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PMA9000EX

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Audio Selector Panel with Marker Beacon Receiver
High-fidelity Stereo Intercom
System Installation and Operation Manual
Patented under one or more of the following;
No. 4,941,187; 5,903,227; 6,160,496 and 6,493,450

For use in Experimental/Non-certified aircraft ONLY
Not intended for installation in certified aircraft

The product warranty is not valid unless this product is installed by an Authorized PS Engineering dealer.

Table of Contents

Rev	Date	Change
1	Sept. 2007	Added more operation details, general clean up
2	Oct. 2007	Updated user interface
3	Nov. 2007	Updated functionality of encoder knobs.
4	March 2008	Increased MP3 memory to 1 GB
5	May 2008	Changed to show cell sidetone enabled at factory
6	June 2008	Removed extra incorrect references
7	August 2008	Updated file transfer information
8	Sept. 2008	Changed TEL sidetone to disable at factory
9	Jan. 2011	Improved fround lug installation Appendix B

Section I – GENERAL INFORMATION

1.1 INTRODUCTION

The PMA9000EX represents another evolutionary step in cockpit audio control and intercommunications utility. Using our patented *IntelliVox*® design, front panel utility jack, and pilot programmable configurations, this marks the next level of audio control. The unit is designed for outstanding ergonomics and visually defined mode annunciation and selection.

For use in Experimental/Non-certified aircraft ONLY
This unit is not intended for installation in certified aircraft

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 in the PMA9000EX.

1.2 SCOPE

This manual provides detailed installation and operation instructions for the PS Engineering PMA9000EX-series of Audio Selector Panel/Intercom Systems. This includes the following unit:

Model	Description	Part Number
PMA9000EX	Stereo Audio Selector Panel with Marker Beacon, Bluetooth Interface and MP3 capability, includes utility jack and Internal Recorder System	050-920-0202

1.3 EQUIPMENT DESCRIPTION

The PMA9000EX is a state-of-the-art audio isolation amplifier and audio selector that contains an automatic voice activated (VOX) intercom system and integral marker beacon receiver. It can switch two transceivers (Com 1, Com 2) and six receivers (Nav 1, Nav 2, ADF, DME, MKR and AUX).

A full duplex TELEPHONE mode allows the PMA9000EX to act as an audio interface between aircraft headphone and microphones and specific aircraft approved (FAA/FCC) cellular telephone equipment, through the front mounted jack.

Warning: Use of non-aviation approved cellular telephone equipment may be prohibited by regulation.
PS Engineering is not responsible for unauthorized airborne use of cellular telephones.
For airborne use, the PMA9000EX must be interfaced with an approved system.

There are five unswitched inputs, available for traffic or EGPWS, autopilot disconnect tones, and/or radar altimeter warning, with the fifth unswitched input through a front-mounted utility jack, when configured to act as a fifth unswitched input.

Pushbuttons 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. Unswitched inputs 1,3, and 4 are always presented to the aircraft speaker. Unswitched input 2 will be presented to the speaker when the front panel SPR push button has been selected.

Pushbutton switches select one of the communication transceivers for the pilot and copilot position, and allows radio transmission. In "Split Mode" the PMA9000EX has the ability to allow the pilot to transmit on Com 1 while the copilot can transmit on Com 2. A fail-safe mode connects the pilot headphone and microphone to COM 1 if power is removed for any reason, or if the power switch is placed in the Off (Fail-safe) position. Unswitched input #1 is also provided to the pilot headphone in fail-safe

A six-station voice activated (VOX) intercom is included in the PMA9000EX. This system has PS Engineering's patented *IntelliVox*® circuitry that eliminates manual adjustments. The intercom system incorporates pilot isolate, all and crew modes, two independent stereo music inputs with "SoftMute™". Intercom volume control is through two concentric front panel knobs and a pushbutton intercom mode switch. The small volume knob controls the intercom level for the pilot and copilot, while the large knob controls the passenger intercom volume. Intercom squelch is automatic.

A concentric rotary data input knob on the right side of the unit controls less essential functions and configurations.

An internal MP3 section allows the user to upload digital music files, while a Bluetooth section allows connection with Bluetooth-enabled telephones.

A 3-light, 75 MHz Marker Beacon receiver is integrated in the PMA9000EX. This provides the necessary Marker Beacon lights and audio indications necessary for that portion of an Instrument Landing System (ILS) approach. A pushbutton labeled MKR allows the pilot select high or low sensitivity as well as test and mute modes.

1.4 APPROVAL BASIS — NONE

The PMA9000EX is not approved for installation on US Registered Civilian Aircraft with normal airworthiness certificates.

Operation is subject to the following conditions:
This device may not cause harmful interference.
This device must accept any interference received, including interference that may cause undesired operation.

1.5 SPECIFICATIONS

DIMENSIONS:	Height: 1.3 in. (3.3 cm) Width: 6.25 in. (16.9 cm) Depth behind panel 7.15 in. (18.16 cm)
WEIGHT *PMA9000EX Unit* *Rack with connectors*	 1.34 lb. (0.61 kg) 0.51 lb. (0.24 kg)
POWER REQUIREMENTS (Including Internal Lighting):	
Voltage:	11 to 33 VDC
Maximum Current:	2.5 Amp (Externally protected by a 5A pull-type breaker)

Audio Selector Specifications	
Audio selector panel input impedance:	510 Ω
Input Isolation:	-60 dB (min.)
Speaker Muting:	-60 dB (min.)
Speaker Output (into 4 Ω) with no clipping 14 VDC: 28 VDC:	 3 Watts (min.) 10 Watts (min.)
Receiver Inputs:	9 (Com 1, Com 2, TELEPHONE, Nav 1, Nav 2, ADF, DME, MKR, AUX)
Unswitched Inputs:	5 (including front jack)
Transmitter Selections:	4 (Com 1, Com 2, TEL Com1/2)
Speaker Impedance:	4 Ω
Headphone Impedance:	150 – 1000 Ω
Headphone Output:	38 mW each headset, no clipping <1% THD typical
Microphone Impedance:	150 - 600 Ω

Intercom Specifications	
Intercom Positions:	6 places (with individual *Intelli*Vox® circuits)
Music Inputs:	2, (Independent, Stereo)
Music Muting:	>-30 dB "Soft Mute" when Com or intercom active.
Distortion:	<1% THD @ 38 mW into 150Ω
Mic Freq. Response, 3 dB:	300 Hz - 6000 Hz
Music Freq. Response, 3 dB:	10 Hz – 26 kHz

MARKER BEACON RECEIVER:	
Frequency:	75 MHz Crystal Controlled
Sensitivity: Low: High:	Capable of: (preset at factory for field application) 1000 μVolts (Hard) (360 to 570 μV soft) 200 μVolts (Hard) (130 to 200 μV soft)
Selectivity:	-6 dB at ±10 kHz -40 dB at ±120 kHz
External Lamp Output:	7.5 (±4 VDC unloaded, at maximum brightness) VDC positive when active, max. current 125 mA
MM Sense:	Active high (4.5 ± 1.0VDC)

1.6 EQUIPMENT SUPPLIED

1 ea. of the following items:

Model	Description	Part Number
PMA9000EX	PMA9000EX Audio Panel with Marker Beacon and Stereo intercom.	050-920-0202

Installation Kit: 250-890-0000, containing:

Description	Quantity	Part Number
Installation rack assembly	1	430-890-0040
Rack back plate	1	430-890-0050
44-pin connector kit	2	120-891-2045
Backshell, connector	2	625-025-2465
Backshell Retainer	2	431-881-0100
4 40 X 7/16 screw w/nylon patch	4	475-440-0007
4 40 X 3/8 screw w/nylon patch	4	475-440-1038
4-40 x ¼" screw with lock washer	2	475-440-0001
Solder Lug	2	475-009-0001
Cable Clamp	1	625-001-0002
#6-32 x ½" Flat head Philips screw	6	475-632-0012
#6-32 Clip Nut	6	475-630-0002
Parts ID Sheet	1	002-890-0404

Cable, USB to 2.5 mm 4-conductor, PS Part Number 425-921-3983

Cable, USB-to-USB PC adapter PS Part number, 425-003-1454

1.7 EQUIPMENT REQUIRED BUT NOT SUPPLIED

a. Circuit Breaker: 1 ea; 5 amp PULL TYPE REQUIRED for PMA9000EX
b. Speaker, 4 Ω
c. Headphone Jacks (Stereo, as Required)
d. Microphone Jacks (as Required)
e. Headphones, 150 Ω (Stereo), up to 6 as required
f. Microphones, up to 6 as required
g. Marker Antenna (75 MHz, VSWR 1.5:1, and appropriate for the airspeed)
h. Interconnect Wiring

1.8 OPTIONAL ITEMS

a. Cell Phone Patch Cord, 2.5 mm to 2.5 mm, PS Part Number 425-006-7026
b. Music Patch Cord, 3.5 mm to 5.5 mm, PS Part Number 425-006-2535
c. Phone patch cord for iPhone or Blackberry 3.5 mm 4-conductor to 2.5 mm (Phone only, no music) 425-006-0354

1.9 LICENSE REQUIREMENTS

None

Section II - INSTALLATION

2.1 GENERAL INFORMATION

2.1.1 SCOPE

This section provides detailed installation and interconnection instructions for the PS Engineering PMA9000EX Audio Selector Panel/Intercom/ with internal Marker Beacon.

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.

2.1.2 Certification Requirements

NOTE
The PMA9000EX is not approved for installation in certified aircraft.

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 show 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 PMA9000EX is not required. However, the units should be kept away from heat producing sources (i.e. defrost or heater ducts, dropping resistors, heat producing avionics) without adequate cooling air provided.

2.3.2 Mounting Requirements

The PMA9000EX must be rigidly mounted to the instrument panel of the aircraft structure, within view and reach of the pilot position(s). The unit may be mounted in any area where adequate clearance for the unit and associated wiring bundle exist.

