DO-143
ENVIRONMENTAL Qualifications:	A1D1/CAMXXXXXXXXBBBBAAAX
<i>Temperature Range:</i>	Operating: -20°C to +55°C Storage: -40°C to +85°C
<i>Altitude:</i>	Up to 50,000 feet in an non-pressurized area of the cockpit
DIMENSIONS	Height: 1.3 in. (3.3 cm) Width: 6.25 in. (16.9 cm) Depth: 6.8 in. (17.3 cm)
WEIGHT (With Rack & Connectors) :	1.5 Lb. (0.68 kg.)
POWER REQUIREMENTS (Including Internal Lighting):	
<i>Voltage</i> <i>Maximum Current:</i> <i>Typical operating current:</i>	13.75 or 27.5 VDC* 1 Amp (Externally protected by a 2 Amp circuit breaker.) speaker off:                   350 mA speaker on:                    600 mA *27.5 VDC requires 15W dropping resistor (included).
<i>Audio selector panel input impedance</i>	510 Ω
<i>Input Isolation</i>	-70 dB (min.)
<i>Speaker Muting</i>	-60 dB (min.)
<i>Speaker Output (into 4 Ω):</i>	3 Watts (min.) with no clipping
<i>Switched Receiver Inputs:</i>	8 (Com 1, Com 2, Nav 1, Nav 2, ADF, DME, MKR, AUX)
<i>Unswitched Inputs</i>	2
<i>Transmitter Selections</i>	3; Com 1, Com 2, Com 1/2
<i>Speaker Impedance:</i>	4 Ω
<i>Headphone Impedance</i>	150 - 1000 Ω
<i>Headphone Output:</i>	45 mW each headset with no clipping
<i>Microphone Impedance:</i>	150 - 600 Ω
<i>Intercom Positions:</i>	4 places
<i>Music Inputs:</i>	2
<i>Music Muting:</i>	>50 dB "Soft Mute" when Radio or intercom active.
<i>Distortion:</i>	<1% THD@ 45 mW into 150 Ω
<i>Mic Freq. Response, ±3 dB:</i>	350 Hz - 6000 Hz

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<i>Music Freq. Response, <math>\pm 3</math> dB</i>	200 Hz - 15 kHz
<i>Frequency:</i>	75 MHz Crystal Controlled
<i>Sensitivity:</i>	Low 450 $\mu$ Volts (Hard) Factory adjusted to 1400 $\mu$ V (Soft) 160 $\mu$ Volts (Hard) High Factory adjusted to 150 $\mu$ V (Soft)
<i>Selectivity:</i>	-6 dB at 110 kHz -40 dB at 120 kHz
<i>External Lamp Output:</i>	7.0 (+/- 4) VDC Positive when active, max. current 125 mA
<i>MM Sense:</i>	Active high (4.7 VDC +/- 0.5V) during Middle Marker acquisition, for autopilot use.

## 1.6 EQUIPMENT SUPPLIED

A. 1 ea. of the following units:

Model	Part Number
PMA6000B with Marker Beacon Receiver/Indicator)	6000B
PMA6000B Opt 2 (no Marker Beacon)	6000B -2
Installation kit	250-604-0000
Tray	430-890-0040
Pilot's guide	200-066-0200
Dropping resistor 15 $\Omega$ , 15W for 28V installations	701-015-1501

B. PMA6000 Installation Kit (250-604-0000):

Description	Quantity	Part Number
Rack back plate	1	430-890-0050
44-pin connector kit (male pins)	1	120-891-2045-
Back shell, connector	1	625-025-1131
Back shell cover	1	625-025-1132
2-59 x 5/16 screw	4	475-266-0516
4 40 X 7/16 screw w/nylon patch	4	475-440-0007
4 40 X 3/8 screw w/nylon patch	2	475-440-1038
4-40 x 1/4" screw with lock washer	2	475-440-0001
Solder Lug	2	475-009-0001
Cable Clamp	1	625-001-0002
#6-32 x 1/2" Flat head Philips screw	6	475-632-0012
#6-32 Clip Nut	6	475-630-0002

## 1.7 EQUIPMENT REQUIRED BUT NOT SUPPLIED

- A. Speaker, 4  $\Omega$
- B. Headphones, mono, up to 4 as required
- C. Microphones, up to 4 as required
- D. Marker Antenna (75 MHz, VSWR <1:1.5, as appropriate) (Marker version only)
- E. Interconnect Wiring
- F. Headphone Jacks (Up to 4 as required)
- G. Microphone Jacks (Up to 4 as required)
- H. Circuit Breaker: 1 ea., 2 amp.

## 1.8 LICENSE REQUIREMENTS

None

## Section II -Installation

### 2.1 GENERAL INFORMATION

#### 2.1.1 SCOPE

This section provides detailed installation and interconnect instructions for the PS Engineering PMA6000B-Series Audio Selector Panel/Intercom System and PMA6000B-Series Audio Selector Panel/Intercom System with internal Marker Beacon.

With the exception of the internal marker beacon receiver, the audio panels are identical.

Please read this manual carefully before beginning any installation to prevent damage and post installation problems. Installation of this equipment requires special tools and knowledge. The equipment **must** be installed by an appropriately rated Certified Aircraft Repair Station, in accordance with applicable regulations.

**NOTE:** The PMA6000B-Series requires specialized knowledge equipment and tools for an effective installation. An appropriately rated Certified Aircraft Repair Station **must** install this equipment in accordance with applicable regulations. PS Engineering, Incorporated warranty is not valid unless the equipment is installed by an authorized PS Engineering, Incorporated dealer. Failure to follow any of the installation instructions, or installation by a non-certified individual or agency will void the warranty, and may result in an **unairworthy** installation.

### 2.2 Unpacking and Preliminary Inspection

Use care when unpacking the equipment. Inspect the units and parts supplied for visible signs of shipping damage. Examine the unit for loose or broken buttons, bent knobs, etc. Verify the correct quantity of components supplied with the list in Section 1.6 (B). If any claim is to be made, save the shipping material and contact the freight carrier. Do NOT return units damaged in shipping to PS Engineering. If the unit or accessories shows any sign of external shipping damage, contact PS Engineering to arrange for a replacement. Under no circumstances attempt to install a damaged unit in an aircraft. Equipment returned to PS Engineering for any other reason should be shipped in the original PS Engineering packaging, or other UPS approved packaging.

### 2.3 Equipment Installation Procedures

#### 2.3.1 Cooling Requirements

Forced-air cooling of the PMA6000B is not required. However the unit should be kept away from heat producing sources (i.e. defrost or heater ducts, dropping resistors, heat producing avionics) without adequate cooling air provided.

**NOTICE:** To reduce the amount of heat dissipated in the audio selector panel, when used in a 28 Volt aircraft, it is required that the 15  $\Omega$ , 15-Watt dropping resistor (p/n 701-015-1501) be installed in series with the power input.

If the PMA6000B is installed in a 27.5 VDC aircraft system, a 15  $\Omega$ , 15 Watt dropping resistor (p/n 701-015-1501) should be installed. Failure to do so will generate unnecessary heat inside the unit and may void PS Engineering's warranty.

