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PMA7000S
 PMA7000M-S
 with Options



Document P/N 200-070-0012
 Revision 12, September 2000

Patent No. 5,903,277
 FAA-Approved TSO C50c, C35d
 JAA-Approved JTSO-2C35d, C50c
 Audio Selector Panel
 Marker Beacon Receiver
 High-fidelity Stereo Intercom System
 Installation and Operation Manual

**In certified aircraft, warranty is not valid unless this product is installed by an
 Authorized PS Engineering dealer.**

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Section I GENERAL INFORMATION

1.1 INTRODUCTION

The PMA7000M-S represents the next step in cockpit audio control and intercommunications. Using proprietary *IntelliVox*® design, this unit eliminates the requirements for intercom squelch adjustments. The unit is designed for outstanding ergonomics and visually defined mode annunciation and selection.

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 PMA7000M-S.

1.2 SCOPE

This manual provides detailed installation and operation instructions for the PS Engineering PMA7000M-S-series of Audio Selector Panel/Intercom Systems. This includes the following units:

<u>Model</u>	<u>Description</u>	<u>Part Number</u>
PMA7000S	Stereo Audio Selector Panel	7000S
PMA7000M-S	Stereo Audio Panel with Marker	7000MS
Option 1 added to any unit	Same as above, with optional recorder and message system	Opt.1
Option 2 added to any unit	Same as above, with optional recorder and message system for Vista Map Software	Opt 2
Option 3 added to any system	Black bezel (no silver trim)	Opt 3
Other options may be applied for exclusive use by specific aircraft manufacturers, under Type Certification Call for information.		

Where the functions are identical to all units, it will be referred to herein as a PMA7000M-S. Otherwise, the applicable units will be specified.

1.3 EQUIPMENT DESCRIPTION

The PMA7000M-S-series is a state of the art audio isolation amplifier and audio selector that contains an automatic voice activated (VOX) intercom system. It can switch up to three transceivers (Com 1, Com 2 and Com 3) and six receivers (Nav 1, Nav 2, ADF, DME, MKR and AUX).

The TEL mode allows the PMA7000M-S to act as an audio interface between aircraft headphone and microphones and specific aircraft approved (FAA/FCC) cellular telephone equipment.

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 PMA7000MS must be interfaced with the AirCell AGT.01.

There are two unswitched inputs, for autopilot disconnect, and/or radar 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.

A rotary switch selects one of the three communication transceivers for the pilot and copilot position, and allows radio transmission. In "Split Mode" the PMA7000M-S has the ability to allow the pilot and copilot to operate different transceivers independently. The TEL mode allows the pilot to use the cellular telephone interface. External switches permit telephone operation for the copilot and passengers.

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.

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A six-station voice activated (VOX) intercom is included in the PMA7000M-S. This system has PS Engineering's exclusive *IntelliVox*® circuitry that eliminates manual adjustments. The system contains six separate VOX mic circuits, and only opens the microphone channel in use.

The intercom system incorporates pilot isolate and crew modes, two stereo music inputs with "Soft Mute," and LED indicators for swap and transmit indications. Intercom control is through front panel-mounted knob and 3 position mode switch. A single volume controls intercom level for the pilot and copilot. Passenger headphone volume is factory set, and adjusted in flight with headset-mounted volume controls. Passenger volume control is further adjustable through screwdriver access in the top of the unit. Intercom squelch is automatic.

An optional 3-light Marker Beacon receiver is integrated in the PMA7000M-S. This provides the necessary Marker Beacon lights and audio indications necessary for an Instrument Landing System (ILS) approach.

1.4 APPROVAL BASIS -

TSO Approval.

The PMA7000M-S, and PMA7000S Audio Selector Panels are FAA approved under TSO C50c (Audio Amplifiers) and TSO C35d (Marker Beacon Receivers). In addition, they are approved by the Joint Airworthiness Authorities under JTSA C50C and JAR-TSO 2C35d.

All systems comply with relevant portions of EUROCAE RTCA MPS WG No. 7/70, DO-143 and (*Marker Beacon Receivers*), ED-14C/DO-160C (*Environmental Conditions and Test Procedures for Airborne Equipment*), ED12B/DO-178B (*Software Considerations for Airborne Equipment*) and ED- 18/DO-214 (*Audio Systems Characteristics and Minimum Operational Performance Standards for Aircraft Audio Systems*).

NOTE: The optional message annunciators contained in Option 1 and Option 2 are not TSO-approved, and the installer must determine the relevant approval basis prior to installation. Contact PS Engineering for information regarding FAA approval.

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

TSO COMPLIANCE	
<i>Marker Beacon:</i>	C35d, Class A
<i>Audio Selector/Intercom:</i>	C50c, Class A
APPLICABLE DOCUMENTS:	RTCA/DO-214 RTCA/DO-143 RTCA/DO-160C RTCA/DO-178B
ENVIRONMENTAL Qualifications:	A1D1/CA(MN)XXXXXXBBBBTBKXX
<i>Temperature Range:</i>	
Operating:	-15° C to 55°C
Storage:	-40° C to 85°C
<i>Altitude:</i>	Up to 50,000 feet in a 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. (0.54 kg)

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Specifications, Continued.

POWER REQUIREMENTS (Including Internal Lighting):	
<i>Voltage:</i>	11 to 33 VDC
<i>Maximum Current:</i>	2.5 Amp (Externally protected by a 3 Amp circuit breaker.)
<i>Typical operating current:</i> Speaker off:	350 mA
Speaker on, 28V, full radio volume	1.5 A
Audio Selector Specifications	
<i>Audio selector panel input impedance:</i>	510 Ω
<i>Input Isolation:</i>	-60 dB (min.)
<i>Speaker Muting:</i>	-60 dB (min.)
<i>Speaker Output (into 4 Ω) with no clipping</i> 14 VDC:	3 Watts (min.)
28 VDC:	10 Watts (min.)
<i>Receiver Inputs:</i>	9 (Com 1, Com 2, Com 3, Nav 1, Nav 2, ADF, DME, MKR, AUX)
<i>Unswitched Inputs:</i>	2 (examples: GPS WPT, Value, Autopilot Disconnect, Altimeter DH)
<i>Transmitter Selections:</i>	6 (Com 1, Com 2, Com 3 Com1/2, Com2/1, Telephone)
<i>Speaker Impedance:</i>	4 Ω
<i>Headphone Impedance:</i>	150 – 1000 Ω
<i>Headphone Output:</i>	38 mW each headset, no clipping <1% THD 70 mW each headset with < 10% THD into 150 Ω
<i>Microphone Impedance:</i>	150 - 600 Ω
Intercom Specifications	
<i>Intercom Positions:</i>	6 places (with individual <i>IntelliVox</i> ® circuits)
<i>Music Inputs:</i>	2 (Stereo)
<i>Music Muting:</i>	>-30 dB "Soft Mute" when Com or intercom active.
<i>Distortion:</i>	<1% THD @ 38 mW into 150 Ω <10% THD @ 70mW into 150 Ω
<i>Mic Freq. Response, 3 dB:</i>	300 Hz - 6000 Hz
<i>Music Freq. Response, 3 dB:</i>	100 Hz - 18kHz
MARKER BEACON RECEIVER:PMA7000M-S only	
<i>Frequency:</i>	75 MHz Crystal Controlled
<i>Sensitivity:</i> Low:	Capable of: (preset at factory for field application) 1000 μ Volts (Hard) (360 to 570 μ V soft)
High:	200 μ Volts (Hard) (130 to 200 μ V soft)
<i>Selectivity:</i>	-6 dB at \pm 10 kHz -40 dB at \pm 120 kHz
<i>External Lamp Output:</i>	7.5 (\pm 4 VDC unloaded, at maximum brightness) VDC positive when active, max. current 125 mA
<i>MM Sense:</i>	Active high (4.5 \pm 1.0VDC)

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1.6 EQUIPMENT SUPPLIED

1 ea. of the following units:

Model	Description	Part Number
PMA7000S	PMA7000S Audio Panel with Stereo Intercom, Silver trim. No marker beacon receiver.	7000S
PMA7000S Option 1	PMA7000S DRAWS Audio Selector Panel with Stereo Intercom. NO MARKER. Silver Trim	7000S- Opt 1
PMA7000S Option 3	PMA7000S Audio Selector panel with Stereo Intercom. Black bezel	7000S-Opt. 3
PMA7000S Option 1, 3	PMA7000S Audio Selector Panel Stereo Intercom with Option 1 DRAWS, Black bezel	7000S-Opt. 1, 3
PMA7000M-S	PMA7000M-S Audio Panel with Marker Beacon and Stereo intercom. Silver trim ring.	7000MS
PMA7000M-S Option 1	PMA7000M-S W/DRAWS option, Marker Beacon, Stereo Inter- com. Silver trim ring	7000MS Opt. 1
PMA7000MS Option 3	PMA7000M-S Audio Selector panel with Marker Beacon and Stereo Intercom. Black bezel	7000MS-Opt. 3
PMA7000S Option 1, 3	PMA7000M-S DRAWS Option, Black Bezel- Audio Panel with Stereo Intercom and Marker	7000MS-Opt. 1, 3