To prevent noise, avoid installing the unit close to high current devices or systems with high-voltage pulse type outputs, such as DME or transponders. Avoid running the interconnecting bundles near any high current wires.

2.3.3 Audio Panel Mounting Rack Installation

Remove the unit from the mounting tray by unscrewing the 3/32" hex-head screw that is in the center of the unit. Use caution to avoid hitting the photo-detector lens. Carefully slide the unit free of the tray. Set the unit aside in a safe location until needed. Install the tray using six clip nuts (475-630-0002), and six FHP 6-32 x ½" screws (475-632-0012). 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 two 44-pin connectors in the PMA9000EX. The connectors are a sub-miniature crimp-type, and require the use a hand crimp tool, from table below (or equiv.). The connectors

are 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 ¼" 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

Referring to the appropriate Appendix, assemble a wiring harness as required for the installation. All wires must be MIL-SPEC in accordance with current regulations. Two- and three-conductor shielded 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 43.13-2A 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 PMA9000EX 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 connector, J2 pins 8 & 9, of the PMA9000EX 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 PMA9000EX was 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.

2.4.1.1 Music Inputs and Noise

PMA9000EX units utilize a differential input to help prevent noise from entering the music system. This feature is usually transparent to the installer, however, it is important that the appropriate music signal and ground connections are made directly to the dedicated music signal and ground inputs on the PMA9000EX. The power for IFE and audio panel should be a common bus.

If a music jack is installed for Music 1 or 2, we strongly recommend isolating the jack from airframe ground, by using an insulated mounting plate.

NOTE

Adding a high-performance audio control system, particularly in conjunction with high-performance 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 Existing GMA340 Installation

If the installation replaces a GMA340, no changes are necessary as long as the existing installation meets the requirements. All existing functions of the GMA340 as well as all of the new capabilities afforded by the PMA9000EX will become instantly available. Be advised, the PMA9000EX does not support 3 VHF Coms, however. The PMA9000EX handles two COM transceivers and a full-duplex cellular/satellite telephone.

Added capabilities include, IntelliVox®, DuTel™ duplex telephone, improved music fidelity and Soft Mute™ and Karaoke™ muting modes, improved and more flexible music distribution control, internal recorder function, and additional unswitched audio inputs.

2.4.3 Power

The PMA9000EX is compatible with both 14 and 28 Volt DC systems. A five (5) Amp circuit breaker is required for all installations. Power and ground wires should be #22 connected to J2 Pins 8 and 9. Connect airframe ground to J2 Pin 10 and 11 only. No dropping resistors are required.

2.4.4 Communications 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 only pilot position has access to the radio. The pilot position will have PTT control regardless of the mic selector switch or copilot PTT when the PMA9000EX is in the OFF/EMG 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 microphone 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 Audio Panel interface

The PMA9000EX is designed to interface with standard aircraft avionics, and presents a 500 Ω receiver impedance. For best results, a twisted-shielded cable is recommended from the avionics audio source to the audio panel, with the shield grounded at the audio panel end.

Some avionics do not provide a separate audio low, and may introduce additional electrical noise into the system. For best results, connect the audio low from the audio panel to the radio ground, using one conductor of the twisted-shielded cable.

2.4.5.1 Speaker Load

The PMA9000EX contains one speaker amplifier. Some units with internal speaker amplifiers, such as the King Radio KX170-series, require a resistive load to prevent damage if their speaker amplifier is not used. Connect the speaker output from the unit to the COM 2 Speaker load input on the PMA9000EX (J1 27 WRT 28). The speaker load is 16 Ω, 3W.

2.4.6 TELEPHONE (Duplex) Function for Cell Phones

The TELEPHONE mode in the PMA9000EX is also compatible with many cellular telephones with hands-free headset interfaces, including Bluetooth®.

If a wired connection is desired, the front panel 3/32" utility jack can be used as the interface to the Cell Phone, or a 3/32" jack can be installed somewhere on the aircraft panel. The wired interface jack is connected with the PMA9000EX as shown: A patch cord (3/32" to 3/32") is available from PS Engineering under P/N 425-006-7026.

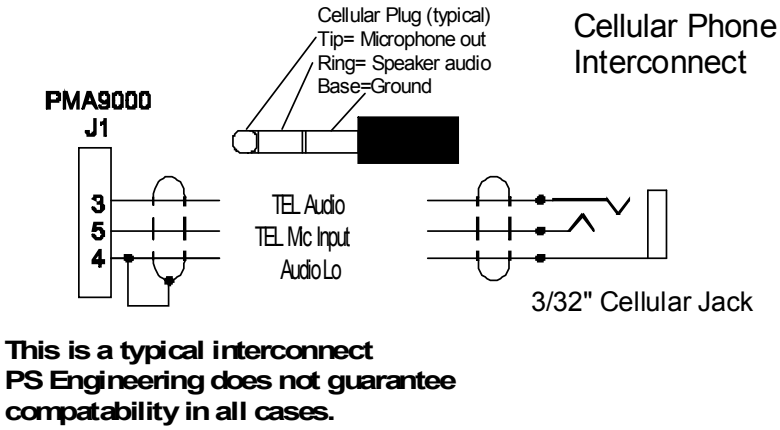


Figure 2 -1 Cellular telephone interface for rear connector, if an additional jack is desired

2.4.6.1 Cell phone Sidetone

As shipped from PS Engineering, the PMA9000EX does not provide cellular telephone sidetone (the user's voice fed back to the headset). Some cell phones do not have sidetone, which may result in loud or distorted sidetone. If sidetone is desired, an internal modification can be made that will allow the PMA9000EX to provide this sidetone. Contact PS Engineering for more information.

NOTE

FCC Regulations (47 CFR 22.925) prohibit airborne operation of cellular phones;
Cellular telephones installed in or carried aboard airplanes, balloons or any other type of aircraft must not be operated while such aircraft are airborne (not touching the ground). When any aircraft leaves the ground, all cellular telephones on board that aircraft must be turned off. The use of cellular telephones while aircraft is on the ground is subject to FAA regulations.
FAA Regulation 14 CFR 91.21(5) allows for use of portable electronic devices that the operator of the aircraft has determined will not cause interference with the navigation or communication system of the aircraft on which it is to be used.
PS Engineering, Inc. does not endorse using unapproved cellular telephone equipment in flight, and takes no responsibility for the user's action. PS Engineering does not guarantee compatibility with personal cellular telephones. For a list of phones that have been tested, visit www.ps-engineering.com.

2.4.7 Transmit Interlock

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

2.4.8 "Swap" Mode

When a momentary, normally open, push-button switch is connected between pin 20 on the J2 connector and aircraft ground, the user can switch between Com 1 and 2 by depressing this switch without having to turn the mic selector switch. This yoke-mounted switch eliminates the need to remove your hands from the yoke to change transceivers. The transfer of TX indication from Com 1 to Com 2 shows that the swap has been initiated; there is no dedicated swap indicator.

2.4.9 Backlighting

The PMA9000EX has an automatic dimming of the pushbutton annunciation LEDs and marker lamps controlled by a photocell. Control of the unit backlighting is through the aircraft avionics dimmer For 14-Volt aircraft, connect J2 Pins 6 and 7 to the aircraft dimmer bus, and pin 5 to ground. For 28-volt systems, connect pin 7 to the aircraft dimmer, and pins 5 and 6 to ground.

The LCD display has backlighting that is controlled by the automatic photocell dimming. In addition, the text inverts for nighttime mode when the ambient light is low. As the light decreases to a dim sunlight, the LCD backlighting will turn on, and you may notice a brightening of the LCD under some conditions.

If an external dimmer control is **not** used, a constant back light illumination can be established for night-time viewing. Pin 6 or 7 (depending on system voltage) must be tied to power (J2, pin 8 or 9) for the back lighting system to work. The photocell mounted in the unit face will automatically adjust the intensity of the push-button annunciator LEDs.

2.4.10 Unswitched inputs

J1, pins 31, 29 and J2 pin 15 are unswitched, unmuted (by transmitter keying), inputs # 1, 3 and 4, respectively. These inputs are presented to the pilot and copilot regardless of the audio configuration, and will always mute the entertainment inputs. These 510 Ω inputs can be used for altimeter DH audio, GPS waypoint audio, autopilot disconnect tones, or any other critical audio signal. Unswitched #1 is always presented to the speaker, plus to the crew headphones, and is available to the pilot in fail-safe (off) mode. Unswitched 3 and 4 inputs are always presented to the crew headphones and to the aircraft speaker.

Unswitched Input	Hear in Fail Safe	Hear in Crew Headset	SPR button Select	Gain
1	Yes	Yes	No	1:1(fixed)
2	No	Yes	Yes	1:1(fixed)
3	No	Yes	No	Adjustable
4	No	Yes	No	1:1(fixed)
5 (jack)	No	Yes	No	1:1(fixed)

Table 2-2 Unswitched input table

J1, pins 31, 29 and J2 pin 15 are unswitched, unmuted inputs # 1, 3 and 4, respectively. These inputs are presented to the pilot and copilot regardless of the audio configuration, and will always mute the entertainment inputs. These 510Ω inputs can be used for altimeter DH audio, GPS waypoint audio, autopilot disconnect tones, or any other critical audio signal. Unswitched #1 is always presented to the speaker. Unswitched 3 and 4 inputs are always presented to the crew headphones and to the aircraft speaker.

Unswitched #2, J1 pin 44 is unswitched is always connected to the Pilot's headphone. However, this unswitched audio is only presented to the aircraft speaker when the SPR mode has been selected. This input would be suitable for air-to-ground (Flitefone) telephone ringer. This input is not related to the cellular telephone interface.

The audio low for unswitched #4 (J2, pin 15) should be connected to a convenient audio low. However, this should NOT be connected to Music Low.

Unswitched #1 is presented to the pilot headphone in fail-safe (off) mode.