#### 2.3.2 Mounting Requirements

The PMA6000B must be rigidly mounted to the instrument panel of the aircraft structure and within view and reach of the pilot position(s). Installation must comply with FAA Advisory Circular AC 43.13-2B. The unit may be mounted in any area where adequate clearance for the unit and associated wiring bundle exist.

### 2.3.3 Mounting Rack Installation

Remove the unit from the mounting tray unscrewing the 3/32-inch hex-head screw that is in the center of the unit. The hex-head screw is the lower opening. Carefully slide the unit free of the tray. Set the unit aside in a safe location until needed. Install the tray using six FHP 6-32 x 1/2-inch screws, P/N 475-632-0012 and #6-32 clip nut, P/N 475-630-0002. The audio selector panel must be supported at front and rear of the mounting tray.

### 2.3.4 Audio Panel Tray and Connector Assembly

The rack connectors mate with one 44-pin female connector in the PMA6000. The connector are a sub-miniature crimp-type, and require the use a hand crimp tool, from table below (or equiv.). The connector is mounted to the tray back plate with #4-40 screws (475-440-1038), from the inside of the tray and the mounting block, 431-891-0100. Ensure that proper strain relief and chafing precautions are made during wiring and installation, using the cable clamp (625-001-0002).

Two grounding lugs are provided, which may be attached to the rear mounting plate with 2 ea #4-40 x 1/4" screws with captivated lock washers. These provide a convenient location to connect the shield ground terminations.

Manufacturer	Crimping Tool	Positioner	Extraction tool
AMP	601966-1	601966-6	91067-1
Daniels	AFM8	K42	M24308-1
ITT-Cannon	995-0001-584	995-0001-739	91067-1

**Table 2-1 Connector Pin crimping tools**

## 2.4 Cable Harness Wiring

Refer to Appendix C for assembling the wiring harness as required for the installation. All wires must be MIL-SPEC in accordance with current regulations. Two- and three-conductor with shield wire must be used where indicated, and be MIL-C-27500 or equivalent specification. Proper stripping, shielding and soldering technique must be used at all times. It is imperative that correct wire be used.

Refer to FAA Advisory Circular 43.13-2B for more information. Failure to use correct techniques may result in improper operation, electrical noise or unit failure. Damage caused by improper installation will void the PS Engineering warranty.

### 2.4.1 Noise

Due to the variety and the high power of radio equipment often found in today's general aviation aircraft, there is a potential for both radiated and conducted noise interference.

The PMA6000B power supply is specifically designed to reduce conducted electrical noise on the aircraft power bus by at least 50dB. Although this is a large amount of attenuation, it may not eliminate all noise, particularly if the amplitude of noise is very high. There must be at least 13.8 VDC present at the bottom connector, pin 43, of the PMA6000B for the power supply to work in its designed regulation. Otherwise, it cannot adequately attenuate power line noise. Shielding can reduce or prevent radiated noise (i.e., beacon, electric gyros, switching power supplies, etc.) However, installation combinations can occur where interference is possible. The PMA6000B is designed in a RFI hardened chassis and has internal Electromagnetic Interference (EMI) filters on all inputs and outputs.

Ground loop noise occurs when there are two or more ground paths for the same signal (i.e., airframe and ground return wire). Large cyclic loads such as strobes, inverters, etc., can inject noise signals onto the airframe that are detected by the audio system. Follow the wiring diagram very carefully to help ensure a minimum of ground loop potential. Use only Mil Spec shielded wires (MIL-C-275000, or better). Under no circumstances combine a microphone and headphone wiring into the same shielded bundle. Always use a 2- or 3-conductor, shield wire as shown on the installation wiring diagram.

The shields can be daisy-chained together, and then connected to the ground lugs mounted on the back plate shown in Appendix B.

Radiated signals can be a factor when low level microphone signals are "bundled" with current carrying power wires. Keep these cables physically separated. It is very important that you use insulated washers to isolate the ground return path from the airframe to **all** headphone and microphone jacks.

Adding a high-performance audio control system, particularly in conjunction with active noise canceling headsets, cannot improve on older avionics that were designed for cabin-speaker use. PS Engineering makes no claim that the audio panel will provide a noise-free audio quality under all installation conditions, particularly with older avionics.

## 2.4.2 Entertainment Input

Two entertainment devices (MP3 player, Portable Satellite Radio, CD player, etc.) can be connected to the unit. Install two 1/8-inch jacks in a convenient location so that the pilot can plug in the entertainment devices into the system.

**NOTE:** Use the low level output of any entertainment device to connect to the audio panel. Maximum signal level is **2 VAC** p-p. **DO NOT** use a speaker-level output, this will cause internal damage in the audio panel.

To use a line level, install a Scosche SLC4, P/N 142SLC4 adapter, available from Crutchfield at 1-800-955-3000  
sales@crutchfield.com

For a stereo input, we **do not** recommended tying the left and right channels (tip and ring) together unless approved by the music source manufacturer. The audio signal at the entertainment input must be a minimum of 500 mV P-P for optimum music performance.

### 2.4.2.1 Soft Mute

The PMA6000B-system incorporates a "Soft Mute" system. This will mute the entertainment devices during ICS or radio traffic. While in the ALL or ISO modes, entertainment #1 is heard by everyone (except by the pilot in ISO mode). While in the CREW mode, pilot and copilot will hear entertainment #1 while the passengers will hear entertainment #2.

The "Mute" button can be used to inhibit the soft mute function, keeping music at the same level. In CREW mode, passengers will hear Music #2, and this will also be controlled by the "Mute" button located on the front panel.

Entertainment inputs #1 and #2 can be paralleled so a single entertainment source can serve both the passengers and the crew in "crew" mode. It is suggested however, that a switch (DPDT) is installed between the single entertainment device and entertainment input #1. This will allow the pilot and copilot to decide if they hear entertainment while in the Crew mode.

Local oscillators and internal signals from some entertainment equipment can cause undesired interference with other aircraft systems. Before takeoff, operate the entertainment devices to determine if there is any adverse effect within the aircraft systems. If any unusual operation is noted in flight, immediately switch off the entertainment devices.

### 2.4.3 PMA6000B Pin assignments

Pin	Function	Pin	Function
1	Copilot Mic Audio	2	Pilot Mic Audio Hi
3	Passenger Mic Hi	4	COM 1 mic audio
5	COM 1 Mic key	6	COM 1 audio In
7	Unswitched 1 Hi	8	NAV 1 input
9	Music 1 Hi	10	Pilot Headphone
11	Swap	12	Blue lamp out
13	Amber Lamp Out	14	Speaker Ground
15	Marker Antenna	16	Copilot mic Lo
17	Pilot Mic Low	18	Passenger 1 Mic Lo
19	Passenger Mic Lo	20	COM 1 Lo
21	COM 2 Mic Key	22	Unswitched 2 Hi
23	Nav 2 Audio Hi	24	Audio Low
25	Music 2 Hi	26	Copilot Phones Hi
27	MM Sense	28	MKR low
29	Airframe Ground	30	Marker antenna ground
31	Copilot Mic PTT	32	Pilot Mic PTT
33	Passenger Mic Hi	34	COM 2 Mic audio
35	COM 2 audio Lo	36	COM 2 audio
37	ADF audio Input	38	DME audio Hi
39	AUX audio Hi	40	Passenger Phones Hi
41	Dimmer Input	42	White lamp out
43	Aircraft power	44	Speaker Hi

### 2.4.4 External Push-to-Talk

An important part of the installation is the PTT (Push-To-Talk) switches that allow the use of your aircraft communications radio for transmissions. There are three typical configurations that can be used. Select the case that best fits the installation. Only the person who presses their PTT switch will be heard over the radio. If the pilot and copilot both use the PTT, the copilot position has access to the radio. The pilot position will have PTT control regardless of the copilot when the PMA6000B is in the FAIL-SAFE mode.