PMA7000M-S Installation Kit: 250-007-3613

Description	Quantity	Part Number
PMA7000M-S installation rack assembly	1	120-430-0420
Top Molex Connector Shell w/key, 44 pin, key 4/5	1	120-425-4402
Bottom Molex Connector Shell w/key, 44 pin, key 7/8	1	120-425-4400
Gold Plated Crimp Pins	88	425-001-0002
4 40 X 7/16 screw w/nylon patch	4	475-440-0007
Grounding bar	1	430-007-0001
6-32 X 3/4 pan head Phillips screw	2	475-632-0038
6-32 Nut Flat	2	475-632-0003
6-32 Lock Nut	2	475-632-0004
Cable Clamp	1	625-001-0002
#6-32 x 1/2" Flat head Phillips screw	6	475-632-0012
#6-32 Clip Nut	6	475-630-0002
Parts identification sheet	1	002-250-7028

1.7 EQUIPMENT REQUIRED BUT NOT SUPPLIED

- a) Circuit Breaker: 1 ea. 2 amp. (14V) or 3 amp (28V)
- 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 <1:1.5, and appropriate for the airspeed)
- h) Interconnect Wiring

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 PMA7000S-Series Audio Selector Panel/Intercom System and PMA7000M-S-Series Audio Selector Panel/Intercom System with internal Marker Beacon.

With the exception of the internal marker beacon receiver, the PMA7000S, and PMA7000M-S are identical. All units will be identified hereafter as the PMA7000M-S, where the information applies to all.

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.

NOTE: The PMA7000M-S requires specialized knowledge 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.

2.1.2 Certification Requirements

When the digital audio warning system is installed in a certified aircraft, certification basis is the installer's responsibility. Due to the variety and options available for interface, PS Engineering, will only provide manufacturers data for our equipment interface. Contact PS Engineering for more details.

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 PMA7000M-S 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.

2.3.2 Mounting Requirements

The PMA7000M-S 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 43.13-2A. The unit may be mounted in any area where adequate clearance for the unit and associated wiring bundle exist.

Avoid installing the audio panel close to high current devices or systems with high-voltage pulse type outputs, such as DME or transponders.

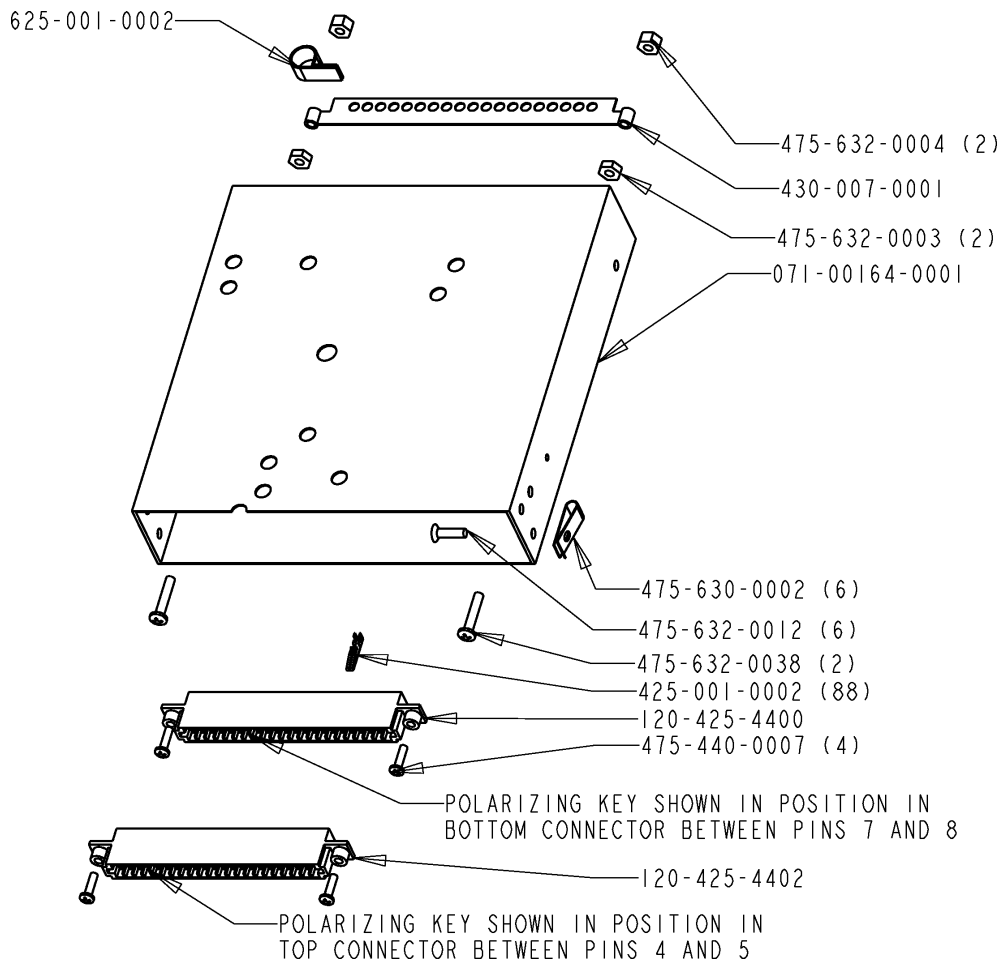
NOTE: The mounting hole configuration for the PMA7000M-S is identical to the PMA6000 series and KMA-24 Audio Selector Panels.

2.3.3 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 1/2" screws (475-632-0012). The audio selector panel must be supported at front and rear of the mounting tray.

2.3.4 Tray and Connector Assembly

The unit connectors mate directly with the circuit boards in the PMA7000M-S. The connectors are a Molex crimp-type, and require the use of a Molex hand crimp tool, EDP P/N 11-01-0203, CR6115B (or equiv.). The connectors are mounted to the unit tray with #4-40 screws (475-440-0007), from the inside of the tray. Ensure that proper strain relief and chafing precautions are made during wiring and installation, using the cable clamp (625-001-0002). Secure the ground bar (430-630-0002), if desired using, #6-32 nuts (475-632-0003) and #6-32 lock nuts (475-632-0004).



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.

NOTE: PS Engineering can make a custom wiring harness for the intercom portion. Call 1-800-ICS-AERO or see www.ps-engineering.com for details.

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 PMA7000M-S 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 20, of the PMA7000M-S 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 PMA7000M-S 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.

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 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 KMA-24 Installation

If the installation replaces a KMA-24 (series -01, -02 or -03), the existing 44 pin connector can be used for the bottom connector of the PMA7000M-S tray as is, providing it is properly installed and wired. No other changes are required except for external marker lights (see Section 3.7.2 for details). The "key" in the existing connector must be located between pins 7 and 8. This connector will be used in the bottom connector position. (See Appendix for complete wiring harness details.)

The existing ground bus may be reused for radio shield connections, if it was constructed so it can be relocated to the PMA7000M-S tray.

2.4.3 Existing PMA6000 installations

In 28-Volt aircraft, the dropping resistor may be removed, however, the 2 Amp breaker should be changed to 3 Amp. If both old unit is stereo (PMA6000S or PMA6000MS), no rewiring is necessary unless additional features are added.

2.4.3.1 Stereo PMA7000M-S installations into monaural PMA6000, PMA6000M.

Installations replacing PMA6000 or PMA6000M require re-wiring of the top connector to accommodate the stereo configuration. See appendixes for detailed interconnect information.

2.4.4 Power

The PMA7000M-S-Series are compatible with both 14 and 28 Volt DC systems. A two (2) Amp circuit breaker is required for 14 VDC installations, and a three (3) Amp breaker for 28 VDC aircraft. Power and ground wires must be a twisted #18 AWG pair. Connect airframe power ground to J1 (bottom connector) Pin Z only. No dropping resistors are required.

2.4.5 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 PMA7000M-S 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.

2.4.6 Audio Panel interface

The PMA7000M-S 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.

2.4.6.1 Speaker Load

The PMA7000-series contains a 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 load input on the PMA7000M-S (J1, pins 19 and L, 16 and M). The speaker load is 16 Ω , 3W.

2.4.7 Com 3 Audio

As installed in the standard configuration, the PMA7000M-S Com 3 audio is placed in the audio when the mic selector switch is in the Com 3 position (fully CCW). Pushing the receiver selector buttons can monitor Com 1 and Com 2 audio. If monitoring of Com 3 is desired in the Com 1 or Com 2, connect Com 3 audio in parallel to the AUX input (J1, pin 11).

2.4.8 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.