NOTE
Inputs 1, 2 and 4 are fixed (1:1), and any audio level adjustments must be made at the input source. Unswitched #3 has a variable adjustment control located on the bottom side of the unit. This control allows you to control the volume level of that unswitched input from 50% to 200% of the input level. Refer to Adjustments section.

The front panel jack can be configured to act as a fifth unswitched input. When configured through the front panel function switches (see operational section), the audio input to this jack will be presented to the pilot and copilot headset, and not muted.

NOTE
The front-mounted utility jack is intended for portable equipment that is advisory in nature. It is NOT INTENDED for use as a primary warning channel. Audio of importance MUST ALWAYS be hard-wired into the unswitched inputs of the audio panel.

2.4.11 Public Address Mode

Using the ECAPS data control, the PMA9000EX can be placed into Public Address (PA) mode. In this mode, the pilot will be talking over the cockpit speaker when he presses his PTT switch. Copilot will still continue on the selected COM radio.

When the Public Address is active, C1 and C2 indicators flash to indicate that the pilot's microphone is tied to the PA.

2.4.11.1 PA Control Output (J2, Pin 19)

When PA Control Output is enabled, J2 Pin 19 will go low when in PA mode, providing a logic level that can be used to incorporate a speaker-switching scheme. This 50 mA circuit (10Ω Z) can control a switching means such as a relay that would transfer the speaker output amplifier from the cockpit speaker to drive another cabin speaker. If the PA mode is used with a microphone in proximity to an active cockpit speaker, feedback might result.

To enable the PA discrete Output located at the rear connector, the internal configuration jumper, J4, MUST be placed across both pins in the header. This jumper is shipped as open from the factory. Contact PS Engineering for details on changing this configuration jumper.

2.4.12 PA Mute (J2, Pin 12)

Pin 12 of J2 is a TTL logic output that is pulled low during radio PTT operation. This serves as an input to external public address system to prevent feedback during transmissions.

2.4.13 Miscellaneous Logic Output (J2, Pin 18)

Pin 18 of the J2 connector is pulled to ground whenever the AUX mode is activated. This serves as a control line for external devices, such as an entertainment system that the pilot wishes to control.

This pin can also be used to control passenger Karaoke Mode, by connecting to pin 13 of the J2, or as a PA cockpit/cabin speaker relay control.

2.5 Intercom wiring

See Appendix C and D for intercom connection configurations. It is critical to the proper operation of this system to have this connector wiring made in accordance with these diagrams. Use 2- and 3-conductor, MIL-spec cable as shown. Connect the shields at the audio panel end only, and tie to the audio low inputs as shown.

NOTE
The intercom harness can be custom made by PS Engineering, Inc. Simply call the factory or www.ps-engineering.com to obtain a wire harness work sheet. The harness will be made to your specifications and fully functionally tested. Harness can be ordered with jack, or without the intercom jacks installed, for easier wire routing through the aircraft.

2.5.1 Entertainment Inputs

The PMA9000EX has three music sources. Two INDEPENDENT inputs wired into the rear connectors, PLUS a front mounted jack that is connected to Entertainment 1, and an internal MP3 player that can store 1 Gigabyte (512 MB before serial number B01094) of digital music files.

Entertainment input number 1 is J2 pins 23 (left channel) and 24 (right channel), with respect to pin 25, and Entertainment number 2 is connected to 26 (left channel), 27 (right channel), with respect to 28.

NOTE

Use the low level output of any additional entertainment device to connect to the audio panel. Maximum signal level is **3 VAC** p-p. **DO NOT** use a speaker-level output, this will cause internal damage in the audio panel.

2.5.2 Entertainment muting

The PMA9000EX-system incorporates a "Soft Mute™" system. This will mute the entertainment devices during ICS or radio conversation.

The Karaoke mode (disabling crew SoftMute™) is controlled through the data selector on the primary display. This allows the pilot to place the entertainment into the background while having the radios in the foreground. This eliminates the constant interruption of the music while still having the radios a priority.

CAUTION

Local oscillators and internal signals from 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.

All additional entertainment devices must be switched off for both takeoff and landing.

2.5.2.1 Entertainment 2 Mute (J2 Pin 13 & 14)

Connecting J2 pin 13 to pin 14 (or ground) through a SPST switch places the entertainment #2 music source into the Karaoke Mode. In this mode, incoming music and intercom conversation will not mute the music for the passengers' intercom net. This allows uninterrupted music during casual conversation and at times when radio communications are of lesser importance.

If desired, the AUX mode control can act as the passengers' mute control. Connect J2 pin 18 (AUX logic) to J2 pin 13 (Entertainment. 2 Mute inhibit).

2.5.3 Configuring Music Input with Data Entry Knob

The two music inputs can be configured by the user from the front panel (see section 3.10). There are three configurations available, independent, ICS mode dependent, and single input.

If the inputs are independent, Input #1 (and the front jack) is provided to the pilot and copilot. Muting (SoftMute™) is controlled by the front panel "mute" selection on the primary display.

If the inputs are intercom mode dependent, input 1 goes to the pilot, copilot and all passengers when the intercom is in the "ALL" mode. In "ISO" mode, the copilot and passengers will hear music input 1. Music 2 is ONLY active in CREW mode, and then provided only to the passengers. The passenger SoftMute™ control becomes active in CREW.

If the single-source mode is activated through the data input, the front panel jack (and music 1) is connected to all intercom positions, regardless of the intercom mode. Crew muting is controlled by the front panel, passenger muting controlled through the switch. See section 3.11 for more details.

2.5.4 Playback button Installation

Internal Recorder can be played back from the front panel by pressing the com radio selected for transmit (C1 or C2) for 1 second.

A remote momentary, normally open (NO) push button switch *may* be installed if desired to activate the Recording System playback remotely. This switch can be located anywhere in cockpit convenient to the pilot's reach. The switch should be connected to pin 22 of J2 of the PMA9000EX, and ground.

2.6 Marker Beacon Installation

2.6.1 Marker Antenna Installation

A marker beacon antenna, appropriate to the type and speed of the aircraft, is required (not included). Refer to aircraft and antenna manufacturer's installation instructions, as well as AC43.13-2A (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.

2.6.2 External Marker Lights

For installations that require external marker beacon lights, there are three outputs that can drive 12-Volt lamps only. The external output lamps are driven high (typically +9 VDC ±1.5 VDC unloaded, at MAX brightness) when active. Maximum source current per lamp is 125 mA. Voltage varies with photocell dimming.

2.6.3 Middle Marker Sense

A Middle Marker Sense output signal is available from the PMA9000EX to flight control systems. This function will not operate during the test mode. This output will go to +4.5 VDC (± 1.0 VDC) when a valid Middle Marker signal is received. This output is J1, pin 39.

2.7 Adjustments

The PMA9000EX is factory adjusted to accommodate the typical requirements for most aircraft configurations. There are three adjustments in the top cover that allow the installer to tailor the specific functions.

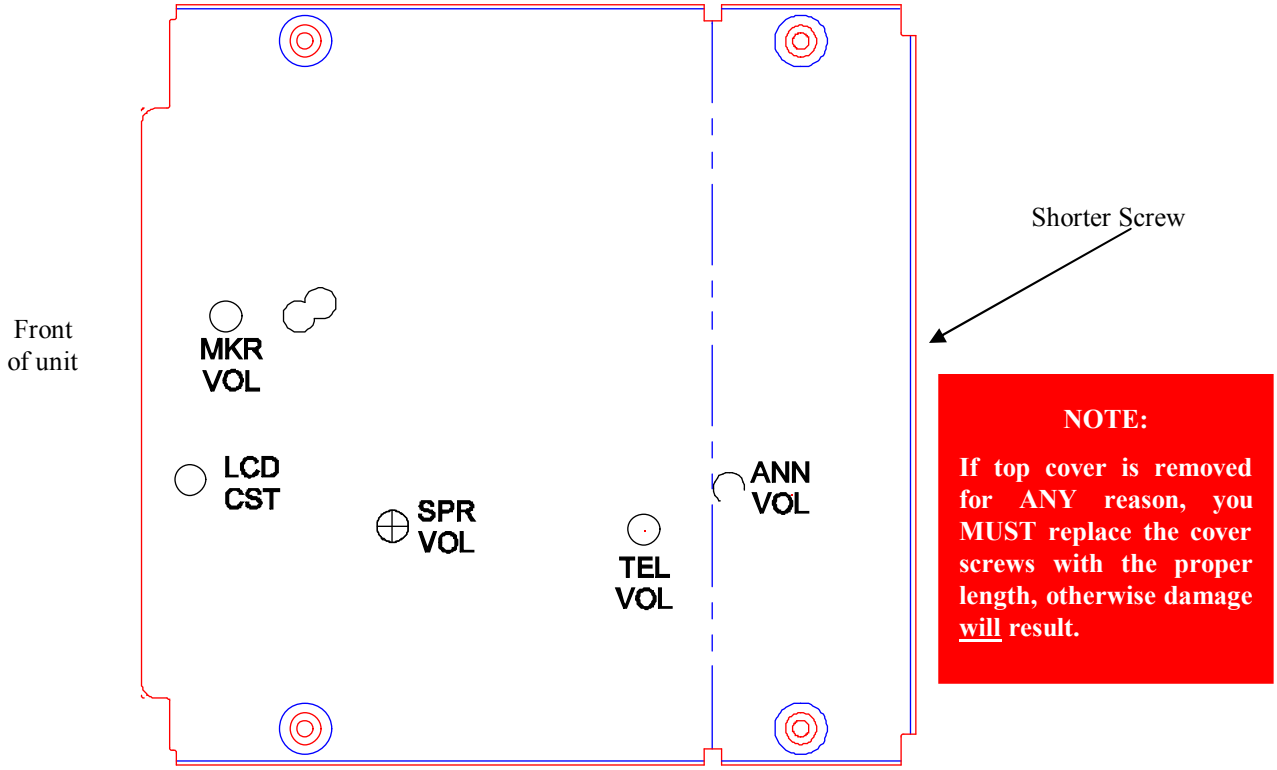


Figure 2-2- PMA9000EX Adjustments, top cover

- Speaker Volume- Turn adjustment clockwise to increase cabin speaker output.
- Marker Beacon Volume, turn adjustment counterclockwise to increase marker beacon audio level.
- TEL volume, turn adjustment Clockwise to increase the incoming telephone audio.
- ANN VOL Function Mode Annunciation Volume – controls the level of the to access voice annunciations contained in the unit. (Top cover must be removed).
- Unswitched Input 3 Volume, adjust from 50% to 200% of input value. (Bottom cover must be removed).
- LCD CST: adjusts display contrast.