*CASE I:* PTT is built into both pilot and copilot yokes.

*CASE II:* PTT is in pilot yoke only. This configuration requires a modified external PTT switch plugged into the copilot's microphone jack. (See Appendix A). When the copilot's PTT is pressed, the intercom switches the mic audio from pilot to copilot mic.

*CASE III:* No built in PTT. This requires two built in PTTs to be installed, or modified external PTT switches to be used. Modify external PTT as required (See Appendix A).

### 2.4.5 Transmit Interlock

Some communications transceivers use a transmit interlock system. In order to fully utilize the Split Mode feature, this function must be disabled. Consult that manufacturer's installation manual.

### 2.4.6 Power

The PMA6000B-Series are compatible with both 13.8 and 28-Volt DC systems. A two (2) Amp circuit breaker is required. Power and ground wires must be a twisted #22 AWG pair.

Included with this product is a power dropping resistor to be connected in series with the power input, bottom connector, pin 43. This dropping resistor is supplied for 28-volt systems so that unnecessary heat dissipation inside the PMA6000B can be avoided.

**NOTICE:** To reduce the amount of heat dissipated in the audio selector panel, when used in a 28 Volt aircraft, a 15  $\Omega$ , 15 Watt dropping resistor (p/n 701-015-1501) must be installed in series with the power input. This resistor should be mounted to aircraft structure to dissipate heat

### 2.4.7 "Swap" Mode

When a normally-open, momentary, push-button switch is connected between pin 11 on the connector and aircraft ground, the user can switch between Com 1 and 2 by depressing this switch without having to change the mic selector. This yoke mounted switch eliminates the need of removing your hands from the yoke to change transceivers.

### 2.4.8 Backlighting

The PMA6000B has an automatic backlighting system controlled by a photo detector. Additional control can be gained by the aircraft avionics dimmer control. Connect the dimmer control line to connector pin 41. The unit has an internal jumper to select between 14-volt and 28-volt electrical systems.

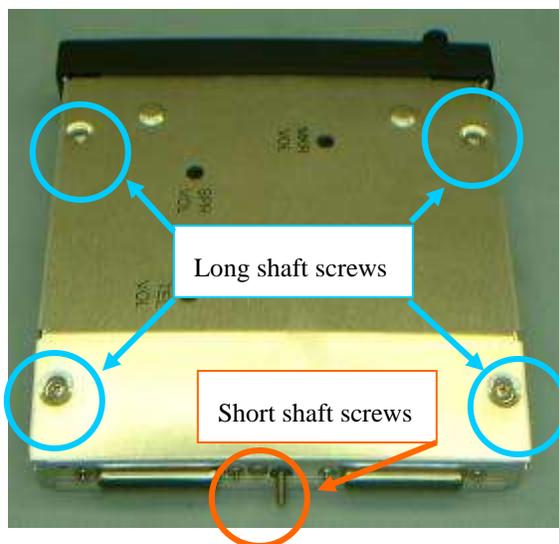
This installation provides the ability to bring the backlighting level to zero. If dimmer control is not used, a constant low-level back light illumination has been established for nighttime viewing. The photocell located in the center of the unit face will automatically adjust the backlight of the push-button lights.

#### 2.4.8.1 Backlighting

As shipped from the factory, the PMA6000B is configured for 14V dimmer systems. For 28V dimmer systems remove jumper J9.

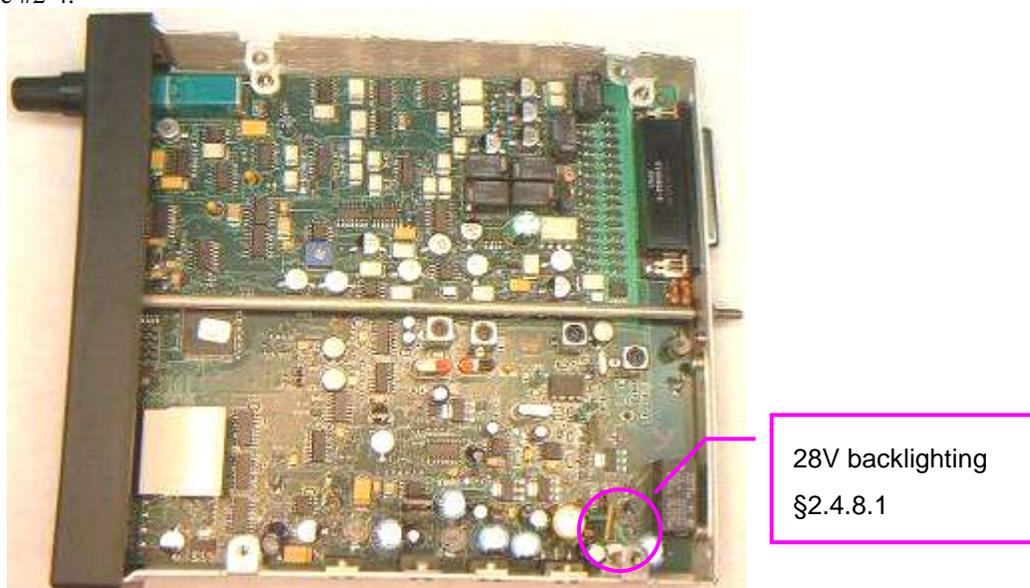
NOTE: Take precautions to prevent ESD damage prior to servicing unit

1. Remove qty. 5 Phillip head screws from the PM6000B. **NOTE: THE SCREW IN THE REAR OF THE PANEL IS A DIFFERENT LENGTH THAN THE OTHER FOUR. YOU MUST PUT THE SHORTER LENGTH SCREW BACK IN THE SAME LOCATION OR DAMAGE WILL OCCUR. See Figure #1.**



**Figure 2-1 Screw Locations**

2. Remove the jumper located in the back corner away from the sub-D connector from *both* pins of J9. See Figure #2-4.



**Figure 2-2 Backlight selection jumper location**

3. Place the lid back on the unit, aligning holes.
4. Install and tighten qty. 4 long thread screws into the lid, and one short screw on the rear.

#### **2.4.9 Middle Marker Sense**

The MM Sense output Pin 27, is connected to certain specific autopilots, and goes high only when a middle marker signal is received, not in test.