2.4.9 "Swap" Mode

When a momentary, normally open, push-button switch is connected between pin 10 on the top 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.

2.4.10 Backlighting

The PMA7000M-S has an automatic dimming of the pushbutton annunciator LEDs and marker lamps controlled by a photocell. Control of the unit backlighting is through the aircraft avionics dimmer. Connect the dimmer control line to J1 pin D for 14 volt systems, and to J1 pin F for 28 volt systems. Pin E is light ground.

If an external dimmer control is not used, a constant low level back light illumination can be established for nighttime viewing. Pin D or F (depending on system voltage) must be tied to power (J1, pin 20) 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.

2.4.11 Unswitched inputs

J1, pin T is the unswitched input number 1 and J1 pin 17 is unswitched input 2. These inputs are presented to the pilot and copilot regardless of the audio configuration, and will always mute the entertainment inputs. These 510V inputs can be used for altimeter DH audio, GPS waypoint audio, autopilot disconnect tones, air-to-ground (Flitefone) telephone ringer or any other critical audio signal. This input is not related to the cellular telephone interface.

2.4.12 PA Mute (J1, Pin 18)

Pin 18 of J1 is a TTL logic output that is pulled low during PTT operation. This serves as an input to external public address system to prevent feedback during transmissions.

2.4.13 Public Address Function (J2, Pin 18)

A PMA7000MS with serial numbers above "D" for the top board (second set of serial numbers) has a Public Address function. By connecting the top connector (J2), Pin 18 to ground, the pilot's microphone audio is placed on the cabin speaker output. When the pilot's PTT is activated, his voice is heard over the speaker. The copilot can continue to use the selected com.

We recommend installing a toggle switch to connect the cabin speaker output (pin W, bottom connector) to a rear or public address speaker instead of the cockpit speaker close to the pilot. This will prevent feedback.

2.4.14 Control Output (J2, Pin A)

Pin A of the top connector is pulled to ground whenever the AUX button is depressed. This serves as a control line for external devices, such as a entertainment system that the pilot wishes to control.

This could be used in conjunction with a PA to control J2, Pin 18, as well as an external relay to change to the cabin speaker from the cockpit.

2.4.15 Intercom wiring

The top connector (J2) is for the intercom and additional functions. See Appendix 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 top connector harness can be custom made by PS Engineering, Inc. Simply call the factory and obtain a wire harness work-sheet. The harness will be made to your specifications and fully functionally tested. All hardware is included.

2.4.15.1 Entertainment Input

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.

2.4.15.1.1 Stereo entertainment (7000S, 7000MS)

Two stereo entertainment devices (CD player, cassette player, etc.) can be connected to the unit. Install two $\frac{1}{8}$ -inch stereo jacks in a convenient location so that the pilot can plug in the entertainment devices into the system. The audio signal at the entertainment input must be a minimum of 500 mV P-P per channel for optimum music performance.

PS Engineering offers an aviation Compact Disk layer, the PCD7100 (Part Number 11952), designed to interface with the PMA7000-Series.

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

2.4.15.1.2 Entertainment distribution

Entertainment source #1 provides music for the pilot and copilot positions, while entertainment source #2 provides music for the four passenger positions. The PMA7000M-S-system incorporates a "Soft Mute" system. This will mute the entertainment devices during ICS or radio conversation.

Any signal appearing in the unswitched audio inputs will always mute the entertainment sources, even though the passengers may not hear the audio tone itself.

Entertainment inputs #1 and #2 can be paralleled so a single entertainment source can serve both the passengers and the crew. 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.

Caution: 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.

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

2.4.15.1.3 Entertainment 2 Mute (Pin V)

The ICS button on the PMA7000M-S controls the muting ("Karoake mode") of entertainment source #1.

Connecting J2 pin V to ground through a SPST switch places the entertainment #2 music source into the Karoake 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 lessor importance.

2.4.16 VOX Override (J2, Pin U)

Normally not connected. Connecting pin U of the PMA7000M-S of J2 to ground will force the *IntelliVox*® open. This can be hooked up as a hot mic switch which will place all microphones on the intercom. This can also be connected through a momentary switch to serve as a VOX test switch, if desired. Because the *IntelliVox*® will close in the presence of a steady tone, this pin is used in testing to defeat the *IntelliVox*® software.

2.4.17 Intercom expansion (J2, Pins P, S, and C)

The PMA7000M-S contains a 6-place intercom. In applications where more intercom positions are needed, PS Engineering can provide intercom expansion units, such as the PM2CREW, part number 11919, 11919R, etc. These can add up to eight additional stereo intercom stations, plus independent music input. Interface to the expansion unit is through J2, pins P (audio input from expansion unit), S (audio output to expansion unit) and C (9 VDC expansion power).

2.4.18 Playback button Installation (J2, Pin 19- Options 1, 2 and 7 ONLY)

To activate the Recording System playback, a momentary push button switch is required. This switch can be located anywhere in cockpit convenient to the pilot's reach. The switch must be connected to pin 19 of J2 of the PMA7000M-S, and ground

2.4.19 Audio Message Acknowledge (J2, Pin W) Option 1 and 2 only)

The audio message installation requires inputs from an external annunciator, such as an Electronics International engine gage system. A falling edge (input pulled low) when applied to the appropriate pin of the connector will cause the message to be played, repeating every two seconds, until the acknowledge (“ACK”) button is pushed.

Install the “ACK” button in a location convenient to the pilot and copilot position. This switch is a momentary SPST switch between J2 Pin W and ground.

The following table contains information regarding various inputs.

Function	EGT or CHT	Fuel Flow or Level	Oil Pressure or temperature	Volt/ Amp	RPM	Manifold Pressure
PMA7000 Pin	Z	22	Y	21	X	20
Message Number	1	2	3	4	5	6
Option 1						
Message Text	“Check temperature”	“Check fuel”	“Check oil”	“Check battery”	“Check engine speed”	“Check boost”

Other combinations can be created at additional cost.

NOTE: PS Engineering can only provide input information at this time. Approval basis is the responsibility of the installer. Contact PS Engineering for more information.

2.5 Marker Beacon Installation

The marker beacon receiver is an option included in the PMA7000M-S. Non-marker (PMA7000S) units can provide audio interface with the external receiver (see section 2.5.4).

2.5.1 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.

2.5.2 External Marker Lights (7000MS)

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 \pm 1.5 VDC unloaded, at MAX brightness) when active. Maximum source current per lamp is 125 mA. Voltage varies with photocell dimming.

2.5.3 Middle Marker Sense (7000MS)

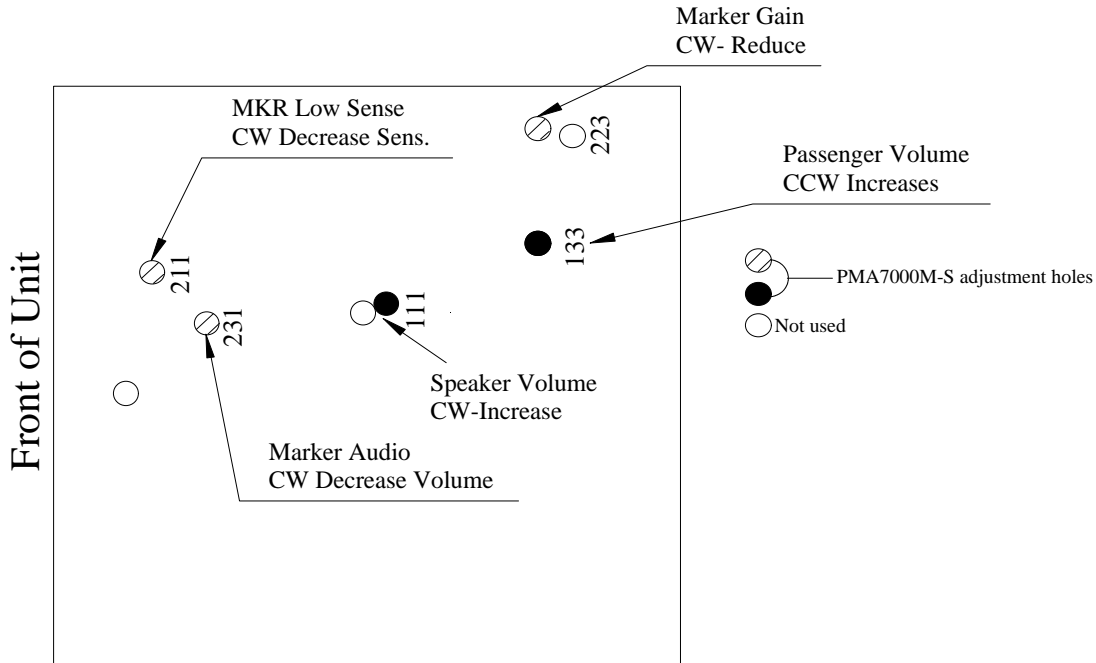
A Middle Marker Sense output signal is available from the 7000M-S to flight control systems. This function will not operate during the test mode. This output will go to +4.5 VDC (\pm 1.0 VDC) when a valid Middle Marker signal is received. This output is J1, pin 2.