Figure 2-3 – Unswitched 3 Audio Level (bottom cover removed)

2.8 Communications Antenna Installation Notes

For best results while in Split Mode, it is recommended that the one VHF communications antenna is located on top of the aircraft while the other communications antenna is installed on the bottom. Any antenna relocation must be accomplished in accordance with AC 43.13-2A, 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 PMA9000EX in Split Mode.**

2.8.1 Audio Active Output

Pin 24 on the J1 connector (and PA Mute Pin 12 on J2) should be connected to Apollo CNX80 for audio message prioritization, refer to CNX80 installation manual for details.

2.9 PMA9000EX Pin assignments

J1	Function	J2	Function
1	Mkr Ant	1	Pilot Phones Low
2	Mkr Ant Low	2	Copilot Phones Low
3	Telephone Audio in	3	Copilot Phones (L)
4	Telephone Low	4	Copilot Phones (R)
5	Telephone Mic Audio	5	Lights Low
6	Telephone Mic Key	6	14/28 V Lights
7	ADF Audio In	7	14/28 V Lights
8	ADF Audio Low	8	Aircraft Power
9	Com 1 Audio	9	Aircraft Power
10	Com 1 Audio Low	10	Aircraft Ground
11	Com 1 Mic	11	Aircraft Ground
12	Com 1 Mic Key	12	PA Mute
13	Com 2 Audio	13	Mute Inhibit
14	Com 2 Audio Low	14	Mute Inhibit Low
15	Com 2 Mic	15	Unswitched #4
16	No Connect	16	Pilot Phones (L)
17	Nav 1 Audio	17	No connect
18	Nav 1 Audio Low	18	Misc (AUX) logic output
19	Nav 2 Audio	19	PA Enable Output
20	Nav 2 Audio Low	20	Swap
21	DME Audio	21	Swap Low
22	DME Audio Low	22	IRS Playback
23	Auxiliary Audio Input	23	Music 1 (L)
24	CNX80 Inhibit	24	Music 1 (R)
25	No connect	25	Music 1 Low
26	No connect	26	Music 2 (L)
27	Com 2 Speaker Load	27	Music 2 (R)
28	Com 2 Speaker Load	28	Music 2 Low
29	Unswitched Audio 3	29	No Connect
30	Com 2 Mic Key	30	No Connect
31	Unswitched # 1	31	Pilot Phones (R)
32	Unswitched #1 Low	32	Copilot Mic Audio
33	Pilot Mic Audio	33	Copilot Mic PTT
34	Pilot Mic PTT	34	Copilot Mic Low
35	Pilot Mic Low	35	Pass 1 Mic Audio
36	Ext IM MKR	36	Pass 1 Mic Audio Low
37	Ext OM MKR	37	Pass 2 Mic Audio
38	Ext MM MKR	38	Pass 2 Mic Audio Low
39	MM Sense	39	Pass 3 Mic Audio
40	Pass HP (L)	40	Pass 3 Mic Audio Low
41	Pass HP (R)	41	Pass 4 Mic Audio
42	Pass HP Low	42	Pass 4 Mic Audio Low
43	Unswitched #2 Low	43	Speaker Low
44	Unswitched #2 Audio	44	Speaker Output

2.10 Post Installation Checkout

After wiring is complete, verify power is ONLY on pins 8 and 9 of the J2 and airframe ground on connector pins 10 and 11. Failure to do so will cause serious internal damage and void PS Engineering's warranty.

2.11 Unit Installation

To install the PMA9000EX, 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 in the center of the unit until it is secure. DO NOT OVER TIGHTEN.

CAUTION

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

WARNING

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

2.12 Operational Checkout

2.12.1 Required Test Equipment

In order to return an aircraft to service after installation of the PMA9000EX, 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.

2.12.2 Audio Panel Test

NOTE

The *IntelliVox*® is designed for ambient noise levels of 80 dB or above. Therefore some clipping may occur in a quiet cabin, such as without the engine running, in a hangar. This is normal.

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. The Com audio will be present in one ear cup only.
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 means. The N1 and N2 indicators illuminates to show which source is in use, ADF, DME AUX and MKR are indicated in the display.
13. Activate the SPR mode. 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.

2.12.3 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 μV, 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 (MKR) - has been selected. 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 ± 3dB of the amber lamp, with 3000 HZ and 400 Hz applied, respectively.
2. Repeat with the unit in LOW sensitivity, with 430 μVolts applied.
3. Connect the marker antenna and verify proper operation.

2.12.4 TELEPHONE Checkout

Activate the TELEPHONE mode. Verify that the pilot headset is connected to the cellular telephone system (if installed). Verify that by using the pilot side PTT, the pilot can transmit on the other selected radio (Com 1 or Com 2). The telephone function will place any person heard by the pilot on the intercom, also heard on the telephone.

2.12.5 Internal Recorder Checkout

With headset plugged into pilot's side jacks, tune COM 1 to local frequency, such as FSS or ATC ground. Select Com 1 on mic selector switch, and record several incoming radio transmissions. NOTE: Due to the continuous nature of AWOS information broadcasts, these will not be properly stored, and should not be used for testing purposes.

Press the Com XMT pushbutton that corresponds to the selected radio transmitter and hold for approximately one second. This action will then automatically play back the last recorded message. Press and HOLD both buttons again to stop the play back, and then momentarily press again to play prior messages.

This audio should appear in the pilot and copilot headsets, and only be incoming transmissions from the transceiver selected in the mic select switch.

If installed, check the audio panel or yoke mounted playback switch, and verify that messages play, in the order received. Repeat for COM 2.

2.13 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.

Return completed warranty registration application to PS Engineering, or complete online at www.ps-engineering.com.

Section III OPERATION

3.1 SCOPE

This section provides detailed operating instructions for the PS Engineering PMA9000EX, Audio Selector Panel/Marker Beacon Receiver/Intercom Systems. Please read it carefully before using the equipment so that you can take full advantage of its capabilities.

This section is divided into sections covering the basic operating areas of the PMA9000EX systems. They are Communications Transceiver Selection, Audio Selector, Intercom, Marker Beacon Receiver, entertainment, telephone, and display/data controlled functions.

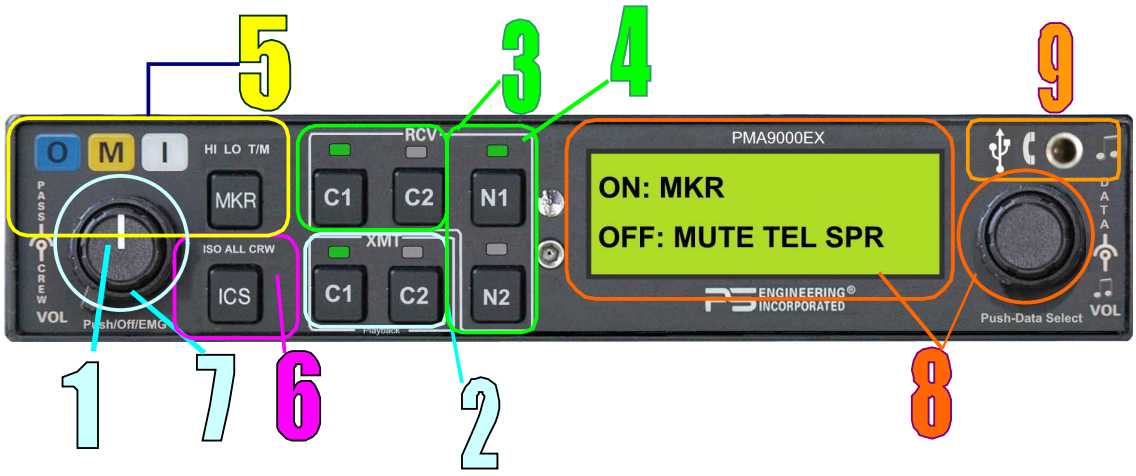


Figure 3-1 PMA9000EX Operating controls

3.2 Power and Fail Safe (1)

Unit power is turned on and off by pushing the volume (left) knob. In the OFF or "**EMG**" position, the pilot headset is connected directly to Com 1 as well as unswitched input #1. This allows communication capability regardless of unit condition. Any time power is removed or turned OFF, the audio selector will revert to fail-safe mode.

The power switch controls all audio selector panel functions, intercom and marker beacon receiver. All pushbutton selections and menu modes (except Bluetooth telephone association) will be remembered and return to the last state when turned on.

3.3 Communications Transmit (XMT) Selection (2)

The two buttons **C2** and **C2** (# 2) in the XMT section control which communications radio is selected for transmit. The top row of pushbuttons (# 3) allows selection of the receiver audio. Push the lower button to select the desired COM transmitter. A green LED above the button illuminates to indicate that the audio is selected.

The PMA9000EX-Series has an automatic com receiver selector system. Audio from the selected transceiver is automatically heard in the headsets and speaker (if selected). You can check this function by switching from Com 1 transmitter to Com 2 transmitter by pressing the COM 2 transmitter selector pushbutton. See that the associated Com 2 receive pushbutton indicator light that is located immediately

above the Com 2 transmitter pushbutton turns green. This guarantees that the pilot will *always* hear the audio from the transceiver selected for transmit.