#### **2.4.10 Unswitched Inputs**

The PMA6000B has two unswitched inputs. pin 7 and pin 22 are unswitched/unmated inputs that are heard by the crew and over the cockpit speaker at all times.

### 2.4.11 Intercom

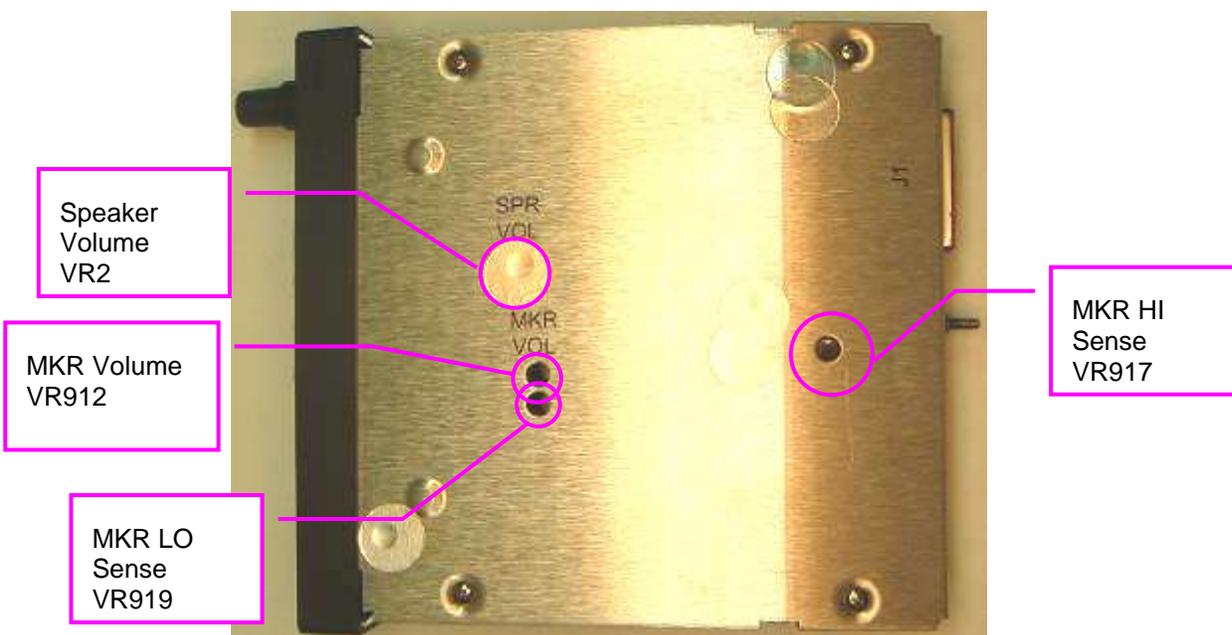
All mic and headphone jacks must have insulating washers, the cable must be Teflon coated, twisted-shielded wire, and the shield must only be connected to the ground return wire **only** at the intercom connector.

## 2.5 Adjustments

The PMA6000 is factory adjusted to accommodate the typical requirements for most aircraft configurations. There are three adjustments however, that will allow the installer to tailor the specific functions. See section 2.4.8.1 for disassembly instructions.

<u>Adjustment</u>	<u>Clockwise Results In</u>
Cabin Speaker Level	Increase Speaker Volume
Marker Beacon Level	Decrease Marker Volume
MKR High Sense	Increase sensitivity
MKR Low Sense	Increase Sensitivity

To make the necessary adjustments, use a small jeweler's slotted screwdriver.



## 2.6 Marker Antenna Installation

Refer to aircraft and antenna manufacturer's installation instructions, as well as AC43.13-2B (or later revision), Chapter 3, for information on proper antenna installation techniques. The marker beacon antenna must be mounted on the bottom of the aircraft.

## 2.7 Communications Antenna Installation Notes

For best results while in Split Mode, it is suggested that the one VHF communications antenna be located on top of the aircraft while the other communications antenna be on the bottom. Any antenna relocation must be accomplished in accordance with AC 43.13-2B, aircraft manufacturers' recommendations and FAA-approved technical data.

**Warning:** It is probable that radio interference will occur in the split mode when the frequencies of the two aircraft radios are adjacent, and/or the antennas are physically close together. PS

Engineering makes no expressed or implied warranties regarding the suitability of the PMA6000B in Split Mode.

## **2.8 Unit Installation**

To install the PMA6000B, gently slide the unit into the mounting rack until the hold-down screw is engaged. While applying gentle pressure to the face of the unit, tighten the 3/32" hex-head screw next to the copilot control shaft until the unit is secure. **DO NOT OVER TIGHTEN.**

**Warning:** Do not over-tighten the lock down screw while installing the unit in tray.  
**Internal damage will result.**

## **2.9 Post Installation Checkout**

### **2.9.1 Required Test Equipment**

In order to return an aircraft to service after installation of the PMA6000B with marker beacon receiver, the installer must have access to a Marker Beacon signal generator:

- a. IFR NAV401L, NAV402AP, IFR4000
- b. TIC T-30D, T-36C

Equivalent test equipment is acceptable as long as the testing requirements can be met.

### **2.9.2 Power Test**

After wiring is complete, verify power is **ONLY** on pin 43 of the connector, and airframe ground on connector pin 29. Failure to do so will cause serious internal damage and void PS Engineering's warranty.

1. Apply power to the aircraft and avionics.
2. Plug headsets into the pilot, copilot, and occupied passenger positions.
3. Verify fail-safe operation by receiving and transmitting on com 1 from the pilot position, with the audio panel power off.
4. Switch on the unit by pressing the volume (VOL) knob.
5. Check intercom operation.
6. Push the Com 1 Xmt select button (lower row).
7. Verify that both of the **Com 1** buttons light. Verify that transmit button LED (Light Emitting Diode) near the mic selector is not blinking. If the LED is blinking, stop testing and troubleshoot the microphone PTT installation.
8. Verify proper transmit and receive operation from the copilot position, noting that the copilot PTT switch allows proper transmission on the selected transceiver. Verify that the Com 1 Xmt button blinks when transmitting.
9. Verify that pushing the **COM 2** button causes the button to illuminate, and the Com 2 receiver to be heard. Verify operation on Com 1 from the pilot position.
10. Repeat for Com 2
11. Press and hold the Com 1 Xmt button. While holding the Com 1 button, press the Com 2 Xmt button. This places the unit in "Split Mode;" Verify that the pilot can transmit and receive on Com 1, while the copilot transmits and receives on Com 2.
12. Verify proper operation of all receiver sources by selecting them using the appropriate button. The button illuminates to show which source is in use.
13. Push the SPR button. Verify that all selected audio is heard in the cockpit speaker. Verify that the audio mutes when the mic is keyed.

14. Verify that the appropriate LED in the lower button row blinks when either push to talk is keyed.
15. Verify proper Intercom system operation in the **ALL**, **ISO** and **CREW** modes (see Table 3-1).
16. Verify that the audio selector panel system does not adversely affect any other aircraft system by systematically switching the unit on and off, while monitoring the other avionics and electrical equipment on the aircraft.