2.5.4 Marker Audio Input (7000S)

If using an external marker receiver, the audio input is J1, pin 21 (MKR input).

2.6 Adjustments

The PMA7000M-S is factory adjusted to accommodate the typical requirements for most aircraft configurations. There are five adjustments however, that will allow the installer to tailor the specific functions.



2.7 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 PMA7000M-S in Split Mode.

2.8 Wireless telecommunications interface

The PMA7000M-S has interface capability with units such as the AirCell AGT.01. It is the user's responsibility to determine the appropriate legal use of the equipment, and provide the services.

Interface to the AirCell, or any telecommunications device, is through the J1 (bottom) connector, pins 14 and N. Pin 14, labeled cellphone ring, is connected to pin V of the AirCell connector and pin N of J1 is connected to pin W. The shield is terminated to pin K on the AirCell. On the AirCell interface these are listed as data/fax lines, but they are used for voice interface in this case.

Use a 2-conductor with shield cable, and connect the shield to Pin K of the AirCell.

If interface is desired with another type of wireless telecommunications unit, the aircraft owner can purchase an after-market interface cable. By Federal Communications Commission (FCC) regulations, these can only be used on the ground in the United States.

PS Engineering makes no expressed or implied warranty that the equipment will be compatible with any devices other than AirCell.

Some interface cables are available from MobileQuest at 800-882-1288, or (215) 734-7000. The following is a partial list of available interface cables:

Compatible Phones

PS Engineering
PMA7000M-S Series Audio Selector Panel and Intercom System
Installation and Operator's Manual

Audiovox Series 5
Motorola TeleTAC, DPC 550, DPC65-, Lite Series, Profile Series
Motorola Elite, M70, M75, SC-725
Motorola Bag Phones, Mobiles
NEC100 Series, 110, 120, 180, Sport
NEC 700 & 800 Series
OKI 900/910, AT&T 3730/3710
OKI 1150/1145, AT&T 3760
Fujitsu PCX
Mitsubishi 4000, DiamondTel 22X/20X/18X
NEC960
NEC DT2000 Digital Phone

Unauthorized use of cellular telephone devices in aircraft is subject to FCC enforcement action, which may include a \$10,000 fine per incident. PS Engineering, Inc. does not endorse using unapproved cellular telephone equipment in flight, and takes no responsibility for the user's action.

2.8.1 Hook Switches

While the mic selector acts as the hook switch for the pilot, additional hook switches must be installed to have full access to the cellphone system. The copilot hook switch is a SPST switch that connects pin L of J2 on the PMA7000M-S to ground to place the copilot on the cellphone.

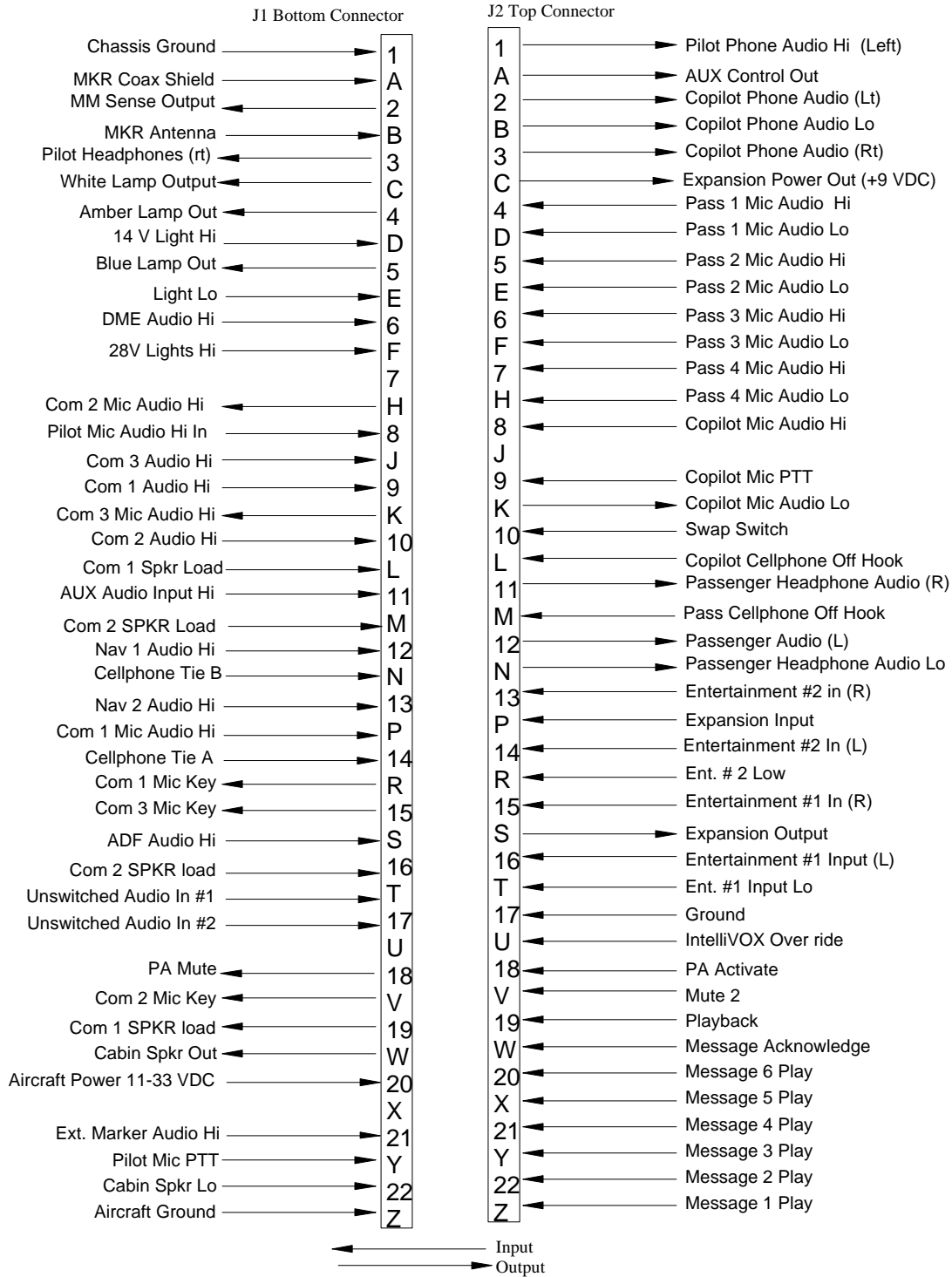
PMA7000M-S J2, pin M is the passenger hook switch. Install a SPST switch in a location adjacent to each passenger headset where cellphone use is desired. When pin M is connected to ground through any switch, the passenger microphones are all on the cellphone system.

The wireless communication "tel" system utilizes an intercom loop. Therefore, any time the cellphone is in use from the pilot or copilot side, pilot and copilot will lose intercom capability. In the ALL mode, when the passengers' activate the cell phone, the pilots will have intercom, and continue to hear and transmit over the avionics normally. However the passengers will not have intercom, because they are on the telephone.

To prevent unwanted distractions, only the pilot and copilot will hear an incoming call ring signal. They can then decide to allow a passenger to activate the hook switch and use the telephone.

If the pilot has selected "TEL" mode, the passengers cannot access the telephone in the "CREW" intercom mode, but they will hear the call.

2.9 PMA7000M-S Pin assignments (Standard Version Only)



2.10 Post Installation Checkout

After wiring is complete, verify power is **ONLY** on pin 20 of the J1 (bottom connector), and airframe ground on bottom connector pin Z. Failure to do so will cause serious internal damage and void PS Engineering's warranty.

2.11 Unit Installation

To install the PMA7000M-S, 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.**

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

2.11.1 Operational Checkout

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 the right ear cup only.
4. Switch on the unit by pressing the volume (VOL) knob.
5. Check intercom operation.
6. Rotate the Mic Selector Switch to the **Com 1** position.
7. Verify that the **Com 1** button lights. Verify that the green transmit LED (Light Emitting Diode) near the mic selector is not illuminated. If the LED is on, 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.
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 and Com 3, (if installed).
11. Rotate the mic selector switch to the **COM 1/2** position. Verify that the pilot communicates on Com 1 and the copilot on Com 2.
12. Rotate the mic selector switch to the **COM 2/1** position. Verify that the pilot communicates on Com 2 and the copilot on Com 1.
13. Rotate the mic selector switch to the **TEL** position. 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 Com 1. The copilot has no transmit capability in TEL mode.
14. Verify proper operation of all receiver sources by selecting them using the button. Note that the button for the receiver sources stays in, and the button illuminates to show which source is in use.
15. Push in the SPR button. Verify that all selected audio is heard in the cockpit speaker. Verify that the audio mutes when the mic is keyed.
16. Verify that the LED in the lower right side illuminates when either push to talk is keyed.
17. Verify proper Intercom system operation in the **ALL**, **ISO** and **CREW** modes (see Table 3-1).
18. 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.