The PMA9000EX "remembers" the receiver selection, so that when switching transmitters from COM 1 to COM 2, if COM 2 audio was previously selected, COM 1 audio will continue to be heard. This eliminates the pilot having to switch Com 1 audio back on, after changing transmitters.

When switching from COM 1 to COM 2 while Com 2 was not previously selected, COM 1 audio will be switched off. In essence, switching the mic selector will not override prior selection of COM receiver audio.

In normal (not split) modes, the PMA9000EX gives priority to the pilot's radio Push-To-Talk (PTT). If the copilot it transmitting, and the pilot presses his PTT, the pilot's microphone will be heard over the selected com transmitter.

3.3.1.1 Split Mode

The split mode can be activated at any time by pressing the **C1** and **C2 XMT** buttons at the same time. This places the pilot on COM 1 and the Copilot on COM 2.

Pilot on COM 2 and 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 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.

3.3.1.2 Swap Mode (Switch from Com 1 to Com 2 remotely)

With a yoke mounted, normally open momentary switch, the pilot can change from the current Com transceiver to the other by depressing this switch. To cancel "Swap Mode," the pilot may either press the yoke mounted switch again, or select a different Com with the XMT buttons.

3.3.2 Internal Recorder

The PMA9000EX comes equipped with an internal recorder. This digital system stores the last incoming audio from the radio you have selected for transmit. It can store as many of 16 incoming messages, and up to 30 seconds of audio. The pilot and copilot hear the playback. It is also possible to modify the unit to exclude the copilot from the playback, and annunciation playback. Contact PS Engineering, for more details.

3.3.2.1 Playback

Recording is automatic. To play back the message, press and hold the XMT button for the communications radio that is selected for transmit for about 1 second or until the message plays back.

To stop the, hold the same button until the playback stops, about 2 seconds. Then the next 1-second press will play the next earlier message stored.

The playback will stop automatically when the selected com audio becomes active again. Press the button again to start the message again. The audio received during playback is NOT stored.

Figure 3-2 Playback Controls

3.4 COM Audio Selector (3)

Communication audio from the other radio, not selected for transmit, can be heard by pressing the associated RCV button. You will always hear the audio from the selected transceiver.

In SPLIT mode, only the pilot will hear selected navigation audio.

3.5 Navaid Audio selection (4)

VHF Navigation receiver audio is selected through two momentary, push-button, backlit switches.

The users can identify which receivers are selected by noting which green LEDs are lit above the button. Navigation aid audio push buttons are labeled **N1**, **N2**.

The **MKR** (Marker), **ADF AUX** (auxiliary) and **DME** audio is available when selected through the ECAPS graphical and data control system.

3.6 Marker Beacon Operation (5)

The Marker Beacon Receiver 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/flashes 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 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 MKR button controls audio selection, marker sensitivity, and audio muting, and lamp test.

- MKR button press of < 1 second: toggles between high and low receiver sense
- MKR button press between 1 and 2 seconds: Activates audio mute, and marker lamp test activated. The next beacon received will re-activate the audio.
- MKR button press > 2 seconds: toggle marker audio on/off. The marker audio can also be selected from the display menu

To adjust the volume level, there is a service adjustment located on the top of the unit.

Use "**HI**" sensitivity initially. This allows you to hear the outer marker beacon about a mile out. Then touch the smaller MKR button to switch into Low Sensitivity mode. "**LO**" sensitivity gives you a more accurate location of the Outer Marker.

Holding the MKR button for two seconds activates marker test lamp, which illuminates all three lamps simultaneously to assure the lamps (internal and external) are in working order. TST does not activate MM autopilot sense output. Releasing the button returns to the last sensitivity.

3.7 Intercom Operation (6)

3.7.1 *IntelliVox*® VOX-Squelch

No adjustment of the *IntelliVox*® squelch control is necessary. There is no field adjustment. Through three individual signal processors, the ambient noise appearing in all six microphones is constantly being sampled. Non-voice signals are blocked. When someone speaks, only their microphone circuit opens, placing their voice on the intercom.

The system is designed to block continuous tones; therefore people humming or whistling in monotone may be blocked after a few moments.

For consistent performance, any headset microphone **must** be placed within ¼-inch of your lips, preferably against them. (ref: *RTCA/DO-214, 1.3.1.1 (a)*).

NOTE

It is also a good idea to keep the microphone out of a direct wind path. Moving your head through a vent air stream may cause the *IntelliVox*® to open momentarily. This is normal.

The *IntelliVox*® is designed to work with normal aircraft cabin noise levels (70 dB and above). It loves airplane noise! Therefore, it may not recognize speech and clip syllables in a quiet cabin, such as in the hangar, or without the engine running. This is normal.

For optimum microphone performance, PS Engineering recommends installation of a Microphone Muff Kit from Oregon Aero (1-800-888-6910). This will not only optimize VOX performance, but will improve the overall clarity of *all* your communications.

Table 3-1 Mic Muff ™ Part Numbers

Manufacturer	Model	Mic Muff™ Part Number
Bose	Dynamic Electret M87 Dynamic	90010 90015 90020
David Clark	H10-30 H10-20, H10-40 H10-13.4	90010 90015 90015
Lightspeed	All	90015
Peltor	7003 7004	90010 90015
Pilot	11-20 & 11-90	90015
Sennheiser		90015
Telex	Airman 750, Echelon AIR3000	90015 90010

3.7.2 Intercom Volume Control (7)

The smaller, inner volume control knob adjusts the loudness of the intercom for the pilot and copilot. It has no effect on selected radio levels, music input levels or passengers' volume level.

The larger, outer volume control knob controls intercom volume or the passengers. It has no effect on radio or music levels.

Adjust the radios and intercom volume for a comfortable listening level. Most general aviation headsets today have built-in volume controls; therefore, volume also can be further adjusted at the individual headset.

3.7.2.1 Mono headsets in Stereo Installation

The pilot and copilot positions work with stereo or mono headsets. All passenger headsets are connected in parallel. Therefore, if a monaural headset is plugged in to a PMA9000EX Stereo installation, one channel will be shorted. Although no damage to the unit will occur, all passengers will lose one channel, unless they switch to the "MONO" mode on the headset. PS Engineering modifies headsets to add stereo capability, using high-fidelity speakers. Contact factory for details.

3.7.3 Intercom Modes

The "**ICS**" pushbutton switch on the left side of the panel provides the selection of the three intercom modes. The description of the intercom mode function is valid only when the unit is not in the "Split" mode.

This button cycles through the intercom modes, from left to right, then right to left as: ISO, ALL CRW and CRW, ALL, ISO. An LED behind the text shows which mode is currently active.

ISO: The pilot is isolated from the intercom and is connected only to the aircraft radio system. He will hear the aircraft radio reception (and sidetone during radio transmissions). Copilot will hear passengers' intercom and entertainment, while passengers will hear copilot intercom and entertainment. Neither will hear aircraft radio receptions or pilot transmissions.

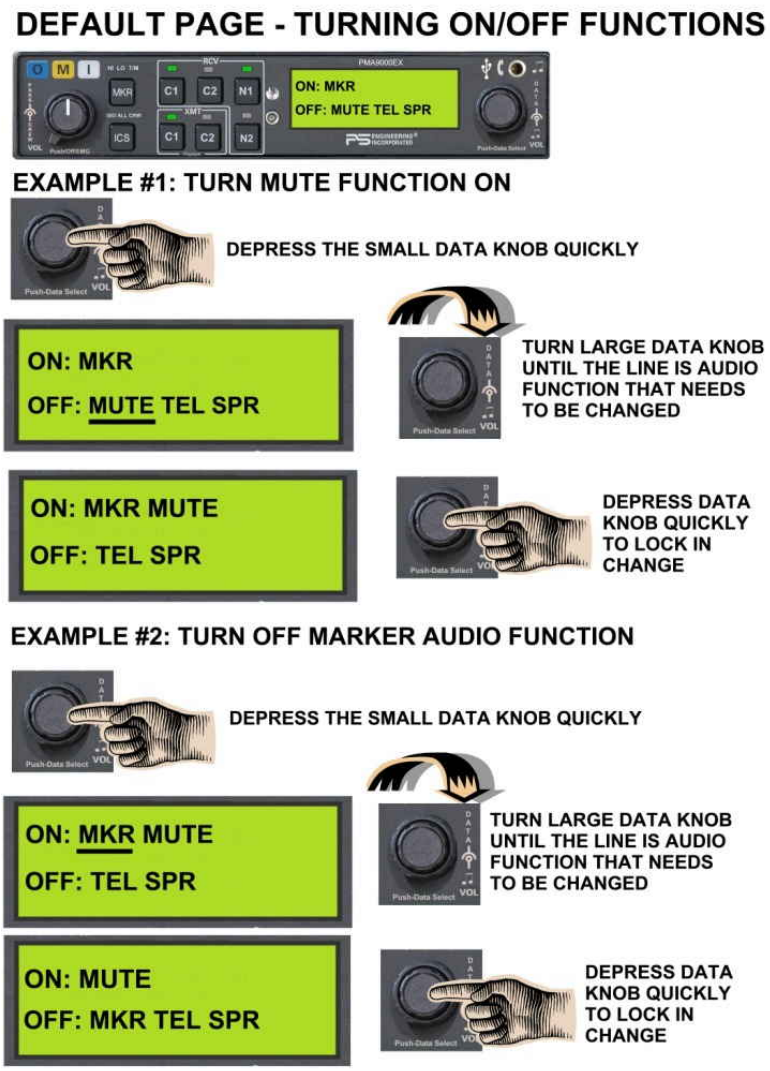
ALL: All parties will hear the aircraft radio and intercom. Crew and passengers will hear selected entertainment. During any radio or intercom communications, the music volume automatically decreases. The music volume increases gradually back to the original level after communications have been completed.