### **2.9.3 Marker Checkout**

1. Connect a ramp generator at the antenna end of the marker coax. With the unit under test in HI sensitivity, verify that a 160  $\mu$ V, modulated 95% with 1300 Hz, signal will illuminate the amber (M) marker light, and that marker audio is present in the headphones when the Marker Audio (M) push-button has been depressed. Select SPR for speaker to verify marker audio availability on the cabin speaker. Verify that the white (I) and blue (O) lights will illuminate within  $\pm 3$ dB of the amber lamp, with 3000 HZ and 400 Hz applied, respectively.
2. Repeat with the unit in LOW sensitivity, with 430  $\mu$ Volts applied.
3. Connect the marker antenna and verify proper operation.

### **2.10 Final Inspection.**

Verify that the wiring is bundled away from all controls and no part of the installation interferes with aircraft control operation. Move all controls through their full range while examining the installation to see that no mechanical interference exists. Verify that the cables are secured to the aircraft structure in accordance with good practices, with adequate strain relief. Ensure that there are no kinks or sharp bends in the cables and coaxial cables. Verify that the cables are not exposed to any sharp edges or rough surfaces, and that all contact points are protected from abrasion. Complete logbook entry, FAA Form 337, weight and balance computation and other documentation as required. Return completed warranty registration application to PS Engineering, or register online at [www.ps-engineering.com/warranty.shtml](http://www.ps-engineering.com/warranty.shtml) .

## Section III OPERATION

### GENERAL INFORMATION

#### 3.1 GENERAL INFORMATION

This section provides detailed operating instructions for the PS Engineering PMA6000B, Audio Selector Panel/Intercom Systems. Please read it carefully before using the equipment so that you can take full advantage of its capabilities.

This guide is divided into sections covering the basic operating areas of the PMA6000B systems. They are: Audio Selector, Audio Selection, Intercom, and Marker Beacon Receiver (if equipped).



Figure 3-1 PMA6000B without Marker (-0100)



Figure 3-2 PMA6000B with Marker (-0300)

#### 3.2 Power, Fail Safe Operation (1)

Unit power is turned on and off by pressing the unit Volume control knob (smaller concentric knob on left side of unit) In the OFF or "FAIL-SAFE" position, the pilot is connected directly to Com 1 and unswitched input #1, allowing transmit receive and alert capability regardless of unit condition. Any time power is removed or turned OFF, the audio selector will be placed in the fail-safe mode. In fail-safe mode, the pilot headset is connected directly to Com 1.



### 3.3 Volume Control (2)

The volume control knob adjusts the loudness of intercom in all headphones, pilot, copilot, and passenger. It has no effect on selected radio audio or music levels. Many general aviation headsets have a built-in volume control, so volume can be reduced “locally.”

### 3.4 Audio Selector (3)

Through the use of ten, push-button, backlit switches, it is possible to select any or all receiver audio.

When selected, a green LED in the button will illuminate indicating which audio source is selected. You will always hear the audio from the transceiver that is selected by the two push-button mic selector switches.

The users can identify which receivers are selected by noting which push-button switches are illuminated. Push buttons labeled **Nav 1**, **Nav 2**, **DME**, **MKR** (Marker), **ADF**, **AUX** (auxiliary), and **SPR** (Speaker) are momentary type switches. Press the switch again and it will be in the "off" position and remove that receiver from the audio. While selected, the switch will also be annunciated by an internal LED.

### 3.5 Transmit selection (4)

To select a radio for transmission, push the lower button in the Com selection section (XMT). Both the pilot and copilot have transmit capabilities on the selected transceiver. All hear the selected audio if the intercom is in the ALL mode. Only the person who presses their Push-To-Talk (PTT), will be heard over the aircraft radio.

The PMA6000B-Series has an automatic selector mode. Audio from the selected transceiver is automatically heard in the headsets and speaker (when selected). You can check this function by switching from COM 1 to COM 2 and watch the selected audio light on the selector change from Com 1 to Com 2. This ensures the pilot will never transmit on a radio that he is not listening to.

When switching the xmt selector from COM 1 to COM 2, while COM 2 audio had been selected, Com 1 audio will continue to be heard. This eliminates the pilot having to switch Com 1 audio back on, if desired.

When switching from COM 1 to COM 2 while Com 2 has NOT been selected, Com 1 audio will be switched off. In essence, changing the transmitter selection will not effect the previous selection of Com receive audio.

#### 3.5.1 Swap Mode (Switch from Com 1 to Com 2 remotely)

With a yoke mounted, momentary switch, the pilot can change from the current Com transceiver to the other by depressing this switch. When "Swap Mode" is active, the COM transmit and receive indicators will toggle to the other Com. To cancel "Swap Mode," the pilot may either press the yoke mounted switch again, or push

the other com selector.

### 3.5.2 Split Mode

Pushing both Com 1 and Com 2 XMT buttons at the same time puts the PMA6000B into "Split Mode". This places the pilot on Com 1 and the copilot on Com 2, and they can use their respective radios independently. The passengers will not hear the radios or crew intercom in the split mode. An example of this useful feature is when the pilot may want to talk to Air Traffic Control, while the copilot may be speaking to Flight Watch.



Placing the pilot on Com 2 and the copilot on Com 1 is not possible.

#### Note:

**Due to the nature of VHF communications signals, and the size constraints in general aviation aircraft, it is probable that there will be some transmission bleed-over in the Split mode, particularly on adjacent frequencies.**

**PS Engineering makes no warranty about the suitability of Split Mode in all aircraft conditions.**

#### Note:

In all PMA6000B-series, Split Mode pilot can still monitor all audio receive inputs (Nav, ADF, etc.) and copilot will only hear Com 2. Additionally, the intercom function between pilot and copilot that is controlled by the ISO/ALL/CREW switch.

## 3.6 Speaker Amplifier (5)

The "SPR" in the audio section stands for speaker. This switch will place all selected audio on the cockpit speaker when selected.

NOTE: with the exception of unswitched unmuted inputs, the speaker amplifier is not active in the "Split Mode." To reduce power consumption and internal heat buildup in the avionics stack, switch off the speaker amplifier when not in use.

## 3.7 Intercom Operation

### 3.7.1 Adjusting the VOX-Squelch control (6)

The PMA6000B provides a single VOX squelch control for the pilot, copilot and the passengers, although each microphone has its own squelch circuit, and only a microphone spoken into will be open. Since the number of microphones open at any one time is reduced, the amount of background noise is diminished.

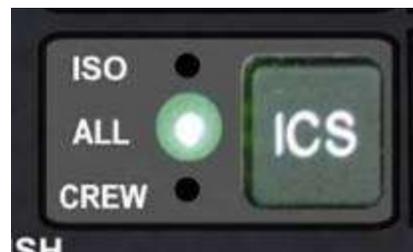
With the engine running, set the VOX control knob (Outer concentric knob) by turning the knob fully counter-clockwise. Then slowly rotate the SQL control knob clockwise until you no longer hear the engine noise in the headphones. When the microphone is positioned properly near your lips, normal speech levels should open the channel. When you have stopped talking, there is a delay of about ½ second before the channel closes. This helps prevent choppy communications.