2.11.1.1 Marker Checkout (7000M-S only)

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 μ 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 ± 3 dB of the amber lamp, with 3000 HZ and 400 Hz applied, respectively.
2. Repeat with the unit in LOW sensitivity, with 430 μ Volts applied.
3. Connect the marker antenna and verify proper operation.

2.11.2 Receiver Sensitivity

Although the PMA7000M meets FAA TSO-C35d sensitivity specifications, the sensitivity of the receiver has been adjusted to meet real world requirements (150 μ V and 430 μ V, soft). This will usually eliminate the need for the avionics shop to reduce the sensitivity in the field so as to prevent early detection of the marker beacons. If your particular installation requires more or less sensitivity, see adjustment section 2.6, and figure 2-1.

2.12 Cellular Interface Checkout

When a wireless telecommunication system is installed and configured, a dial tone will appear in the headset of the pilot when the mic selector is in the "Tel" position. In "ALL" intercom mode, a dial tone will be heard whenever the copilot or passenger's hook switch is closed.

2.13 Internal Recorder Checkout (Optional)

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 at least five incoming radio transmissions.

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

Depress the panel or yoke mounted playback switch, and verify that messages play, in the order received.

Repeat for COM 2, and COM 3 (if installed).

2.14 Digital Annunciation Checkout (Optional)

If interfaced with an annunciation system, verify that all alert messages play at the appropriate time, and that they are silenced by the "ACK" button.

2.15 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 log book entry, FAA Form 337, weight and balance computation and other documentation as required. Sample text for FAA Form 337, and instructions for continuing airworthiness can be found in Appendix F.

Return completed warranty registration application to PS Engineering.

Section III OPERATION

GENERAL INFORMATION

3.1 SCOPE

This section provides detailed operating instructions for the PS Engineering PMA7000M-S, and PMA7000S Audio Selector Panel/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 four sections covering the basic operating areas of the PMA7000M-S systems. They are Audio Selector, Transceiver Selection, Intercom, and Marker Beacon Receiver (7000M-S only).

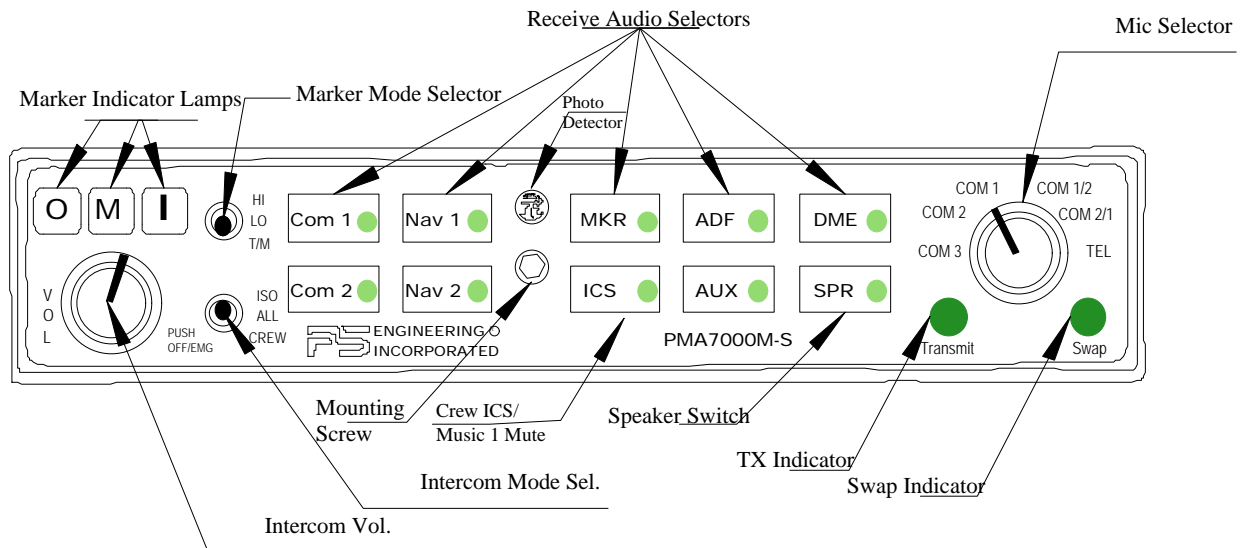


Figure 3-1 PMA7000M-S controls

3.2 Power Switch (EMG-Fail Safe Operation)

Unit power is turned on and off by pushing the volume knob. In the OFF or "EMG" position, the pilot is connected directly to Com 1. This allows communication capability regardless of unit condition. Any time power is removed or turned OFF, the audio selector will be placed in the fail-safe mode.

The power switch also controls the audio selector panel functions, intercom, and marker beacon receiver, (PMA7000M-S only). Unless the mic selector is in Com 3 mode, at least one of the selected audio LEDs will be on (Com 1 or Com 2).

3.3 Microphone Selector (All models)

When the mic selector switch is in the **Com 1** position, both pilot and copilot will be connected to the Com 1 transceiver. Only the person who presses their Push To Talk (PTT), will be heard over the aircraft radio. Turning the rotary switch to the COM 2 position will place pilot and copilot on Com 2.

The PMA7000M-S gives priority to the pilot's PTT. If the copilot is transmitting, and the pilot presses his PTT, the pilot's microphone will be heard over the selected com transmitter.

Turning the mic selector fully counterclockwise places the pilot and copilot on Com 3. Com 3 receive audio is automatically placed in the headset (and speaker if selected). Com 1 and/or Com 2 receiver audio can be selected to monitor those transceivers.

The PMA7000M-S-Series has an automatic selector mode. Audio from the selected transceiver is automatically heard in the headsets and speaker. 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 *always* hear the audio from the transceiver he is transmitting on.

When switching the mic selector rotary switch 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, switching the mic selector will not effect the selection of Com audio.

The "TEL" position, fully CW on the mic selector switch, is the pilot's "hook" switch, when the system is interfaced to an appropriate approved wireless telecommunication system, such as the AirCell system. Placing the mic selector in TEL placed the pilot microphone and headphones on the cellphone. The pilot PTT will switch the pilot mic to the COM 1, and allow continued aircraft communications as well.

The copilot will also be able to transmit on COM 1 with his PTT as well.

NOTE: Placing the mic selector switch in the TEL position will disable pilot and copilot intercom, as the intercom circuit is transferred to the telephone use. In crew or ISO mode, placing the switch in TEL mode removes the passengers access to the telephone.

3.3.1 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, an annunciator in the lower right corner of the unit will illuminate, indicating that the Mic Selector switch position is no longer current. To cancel "Swap Mode," the pilot may either press the yoke mounted switch again, or turn the Mic Selector Switch to the Com that is active.

3.4 Audio Selector (All models)

Receiver audio is selected through two momentary and six latched, push-button, backlit switches. **Com 1** and **Com 2** are the momentary switches.

Because the rotary microphone selector switch controls what transceiver is being heard, the **Com 1** and **Com 2** push-buttons are of the momentary type and do not remain in when selected. This is also part of the "auto" function. You will always hear the audio from the transceiver that is selected for transmit by the rotary mic selector switch.

The users can identify which receivers are selected by noting which of the green switch LEDs are illuminated. Push buttons labeled **Nav 1**, **Nav 2**, **DME**, **MKR** (Marker), **ADF**, **AUX** (auxiliary), and **SPR** (Speaker) are "latched" type switches. When one of these buttons is pressed, it will stay in the "in" position. Press the switch again and it be in the "out" position and remove that receiver from the audio.

3.4.1 Speaker Amplifier

The "**SPR**" in the push-button section stands for speaker. This switch will place all selected audio on the cockpit speaker when this switch is selected. NOTE: Except for the unswitched audio, the speaker amplifier is not active in the "Split Mode."

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

3.4.1.1 Public Address Function

In PMA7000MS versions above “F” serial number for the top board (2nd set of unit serial numbers) a public address function was added. To access this function, a switch is installed to connect the top connector, pin 18, to ground. This places the *pilot* microphone on the speaker output (Pin W) when the PTT is pushed. The copilot can continue to use the selected com radio.

We recommend that the switch transfer the audio from the cockpit speaker to a cabin speaker for public address. This will prevent feedback.

3.4.2 Key “Click”

The PMA7000M-S is equipped with a “click” function that provides an aural feedback to the user in addition to the tactile button push. This sound can be enabled or disabled by simultaneously holding the COM 1 and COM 2 buttons in for at least 5 seconds. Any person hearing the radios will also hear the key click.

Allow at least 20 seconds between turning the key click on and off.