In the Alternate Intercom Mode, selected from the submenu (section 3.8.1), the passengers will not hear the aircraft radios. In addition, when the radio audio is active, the passenger microphones will not be heard by the pilot and copilot, although the passengers will hear themselves and the crew.

CREW: 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 may listen to entertainment as configured.

3.8 EnCoder And Push-Push Switch - ECAPS (8)

ECAPS is a system that consists of an encoding knob and a push-push switched integral into the knob. By pressing the knob, it activates the selection and by turning the knob, a function can be accessed. Functions will always come up on the display with most recently used function first. By turning the larger knob of the concentric control the various functions will be displayed. When the desired function is displayed, turning the smaller knob will turn that function on or off, as desired. . Then the small knob can be pushed to accept the change, or the change will be accepted automatically five seconds after the last change. The display returns to the primary display after the unit accepts the change.



3.8.1 Speaker Amplifier

The speaker (SPR) can be turned on or off in the same manner as the selected secondary navaids. This control will place all selected audio on the cockpit speaker when this switch is selected. Except for the unswitched audio, the speaker amplifier is not active in the "Split Mode".

Unswitched audio, (the inputs dedicated to autopilot disconnect, altimeter warning, etc.) will come through the speaker regardless of the speaker button position.

Depending on installation, important audio annunciations such as radar altimeter or autopilot disconnect will come over the speaker even if it is not selected, while other unswitched, but muted inputs, such as GPS alerts, will only be present if the SPR button is selected. Consult your professional avionics installer for these important configuration details.

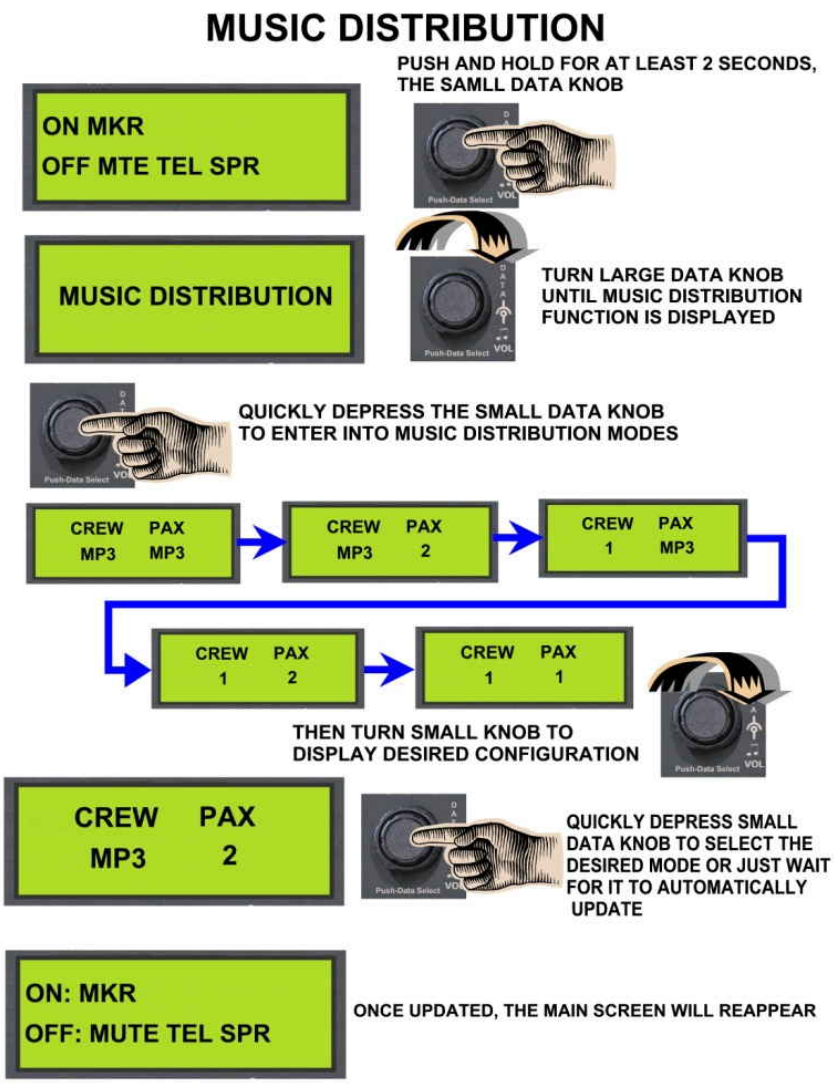
3.8.2 Alternate Intercom Function Mode

Alternate Intercom Function is a mode that allows everybody to talk on the intercom, but the passengers do NOT here the aircraft radios. In addition, when the aircraft radios are active, the crew does not hear the passengers' microphones, although passengers continue to hear each other.

3.8.3 Music Source/Distribution

The PMA9000EX user has two music channels, which can use any of three sources. One music channel is provided to the crew, and can be distributed to the passengers. Another music input is dedicated to the Passengers stations. The three sources, Music 1, Music 2 and MP3 can be directed via the ECAPS to the Crew and passenger channels.

NOTE: If the expected music is not heard, check which source has been selected for the crew.



3.8.4 Music Volume

The smaller data knob serves as the main music volume control for Music 1, and the internal MP3 play when it is playing files.

In addition, the volume of the music input #2 can be adjusted independently. Hold the push button in for 2 seconds to activate the Music Volume submenu, select the source to change and use the small knob to change the volume level. NOTE: The MP3 volume is also controllable, and these two will interact, depending on which music source is using the MP3 player.

All music volume controls are 0-31 steps.

3.8.5 Music Mute Control

ECAPS controls the music muting allowing the user to tailor the SoftMute® to their taste and situation. There are two SoftMute muting circuits, one for pilot and copilot, and another independent circuit for the passengers. The Soft Mute circuit will cut the music almost completely out whenever there is conversation on the radio or intercom. When that conversation stops, the music returns to the previous level comfortably, over a second or so.

The pilot and copilot SoftMute is controlled from the primary display. Activate the cursor by pressing the small knob. Rotate the underline cursor under Mute, and press to toggle the SoftMute on and off. The passenger's music is controlled by an external switch.

3.8.6 MP3 Controls

The internal MP3 player can be turned on and off and have player functions controlled through the ECAPS system.

MP3 PLAYER ON/OFF

MP3 RANDOM MODE

MP3 FILE TRANSFER

3.8.7 MP3 Upload

The PMA9000EX has 1 GB of internal storage (512 MB before S/N B01094). Due to the transfer rate advantages, we recommend that you transfer files from a laptop to the PMA9000EX if possible. Direct USB device transfer requires 35-40 minutes to transfer 1G of songs, Laptops typically require 4-6 minutes for the same amount of data with USB 2 port.

The PMA9000EX is not compatible with iTunes formats.

3.8.7.1 Laptop transfer

PS Engineering recommends Microsoft XP operating system or later.

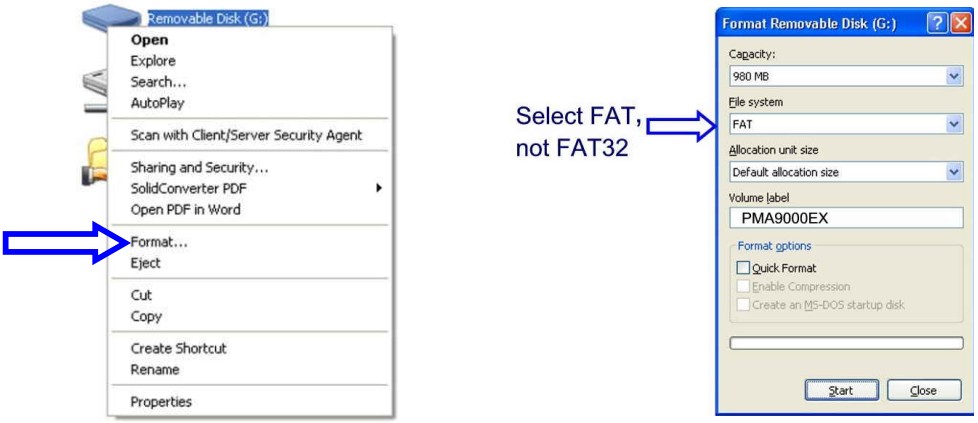
1. Using the supplied 2.5 mm-to-USB cable, along with the supplied USB-to-USB adapter cord (PS Part number 425-003-1454), connect this set of cables from the PMA9000EX front panel jack to a PC USB port.
2. With the PMA9000EX turned off, push and hold the small data knob while powering the PMA9000EX on. Wait until the audio panel displays "USB drive mode" before releasing.
3. When windows recognizes the PMA9000EX as a removable drive, select "Open folder to view files using Windows Explorer"
4. Create a subfolder (name it whatever you wish, like "PlaneMusic") on your PMA9000EX to contain the specific music files you will want on the airplane.
5. Copy the desired music into this folder.
6. After transfer is complete, turn the audio panel off, and back on to return to normal operation.

3.8.7.2 Direct USB Device Transfer

The program inside the unit will recognize and import any compatible audio files (.wav, .mp3, unpr o-tected .wma) from an external source, through the USB cable.

For best results, the following procedure should be used for a USB flash memory device when used with the PMA9000EX. The USB drive should be reformatted before being used with the PMA9000EX and only music files should be stored, in a single subfolder on the USB Device.

1. Connect the USB Drive to your PC
2. From "Start" select "My Computer" and select the external drive.
3. Right Click on the device, and select "Format. . . "
4. Select "FAT" as File system, and "Start" **WARNING**, **this will erase all files on this device**.



5. After formatting is complete, right click in the drive, and select "New. . . Folder" and create a new folder for your music that you will put on your PMA9000EX

6. Transfer your music files into the new music folder.

We recommend having no more than 1G of music files in this folder (512MB before Serial Number B01094). Because of the Microsoft file protocol, we cannot predict which files will be omitted.