### 3.7.2 Intercom Modes (6)

The ICS switch is a 3-function mode selector that allows the pilot to tailor the intercom function to best meet the situation. The description of the intercom mode function is valid only when the unit is either in the COM 1 or COM 2 modes. When the unit is in the "Split" mode, only the passengers have intercom function.

Pushing the ICS button cycles the intercom through the three intercom modes.

**ISO:** (Top indicator): The pilot is isolated from the intercom and is connected only to the aircraft radio. He will hear the aircraft radio reception (and sidetone during radio transmissions). Copilot and passengers will hear the intercom and music on Entertainment 1, but not the aircraft radio receptions or pilot transmissions.



**ALL:** (Middle indicator): All parties will hear the aircraft radio, intercom, and music from Entertainment input #1. However, during any intercom communications, the music volume automatically decreases when SoftMute™ is active. The music volume increases gradually back to the original level after communications have been completed.

**CREW** (Lower indicator): Pilot and copilot are connected on one intercom channel and have exclusive access to the aircraft radios. They may also listen to Entertainment 1. Passengers can continue to communicate with themselves without interrupting the Crew and also may listen to Entertainment 2. Anytime the PMA6000B is in "Split Mode" the pilot and copilot do not have any intercom function. The passengers will maintain intercommunications.

### 3.7.3 Entertainment Input

The audio selector panel has provisions for up to two separate entertainment input devices. Which device is heard is determined by the intercom mode switch located in the center of the intercom section of the audio panel. (See Table 1 for overview.)

While in the ISO (Isolate) mode, only the copilot and the two passengers will hear entertainment device #1. In normal operation, whenever a person speaks, the music will automatically mute and then will gradually return to the original listening level when the radio or intercom activity ceases.

When in the ALL mode, all parties will hear the entertainment input #1. While in the CREW mode, pilot and copilot will hear entertainment input #1 while the passengers may listen to entertainment input #2.

It is also possible to use only one entertainment input device for both entertainment inputs (1 and 2). A switch (DPDT) should be installed between the single entertainment device and entertainment input #1. This will allow the pilot and copilot decide if they hear entertainment while in the Crew mode.

### 3.7.4 Soft Mute

The "Mute" button controls the music #1 & #2 muting circuits. This "Karaoke Mode" prevents the music muting when a sing-a-long is desired. "Soft Mute" mode only applies to entertainment input #1 & #2.

## 3.8 Marker Beacon (7)

The Marker Beacon Receiver included in the PMA6000B uses visual and audio indicators to alert you when the aircraft passes over a 75 MHz transmitter.

The Blue lamp, labeled "O," is the Outer Marker lamp and has an associated 400 Hertz 'dash' tone. The lamp and tone will be keyed at a rate of two tones/flushes per second when the aircraft is in the range of the Outer Marker Beacon.

The Amber lamp, labeled "M," is the Middle Marker lamp and is coupled with a 1300 Hertz tone. It is keyed alternately with short 'dot' and long 'dash' bursts at 95 combinations per minute.

The White lamp, labeled "I" is the Airway/Inner marker and has a 3000 Hertz 'dot' tone. The lamp and tone will be keyed at a rate of six times per second.

The audio from the Marker Beacon Receiver can be heard by selecting the "M" push-button switch.

A 3-position switch is used to set the receiver sensitivity and to test the indicator lamps. Use "HIGH" sensitivity initially. This allows you to hear the outer marker beacon about a mile out. Then select the "LOW" sensitivity to give you a more accurate location of the Outer Marker. The momentary down switch position

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PMA6000B Audio Selector Panel and Intercom System  
Installation Manual

is labeled "TEST" and illuminates all three lamps simultaneously to assure the lamps are in working order.

## **Section IV- Warranty and Service**

### **4.1 Warranty**

In order for the factory warranty to be valid, the installations in a certified aircraft must be accomplished by an FAA- certified avionics shop and authorized PS Engineering dealer. If the unit is being installed by in an experimental aircraft by the owner/builder, a dealer-made harness must be used for the warranty to be valid.

PS Engineering, Inc. warrants this product to be free from defect in material and workmanship for a period of one (1) year from the date of sale. During this one-year warranty period, PS Engineering, Inc., at its option, will send a replacement unit at our expense if the unit should be determined to be defective after consultation with a factory technician.

This warranty is not transferable. Any implied warranties expire at the expiration date of this warranty. PS Engineering SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. This warranty does not cover a defect that has resulted from improper or unreasonable use or maintenance as determined by us. This warranty is void if there is any attempt to disassemble this product without factory authorization. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state. Some states do not allow the exclusion of limitation of incidental or consequential damages, so the above limitation or exclusions may not apply to you.

### **4.2 Factory Service**

The unit is covered by a one-year limited warranty. See warranty information. Contact PS Engineering, Inc. at (865) 988-9800, fax (865) 988-6619, or [www.ps-engineering.com/support.shtml](http://www.ps-engineering.com/support.shtml) before you return the unit. This will allow the service technician to provide any other suggestions for identifying the problem and recommend possible solutions.

After discussing the problem with the technician and you obtain a Return Authorization Number, ship product to:

Service Department  
PS Engineering, Inc.  
9800 Martel Rd  
Lenoir City, TN 37772  
(865) 988-9800 FAX (865) 988-6619  
Email: [intercoms@ps-engineering.com](mailto:intercoms@ps-engineering.com)

Units that do not have an RMA number, a complaint and/or a contact phone number reachable during business hours, will be refused from the Certified Repair Facility.

PS Engineering will not be responsible for units that are shipped via Mail or Parcel Post.

## Appendix A

### External PTT Hook Up

Part of the installation includes the installation of PTT (Push To Talk) switches that allow the use of your aircraft radio for communications transmissions.

There are three configurations that can be used, you must select the case that best fits your installation. NOTE: Only the person who presses their PTT switch will be heard over the radio.

#### CASE I

*The PTT is built into the pilot and copilot yokes*

Simply install the plugs from the headset into the aircraft headphone jacks. Then use the yoke mounted PTT to transmit. No other action is required.

#### CASE II

*Built in PTT only on the pilot side only*

This configuration requires a modified external PTT switch plugged into the copilot's mic jack. (See Details Below) When the copilot's PTT is depressed, this activates an internal relay that switches the mic audio to the aircraft radio from the pilot to the copilot.

#### Case III

*No built in PTT switch at all.*

Two built-in PTT must be installed, or two external, modified PTT switches will be required for both the pilot and copilot. Modifications to the PTT are required. (See details below)

#### Push To Talk Modifications

When received from the manufacturer, an after-market PTT switch opens the mic audio path to the "ring" connection of the PTT mic plug until the button is pressed. When the PTT is between the intercom and the headset, the intercom function will not work unless the PTT switch is depressed. A simple modification can be performed to allow proper intercom operation. NOTE: This mod does not alter normal operation.

Below are some examples of typical modifications. Contact PS Engineering or the PTT manufacturer for more details if necessary.