3.5 Split Mode

Turning the rotary switch to COM 1/COM 2 places the PMA7000M-S into "Split Mode." This places the pilot on Com 1 and the copilot on Com 2. 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. Although this mode has limitations (see below) we believe you will find this to be a useful feature.

Switching to Com 2/Com 1 will reverse the “Split Mode” radio selection. The pilot will be on Com 2 and the copilot will be on Com 1.

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.

Note: Split Mode does not turn off other (Nav, ADF, etc.) selected audio to **pilot**. However, the copilot will only hear the selected communications receiver.

3.5.1 Split Mode ICS

In split mode, the pilot and copilot are usually isolated from each other on the intercom, simultaneously using their respective radios. Depressing the **ICS** button in Split Mode will activate VOX intercom between the pilot and copilot positions. This permits intercommunication when desired between the crew. Pressing the ICS button again disables this crew intercom function.

3.6 Intercom Operation

3.6.1 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)*).

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	90010
	Electret	90015
	M87 Dynamic	90020
David Clark	H10-30	90010
	H10-20, H10-40	90015
	H10-13.4	90015
Lightspeed	15K & 20K	90015
Peltor	7003	90010
	7004	90015
Pilot	11-20 & 11-90	90015
Sennheiser		90015
Telex	Airman 750	90015
	AIR3000	90010

3.6.2 Volume Control

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

Adjust the radios and intercom volume for a comfortable listening level for the pilot. Most general aviation headsets today have built-in volume controls; therefore, passenger volume can be adjusted at the headset. If desired, passenger volume level can be adjusted by a screwdriver adjustment at the top of the tray (see figure 2-1).

3.6.2.1 Mono headsets in Stereo Installation

All passenger headsets are connected in parallel. Therefore, if a monaural headset is plugged in to a PMA7000M-S 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.

3.6.3 Intercom Modes

The lower switch on the left side is a 3-position mode switch that allows the pilot to tailor the intercom function to best meet the current cockpit situation. The description of the intercom mode function is valid

only when the unit is not in the "Split" mode. Then, the pilot and copilot intercom is controlled with the ICS button.

ISO: (Up Position): 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 1, while passengers will hear copilot intercom and Entertainment 2. Neither will hear aircraft radio receptions or pilot transmissions.

ALL: (Middle Position): All parties will hear the aircraft radio and intercom. Crew will hear Entertainment 1, passengers will hear Entertainment 2. 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.

CREW (Down Position): 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 PMA7000M-S is in either the COM 1/COM 2, COM 2/COM 1 ("Split Mode"), the pilot and copilot intercom is controlled with the ICS button. The passengers will maintain intercommunications, but never hear aircraft radios.

3.6.3.1 Entertainment Input

The audio selector panel has provisions for two separate entertainment input devices. They operate independently in the PMA7000M-S. The volume control does not affect music level.

While in the ISO (Isolate) mode, the copilot will hear Entertainment 1 while the four passengers will hear Entertainment #2. The pilot will hear entertainment 1, at a muted level. In normal operation, whenever a person speaks, or if the aircraft radio becomes active, the music will automatically mute and then will gradually return to the original listening level when the intercom or radio conversation ceases.

When in the ALL mode, pilot and copilot will hear Entertainment 1 input while all passengers will hear the Entertainment 2 source. 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. However, it is suggested that a switch (DPDT) 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.

3.6.3.2 Soft Mute and Soft Mute inhibit

The Soft Mute feature assures that the aircraft radio transmissions will not be missed due to entertainment playing. When there is radio reception or intercom conversation, the music level is dropped to a low, or background level. When the radio or intercom traffic ceases, the level gradually returns to normal.

The front panel ICS switch controls muting of entertainment source #1 (for pilot and copilot). Pushing this button places the ICS in Karaoke (or sing along) mode, which inhibits the soft mute feature. This allows the music to continue uninterrupted by intercom or radio traffic when cockpit workload is appropriate. Pushing the button again will release the mute inhibit function.

The passenger music, source #2, can be placed in the Karaoke mode if a remote switch is installed in the aircraft. See wiring information for details.

Table 3-2 Intercom Modes

Mode	Pilot Hears	Copilot Hears	Passenger Hears	Telephone	Comments
Isolate	A/C Radios Pilot Sidetone (during radio transmission) Entertainment 1 is Muted	Copilot and passenger intercom Entertainment #1	Passenger and Copilot intercom Entertainment #2	"Phone Booth" mode Pilot has exclusive use of the telephone. In TEL, Pilot & Copilot connected to Com 1 for PTT TX and receive. Others hear Tel if off hook.	This mode allows the pilot to communicate without the others bothered by the conversations. Copilot and passengers can continue to communicate and listen to music
All	Pilot Copilot A/C Radio Passengers Entertainment #1	Copilot Pilot A/C Radio Passengers Entertainment #1	Passengers Pilot Copilot A/C Radio Entertainment #2	All have access to phone through Hook Switch. Pilot access through TEL switch. All hear telephone audio if off hook.	This mode allows all on board to hear radio reception as well as communicate on the intercom. Music and intercom is muted during intercom and radio communications
Crew	Pilot Copilot A/C Radio Entertainment #1	Copilot Pilot A/C Radio Entertainment #1	Passengers Entertainment #2	Pilot and copilot don't have phone access, unless mic sel in TEL. Passengers have phone through Hook Switch, Passengers hear phone audio.	This mode allows the pilot and copilot to concentrate on flying, while the passengers can communicate amongst themselves.

3.7 Telephone Mode

(When interfaced with a Each intercom position has a "hook switch." The pilot's hook switch is the "TEL" mode on the audio panel, the others are discrete switches mounted adjacent to the headset jacks.

When the intercom is in **ALL** mode, the pilot can speak on the phone only if the mic selector switch is in **TEL** position. All intercom positions will hear the telephone conversation. If any passenger places his or her switch into the "off-hook" position all passengers will also be heard on the phone. All will hear selected audio. Com 1 audio is automatically heard in the headsets. The pilot and copilot will have transmit capability on Com 1, simply by using their respective PTT switch.

In **CREW** mode, the pilot and copilot are may use the telephone, with their respective hook switch (the pilot selects TEL on the mic selector). Any passenger who places their switch into the off-hook position will also have access to the phone, and all four passengers will hear the conversation.

In **ISO** intercom mode, when the PMA7000M-S 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, and will transmit on that radio using the PTT. All selected audio is provided. If any other passenger goes "off hook" they will hear the phone.

In all cases, only the pilot (and copilot in **ALL** or **CREW**) will hear the cellphone ring. At that time they can chose to allow a passenger to take the call, or answer the phone.

Note: Because the cellphone uses an intercom circuit, all stations on that circuit will lose intercom capability when the cellphone is in use.

3.8 Marker Beacon (PMA7000M-S)

The optional 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 audio from the Marker Beacon Receiver can be heard by selecting the "MKR" push-button switch. To adjust the volume level, there is a service adjustment located on the top of the unit. See Section 2.5

A three-position switch is used to set the receiver sensitivity and to test the indicator lamps. Use "**HI**" sensitivity initially. This allows you to hear the outer marker beacon about a mile out. Then select the "**LO**" sensitivity to give you a more accurate location of the Outer Marker. The momentary down switch position is marker test, labeled "T/M" and illuminates all three lamps simultaneously to assure the lamps (internal and external) are in working order. TST does not activate MM sense output.

In units with serial numbers above "F" series in the first set of numbers, a marker mute function was added. Pressing the marker mode select down (to "T/M") will cause the marker audio to mute for that beacon. The next beacon received will re-activate the audio.

3.9 Internal Recorder System (Optional)

The Intercom Recording System (referred to here as the IRS) is a digital recording system allowing automatic storage and playback of aircraft radio traffic.

Operating as a continuous loop recorder, (first message received will be the last heard), the recorder has one minute of recording time or up to 16 messages. With its own built in VOX circuit, there are no buttons to press to start recording. The system automatically begins to record the instant the radio becomes active. Only aircraft radio audio in pilots headset is recorded and only the pilot will hear the playback audio.

3.9.1 Operation

Recording is automatic; there is no action required by the pilot. To play back the last recorded message, simply press the momentary switch associated with the IRS. Each additional press of the button will play the preceding recorded message. You must wait for the message to finish playing before accessing the prior message.

To cancel the playback, press and hold the playback button for two seconds. The next time the button is pressed, the next earlier message will be heard.

3.10 Audio Messaging system (Option 1, Option 2, only)

When this option is installed, the PMS7000M-S contains six stored messages. An outside annunciator, such as an Electronics International engine gage system triggers these messages. When there is an announcement, it will be repeated every two seconds until the remote-mounted ACK button is pushed. This stops the played annunciation, until the next announcement is required (the next falling edge).

3.10.1 Concurrent Messages

When a recorded message or audio annunciation is playing, the other audio source is momentarily inhibited. For instance, if an IRS message is being played, the audio annunciation will not begin until the IRS message is finished. Conversely, the IRS recording cannot be played as long as there is an aural alert being played. There is no recording made if playing a recording or annunciation.