To upload from a USB memory device, select the "Music Transfer" function on the submenu. Follow the onscreen instructions; connect the memory device to the 2.5 mm to USB cable, and then plug the cable into the front of the PMA9000EX when prompted.

After the music transfer is complete, the PMA9000EX will automatically reset to store the files and create the new play list. Therefore it is not advisable to upload files in flight or when the audio panel is otherwise in use.

Note: For best results, use quality name-brand USB devices.

Different types of files, and music file programs may result in variation in the volume level of the stored music.

The maximum transfer rate will decrease by about 1% each time the unit is uploaded, therefore frequent music upload is not advised.

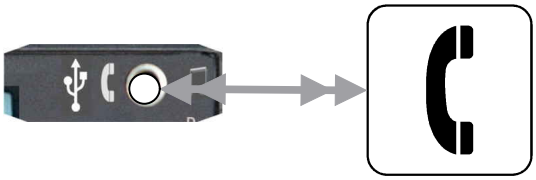
3.9 Utility Jack (9)

The 2.5-millimeter (3/32") jack on the front of the PMA9000EX has three distinct functions:

- Wired Cell phone input
- Music input
- Advisory audio input

3.9.1 Cellular phone (wired)

When a *wired* cellular telephone is connected to this jack using a 2.5 mm to 2.5 mm adapter cord (PS Part Number 425-006-7026), the PMA9000EX audio panel will connect the intercom to the cell phone when the "TELEPHONE mode is activated, and behave as described in section 3.7. The telephone ringer, if present, will be heard unless the input is muted by other radio or intercom..

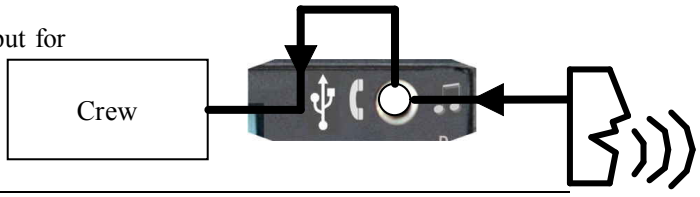


3.9.2 Music Input

When used as a music input, the front panel jack is treated as Music #1. However, thanks to the PMA9000EX controls, it can be distributed to all users, regardless of the intercom mode. A patch cord is available with 2.5 mm to 3.5 mm (3/32 to 1/8") adapter cord (PS Part Number 425-006-2535).
There are three music sources available to the PMA9000EX, MP3, Music 1, and Music 2. Music 1 input can be either on the front jack, OR the Music 1 input at the rear connector (Pins 23 and 24 J2). Music 2 is wired into the rear connector, only (Pins 26 and 27, J2)
If you plug a telephone into the jack, it will function as full duplex phone when the "TELEPHONE" button is pressed
We've built some intelligence into the PMA9000EX, too. If you have Music 1 connected to the rear pins, and there is music playing, the PMA9000EX "knows" that what you put into the front jack must be a priority. So the unit will automatically switch the jack to the priority mode.

3.9.3 Audio Advisory Input

The front jack can be used as a priority advisory input for auxiliary systems such as a GPS terrain advisory or portable traffic watch system. To prevent radio or



intercom from muting this input, disable the "**Mute**" function.

3.9.3.1 Smart Jack Function

When the PMA9000EX has a signal on music #1 input coming in from the rear connector, the front panel jack automatically becomes a Priority Advisory input, and is heard in the crew headphones.

NOTE

The front jack is no substitute for the certified installation of alerts such as the GPS waypoint or autopilot tones. These still must be hard wired into the back by your installer.

3.10 Telephone Mode

3.10.1 Bluetooth Telephone Connection

Before the PMA9000EX can be used in TELEPHONE mode with a wireless Bluetooth connection, the unit must be associated with a specific phone. This must be done after each power cycle of the PMA89000EX.

Activate the "seek device" function on the cell phone, and then enter the access code "**0000**" when the phone detects the "PMA9000EX" on the list of available devices.

This process will be necessary for any phone to be used, and only one cell phone can be associated with the audio panel at a time. If the additional phones are associated with the PMA9000EX at the same time, only the *first* phone will transfer audio to the panel.

3.10.2 Telephone (TEL) Operation

The TEL mode serves as a full duplex interface and distribution for telephone systems such as AirCell or portable cellular phones with earpiece jacks. Select TEL -> ON to activate the telephone mode.

From the main display, select TEL to ON to make an outgoing call.

When the Bluetooth-enabled phone receives an incoming call, the PMA9000EX display will show "Telephone Ringing" and play a ring tone. Pressing the encoder knob will connect the call, if desired. The PMA9000EX exits the telephone mode automatically when the cellular phone hangs up.

In TELEPHONE mode, the pilot microphone and headphones are connected to the cell phone. The pilot PTT will switch the pilot mic to the selected com transceiver, and allow continued aircraft communications to continue.

The copilot will also be able to transmit on the other selected radio with his PTT as well.

Entering the TEL mode connects the telephone to the users as follows:

In **ALL** intercom mode, all crew and passengers will be heard on the phone when they speak. Com and other selected radio audio is also heard in the headsets. If the pilot or copilot pushes the radio PTT, their mic will be transferred to the selected Com radio. The telephone party will not hear ATC communications, and vice versa.

In **CREW** mode, only the pilot and copilot are connected to the telephone. Passengers will not hear the telephone. The pilot and copilot will also have transmit capability on the other selected transceiver.

In **ISO** intercom mode, when the PMA9000EX is in the **TEL** mode, the pilot position is in the "Phone Booth." Only the pilot will hear the telephone, and only he will be heard. He will also have access to Com 1 or 2, and will transmit on that radio using the PTT. All selected audio is provided to the pilot.

NOTE

Because the cell-phone uses an intercom circuit, all stations on that circuit will lose intercom capability when the cell phone is in use.

WARNING

Federal Communications Commission regulation 47 CFR 22.925 prohibits the use of 800MHz Cellular handsets in any aircraft that is airborne. Violation of this rule could result in suspension of service and/or

a fine.

3.11 Liquid Crystal Display Control

The contrast on the LCD display can be controlled for individual preference. The contrast has 10 steps, with higher numbers being less contrast.

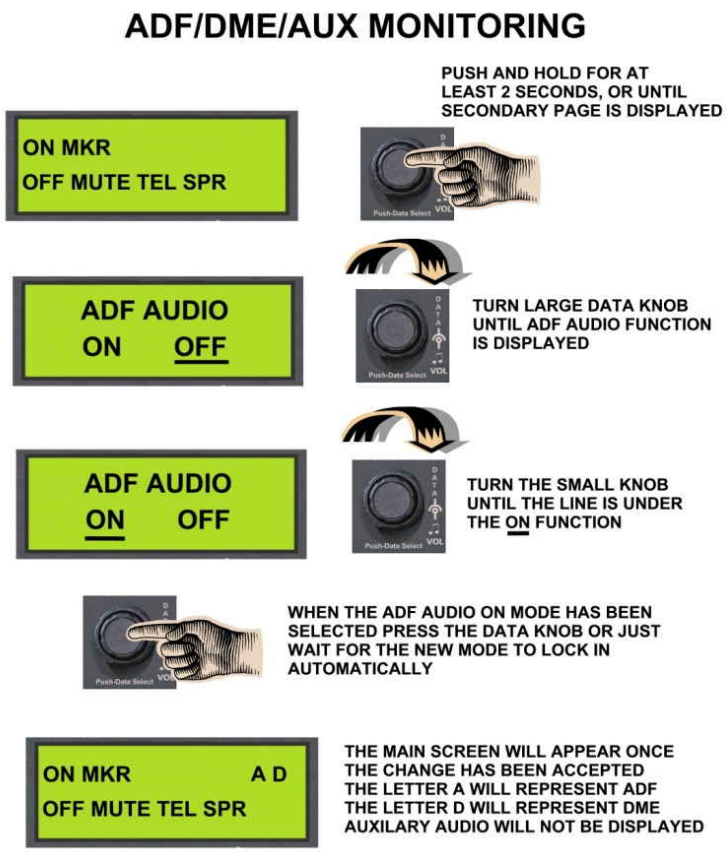
NOTE: Optimum Contrast is usually at level 3 or 4.

3.12 Secondary Navaid Selection (ADF, DME, AUX)

The Marker Beacon Audio is controlled from either the MKR button, or on the primary display screen. Press the small knob to display the underline cursor, select MKR with large knob, and press the small knob to toggle the audio on or off. See Section 3.6 for more detailed information.

The other secondary navigation audio (ADF, DME, and Auxiliary) is controlled through the data knob on the submenu. Press and hold the small knob for 2 seconds to activate the submenu, rotate the large knob to find the ADF or DME page. Rotate the small knob to turn the desired source on or off.

When the ADF or DME are selected, the letter A, or D will appear on the ON line of the display, and can be turned off from the primary display.



3.13 Public Address Function

The Public Address (PA) can be activated through the ECAPS interface. The pilot microphone will be heard on the speaker when the pilot PTT is used. The copilot can continue to use the selected com radio while the pilot will now be heard over the speaker.

The C1 and C2 indicator LEDs will blink to indicate that the pilot is on the PA, and not on the intercom or radio.

Section IV – Warranty and Service

4.1 Warranty

In order for the factory warranty to be valid, the installations must be accomplished under the supervision of an authorized PS Engineering dealer. If the unit is being installed by a non-certified individual in an experimental aircraft, a factory-made intercom 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 two (2) years from the date of sale. During the first **twelve (12) months** of the two-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. For the remaining **twelve (12) months** of the two-year warranty period, the shipping costs for the exchange unit will be borne by the customer.

All transportation charges for returning the defective units are the responsibility of the purchaser. All domestic transportation charges for returning the exchange or repaired unit to the purchaser will be borne by PS Engineering, Inc. The risk of loss or damage to the product is borne by the party making the shipment, unless the purchaser requests a specific method of shipment. In this case, the purchaser assumes the risk of loss.