#### Procedures For David Clark PTT

1. Unscrew the round black plastic cover from the jack.
2. Connect the joined black wires to the red wire.
3. Replace the round black plastic cover.

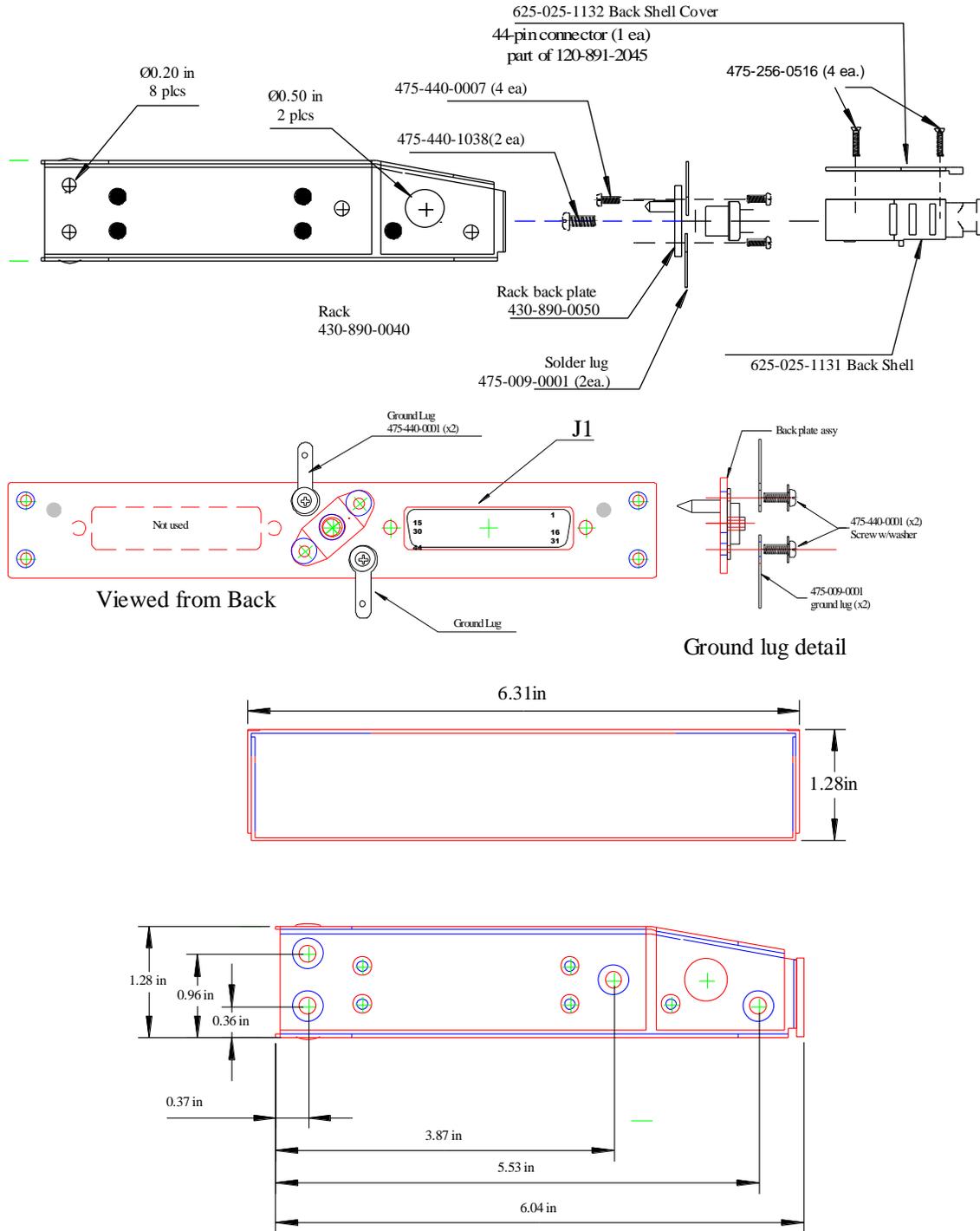
#### Procedures for Telex PT-200

1. Unscrew the round black plastic cover from the jack.
2. Cut the red wire in the middle of the wire.
3. Strip both ends of the insulation.
4. Solder the two ends to the ground lug to the PTT jack.
5. Replace the round black plastic cover.

#### Procedures for Telex PT-300

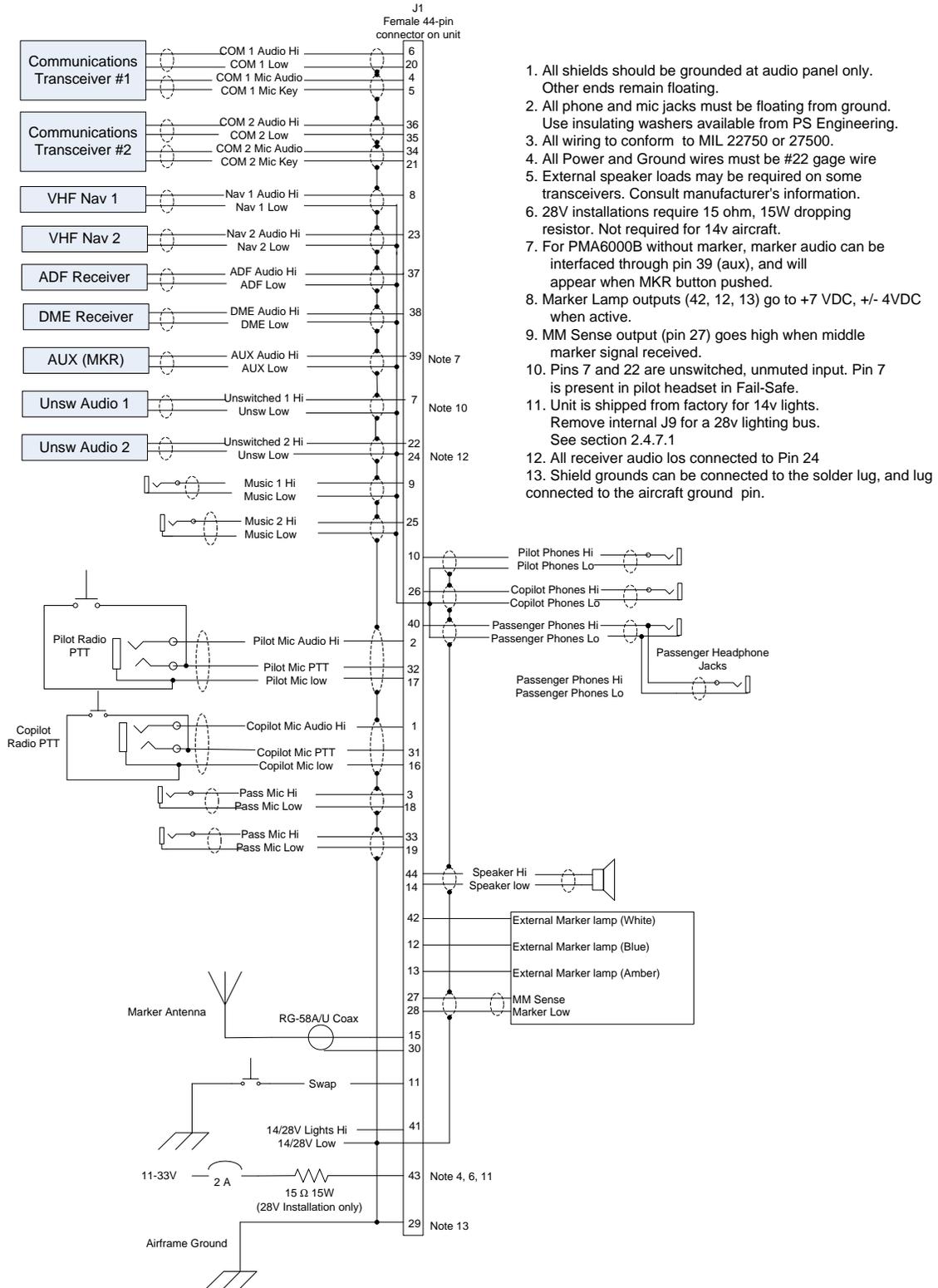
1. Unscrew the round black plastic cover from the plug jack.
2. Remove the heat shrink material from the joined black wires.
3. Solder these two wires to the lug that has a white wire already soldered to it.
4. Replace the round black plastic cover