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-(or other ICAO agency) certified avionics shop and 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 three (3) years from the date of installation as recorded in aircraft logbook and/or on FAA Form 337. During the first **twelve (12) months** of the three-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 **twenty-four (24) months** of the three-year warranty period, the unit must be returned to PS Engineering, Inc., or an authorized warranty service facility, for no-cost repair.

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 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.

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 unit is covered by a three-year limited warranty. See warranty information. Call PS Engineering, Inc. at (865) 988-9800 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:

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

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 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.

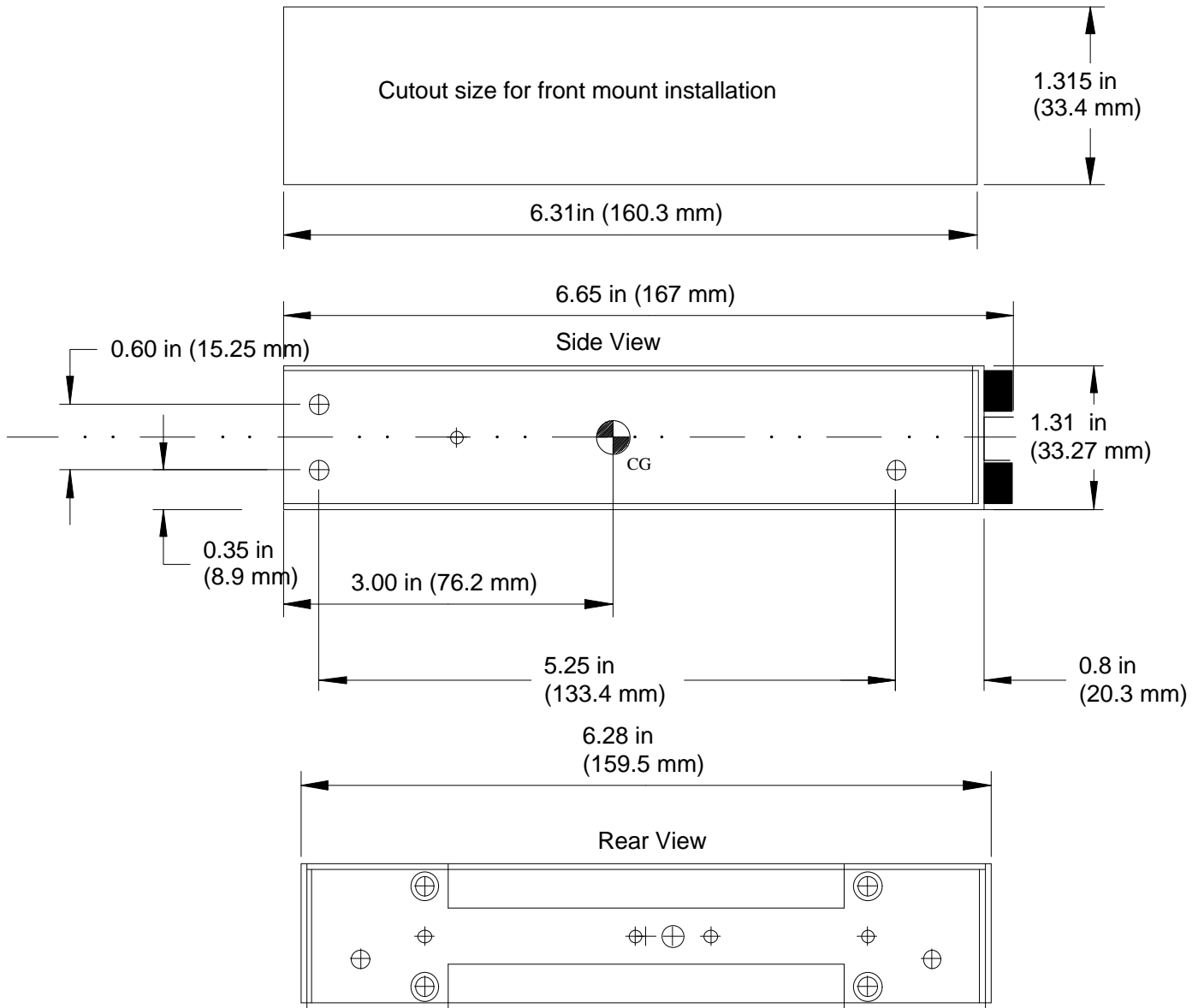
Procedures for Telex PT-200

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

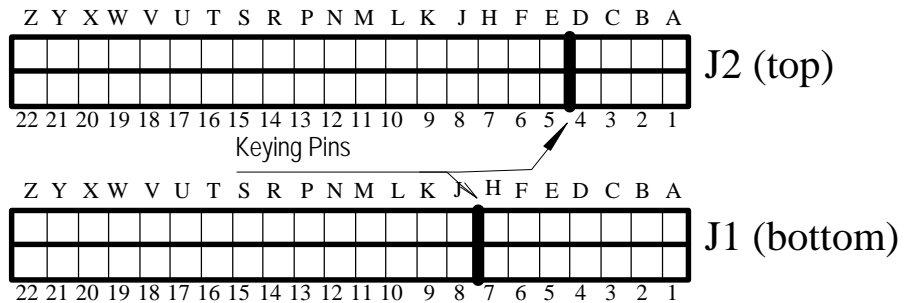
Unscrew the round black plastic cover from the plug jack.
Remove the heat shrink material from the joined black wires.
Solder these two wires to the lug that has a white wire already soldered to it.
Replace the round black plastic cover

Appendix B – Installation Drawing

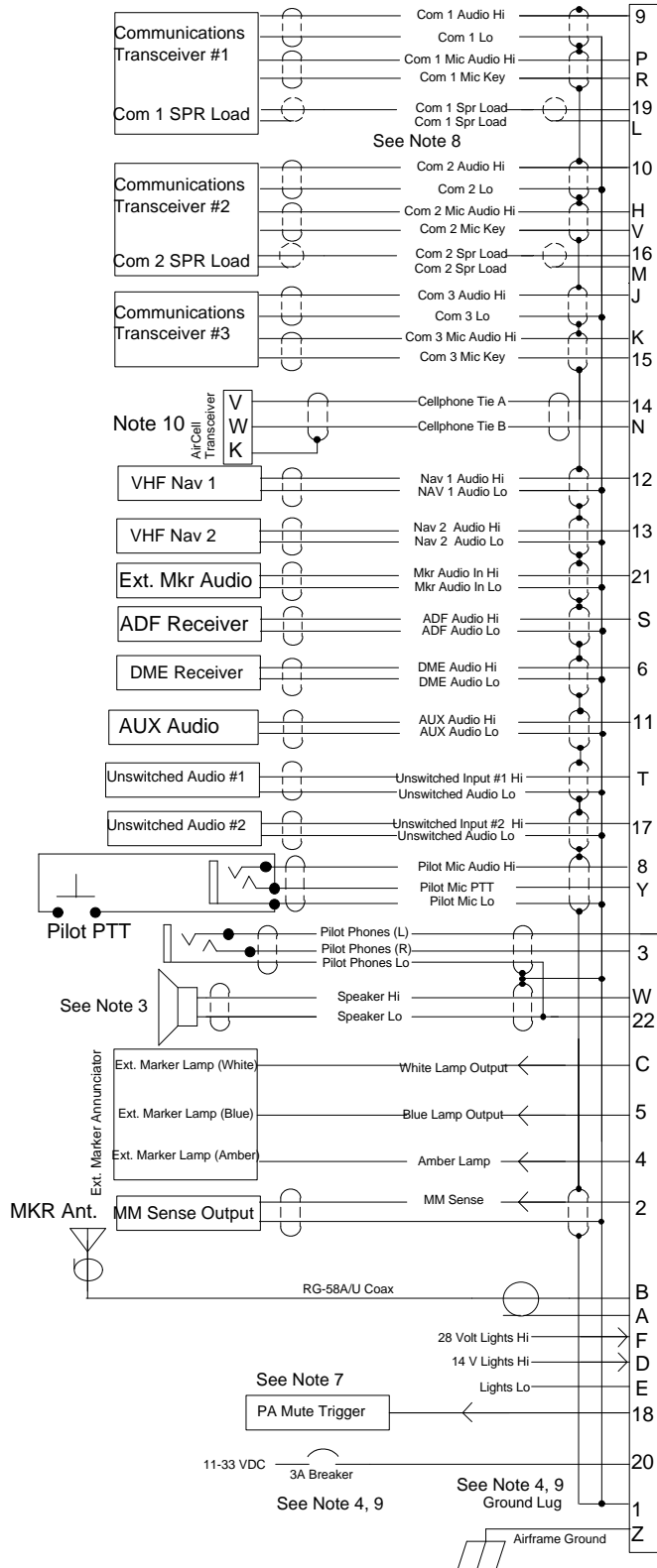


Weight: 1.5 lb with tray and connectors (.68 kg)