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 handling, storage or preservation, or unreasonable use or maintenance as determined by us. This warranty is void if there is any attempt to dissemble 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.

All items repaired or replaced under this warranty are warranted for the remainder of the original warranty period. PS Engineering, Inc. reserves the rights to make modifications or improvements to the product without obligation to perform like modifications or improvements to previously manufactured products.

4.2 Factory Service

The units are covered by a three-year limited warranty. See warranty information. Call PS Engineering, Inc. at (865) 988-9800 before you return any 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:

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

Units that arrive without an RMA number, or telephone number for a responsible contact, will be returned un-repaired. PS Engineering is not responsible for items sent via US Mail.

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 possible configurations ; 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.

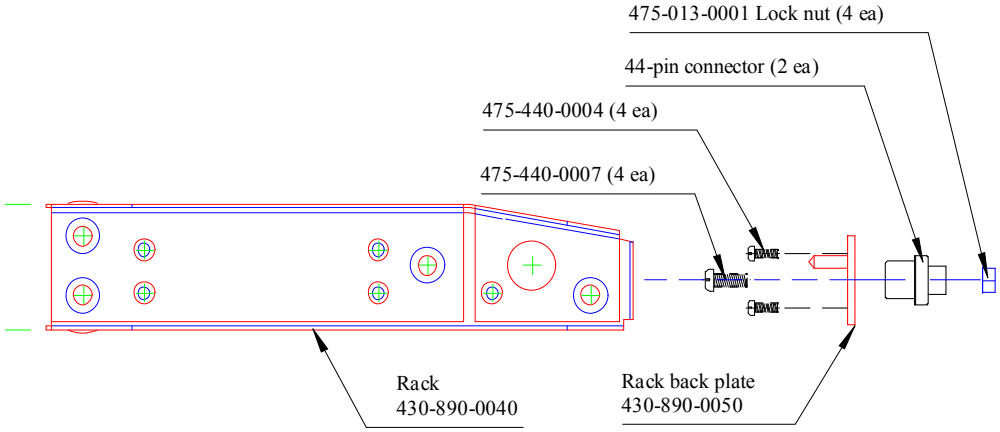
Below are some examples of typical modifications. Contact the PTT manufacturer for more details if necessary.

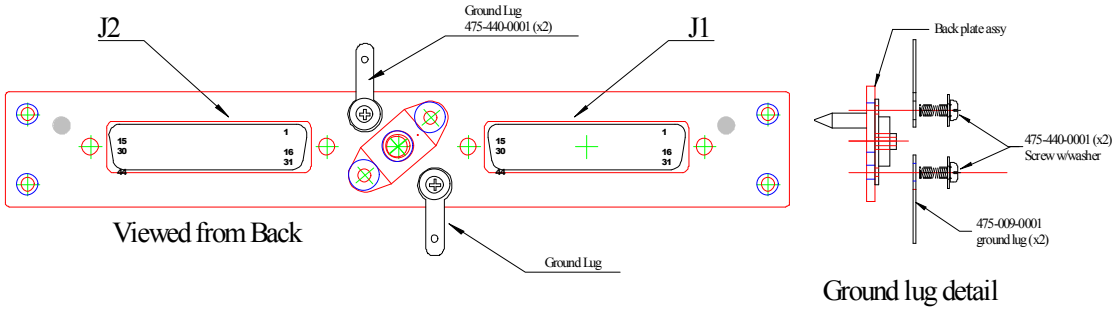
Procedures For David Clark PTT
Unscrew the round black plastic cover from the jack.
Connect the joined black wires to the red wire.
Replace the round black plastic cover.

Procedures for Telex PT-200
Unscrew the round black plastic cover from the jack.
Cut the red wire in the middle of the wire.
Strip both ends of the insulation.
Solder the two ends to the ground lug to the PTT jack.
Replace the round black plastic cover.

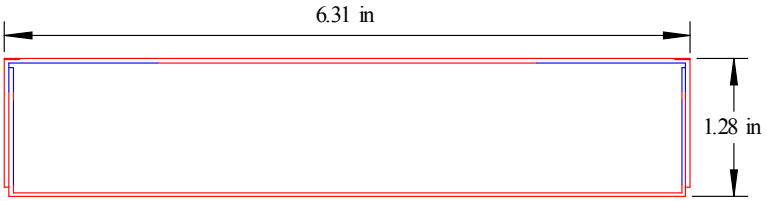
Procedures for Telex PT-300
Unscrew the round black plastic cover from the plug jack.
Remove the heat shrink material from the joined black wires.
Solder these two wires to the lug that has a white wire already soldered to it.
Replace the round black plastic cover

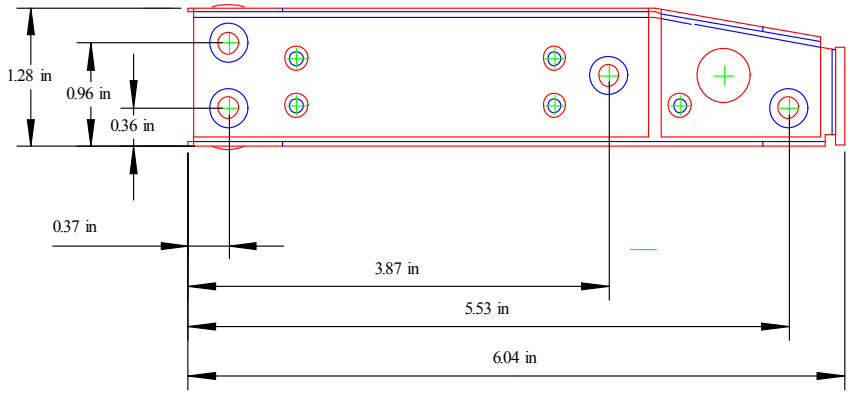
Appendix B – PMA9000EX Installation Drawings





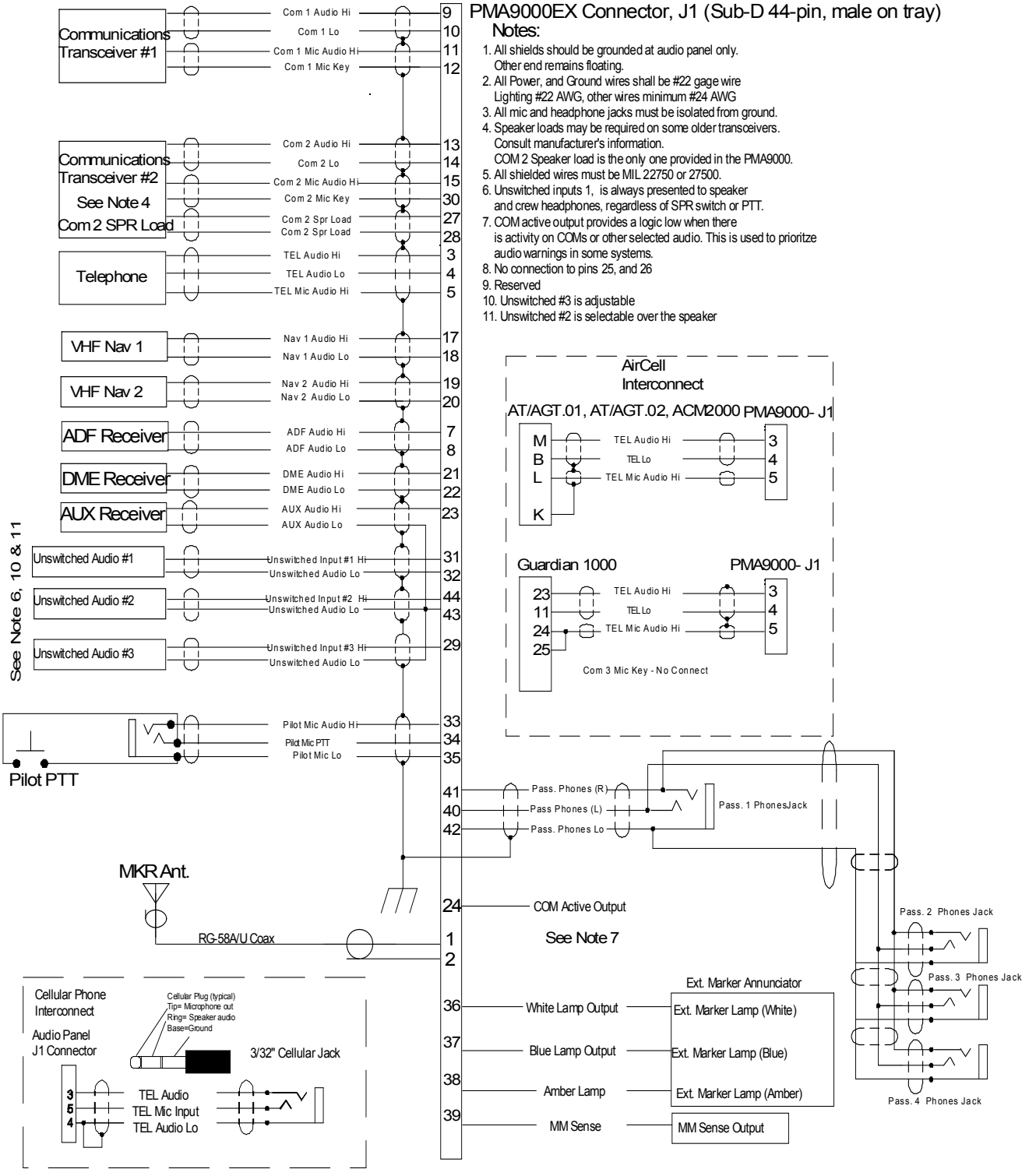
Rear plate detail (not to scale)





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 – J1 Connector Interconnect



Appendix D – J2 Connector Interconnect