## Appendix B- Installation Drawing (not to scale)



**Caution:** Apply steady pressure to the bezel while screwing the unit into the tray to ensure even seating of the unit and connectors.

## Appendix C Wiring/Interconnect



1. All shields should be grounded at audio panel only. Other ends remain floating.
2. All phone and mic jacks must be floating from ground. Use insulating washers available from PS Engineering.
3. All wiring to conform to MIL 22750 or 27500.
4. All Power and Ground wires must be #22 gage wire
5. External speaker loads may be required on some transceivers. Consult manufacturer's information.
6. 28V installations require 15 ohm, 15W dropping resistor. Not required for 14v aircraft.
7. For PMA6000B without marker, marker audio can be interfaced through pin 39 (aux), and will appear when MKR button pushed.
8. Marker Lamp outputs (42, 12, 13) go to +7 VDC, +/- 4VDC when active.
9. MM Sense output (pin 27) goes high when middle marker signal received.
10. Pins 7 and 22 are unswitched, unmuted input. Pin 7 is present in pilot headset in Fail-Safe.
11. Unit is shipped from factory for 14v lights. Remove internal J9 for a 28v lighting bus. See section 2.4.7.1
12. All receiver audio los connected to Pin 24
13. Shield grounds can be connected to the solder lug, and lug connected to the aircraft ground pin.

## Appendix D -Instructions for Continuing Airworthiness and FAA Form 337

Sample ICA Checklist for PS Engineering Audio Panels:

Section	Item	Information
1	Introduction	Installation of audio control panel with integrated marker beacon receiver and intercommunications system.
2	Description	Installation as described in manufacturer's installation manual referenced on FAA Form 337, including interface with other avionics audio as required.
3	Controls	See installation and operator's guide referenced on FAA Form 337.
4	Servicing	None Required
5	Maintenance Instructions	On Condition, no special instructions
6	Troubleshooting	In the event of a unit problem, place the unit into "OFF," the fail-safe mode. This allows pilot communications using COM 1. Follow checkout instructions in the installation manual referenced on the FAA Form 337. For a specific unit fault, contact the manufacturer at (865) 988-9800 for special instructions.
7	Removal and replacement information	<u>Removal:</u> Using a 3/32" Allen-head wrench, carefully unscrew the locking screw located in the center of the unit. While turning the wrench CCW, gently pull on the EDGES of the bezel until the unit is free from the mounting tray. <u>Installation:</u> Engage the locking screw at the back. Turn the locking screw CW, while applying slight pressure to the edges of the bezel. Do not over tighten!
8	Diagrams	Not applicable
9	Special Inspection Requirements	Not Applicable
10	Protective Treatments	Not Applicable
11	Structural Data	Not Applicable
12	Special Tools	None
13	Not Applicable	Not Applicable
14	Recommended Overhaul Periods	None
15	Airworthiness Limitations	Not Applicable
16	Revision	To be determined by installer

### Example for FAA Form 337

One method of airworthiness approval is through an FAA Form 337, *Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance)* In the case of the PM6000B audio panel you may use the following text as a guide.

Installed 4-place intercom/audio selector panel, PS Engineering PMA6000B, part number 6000B in center stack instrument panel location designated for panel mounted avionics at station \_\_\_\_\_. Installed per AC43.13-2B, Chapter 2. Installed per PS Engineering *Installation Operators Manual* p/n 200-066-0200, revision X, dated (xx-xx).

This unit is FAA-Approved under TSO C50c for audio amplifiers, and TSO C35d for Marker Beacon Receivers, and meets environmental tests outlined in RTCA DO-170B as appropriate or this aircraft.

Interface to existing aircraft radios in accordance with installation manual and in compliance with practices listed in AC43.13-2, Chapter 2. All wires are Mil-Spec 22759 or 27500. Connection to the aircraft dimmer bus is accomplished per the installation manual and Power is supplied to the unit through a 1A circuit breaker (type and part number), and total electrical load does not exceed \_\_\_\_% of the electrical system capacity with the PMA6000B added.

Aircraft equipment list, weight and balance amended. Compass compensation checked. A copy of the operation instructions, contained in PS Engineering document 200-066-(xxxx), revision x, Dated ( ), is placed in the aircraft records. All work accomplished listed on Work Order \_\_\_\_\_.

## Appendix E RTCA DO160B Environmental Qualification Form

Audio Selector Panel/Intercom/Marker Beacon Receiver

Part Number: 6000

FAA TSO Number: C50c, C35b Class A

EASA ETSO C50c, 2C35d EASA.IM.210.10028565

Manufacturer: PS Engineering Incorporated 9800 Martel Road Lenoir City TN 37772

Conditions	Section	Conducted Tests
Temperature and Altitude	4.0	Equipment tested to CAT A1
Low Temperature	4.5.1	
High Temperature	4.5.2	
Altitude	4.6.1	Equipment tested to CAT D1
Temperature variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to DO-160B, Par 7.1.1
Operational	7.2.1	
Crash Safety (Impulse)	7.3.1	
Crash Safety (Sustained)	7.3.2	
Vibration	8.0	Equipment tested to Category M, Standard
Explosion	9.0	Category X, not tested
Waterproofness	10.0	Category X, not tested
Fluids Susceptibility	11.0	Category X, not tested
Sand and Dust	12.0	Category X, not tested
Fungus	13.0	Category X, not tested
Salt Spray	14.0	Category X, not tested
Magnetic Effect	15.0	Category X, not tested
Power input	16.0	Equipment tested to Category B
Voltage Spike	17.0	Equipment tested to Category B
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Frequency Susceptibility	19.0	Equipment tested to Category B
Radio Frequency Susceptibility	20.0	Equipment tested to Category A
Radio Frequency Emission	21.0	Equipment tested to Category A
Lightning Induced Transient Susceptibility	22.0	Equipment not tested