Connector viewed from the rear



Appendix C Bottom Connector Interconnect



Bottom Connector, J1

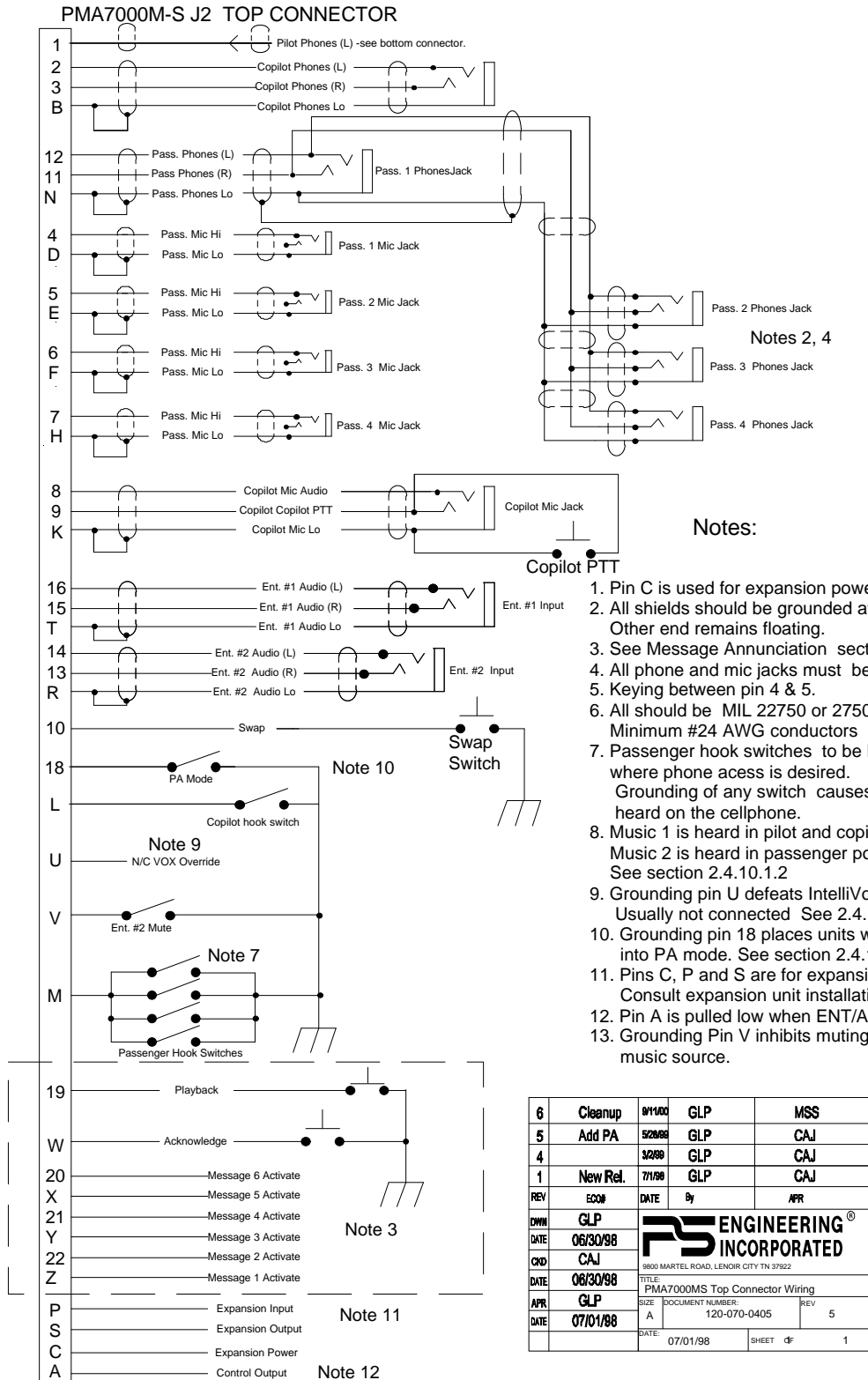
Notes:

1. Pins 7, U, and X not used.
2. All shields should be grounded at audio panel only. other end remains floating.
3. Speaker and Pilot Headphone ground returns MUST be kept separate and connected to pin 22.
4. All Power, and Ground wires must be #18 gage wire Lighting #22 AWG, other wires minimum #24 AWG
5. Pilot mic and headphone jacks must be isolated from ground.
6. Pin 20 connected through a 3 A breaker.
7. PA Mute is a TTL level logic output that is pulled low when PTT active.
8. Speaker loads may be required on some transceivers. Consult manufacturer's information.
9. 28V installations require a 3 A breaker. Retrofit 28V installations may remove dropping resistor and change breaker to 3A.
10. Interface information shown for AirCell phones only. Ground shield at AirCell end only.
11. All shielded wires must be MIL 22750 or 27500.
12. Connect pilot headphone (L) to top connector, Pin 1, using 3-conductor wire.
13. Key pin between pin 7 and 8.
14. External marker audio input to Pin 21 for units without internal receiver.
15. Audio applied to Pins T and 17 is always presented in speaker, pilot and copilot headphones, regardless of SPR switch or PTT.

→ To Pin 1
Top Conn.
See Note 12

REV	5	RDATE	9/15/00	BY	GLP
REV	4	RDATE	3/2/99	BY	GLP
DWN	GLP	PS ENGINEERING® INCORPORATED			
DATE	06/30/98				
CKD	CAJ	8800 MARTEL ROAD, LENOIR CITY TN 37772			
DATE	06/30/98	TITLE: PMA7000 Bottom Connector Wiring			
APR	GLP	SIZE	DOCUMENT NUMBER:	REV	
DATE	07/01/98	A	120-070-0204	4	
		DATE:	07/01/98	SHEET	1 of 1

Appendix D Top Connector Interconnect



6	Cleanup	09/1/00	GLP	MSS
5	Add PA	5/28/99	GLP	CAJ
4		3/2/99	GLP	CAJ
1	New Rel.	7/1/98	GLP	CAJ
REV	ED0#	DATE	By	APR
DWN	GLP			
DATE	06/30/98			
CKD	CAJ			
DATE	06/30/98			
APR	GLP			
DATE	07/01/98			

PS ENGINEERING®	
INCORPORATED	
<small>9800 MARTEL ROAD, LENOIR CITY TN 37522</small>	
TITLE	PMA7000MS Top Connector Wiring
SIZE	A
DOCUMENT NUMBER	120-070-0405
REV	5
DATE	07/01/98
SHEET	1

Appendix E- Instructions for FAA Form 337 and continuing airworthiness

9.1 Instructions for FAA Form 337, Audio Panels

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 PMA7000M-S, you may use the following text as a guide.

Installed audio selector and 6-place intercom, PS Engineering PMA7000M-S, part number 7000 (X) in (Location) at station _____. Installed per *AC43.13-2, Chapter 2, paragraph 23* (Instrument Panel Mounting). Installed per PS Engineering *Installation Operators Manual* p/n 200-070-(XXXX), revision (), dated ().

This unit is FAA-Approved under TSO C50c for audio amplifiers, TSO C35d for Marker Beacon Receivers, and meets appropriate environmental qualifications outlined in RTCA DO-160C 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 aircraft dimmer bus is _____. Power is supplied to the unit through a 3A circuit breaker (type and part number), and total electrical load does not exceed _____% of the electrical system capacity with the PMA7000M-S added.

Aircraft equipment list, weights and balance amended. Compass compensation checked. A copy of the operation instructions, contained in PS Engineering document 200-070-(), revision (), dated (), is placed in the aircraft records. All work accomplished listed on Work Order _____.

9.2 Instructions for Continuing Airworthiness, Audio Panels

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," "fail-safe" and/or "emergency" 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

Appendix F RTCA DO160C (EUROCAE ED-14) Environmental Qualification Form

Audio Selector Panel/Intercom/Marker Beacon Receiver

Part Number: 7000S; 7000M-S

FAA TSO Number: C50c, C35d Class A, JT50 2C35d and JT50 C50c

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 & D1
Low Temperature	4.5.1	-55° C Survival, -15°C Low Operating (A1)
High Temperature	4.5.2	+85°C Survival, +70°C High Short Time Operating
In-flight Loss of Cooling	4.5.4	Not Applicable, no cooling required
Altitude	4.6.1	50,000' unpressurized (D1)
Decompression	4.6.2	Not Applicable
Overpressure	4.6.3	Not Applicable
Temperature variation	5.2	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to Operational test only
Operational	7.2	Equipment tested to Operational test only
Crash Safety	7.3	Equipment tested to Operational test only
Vibration	8.0	Equipment tested to Category M & N
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	Equipment tested to Category Z
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 T
Radio Frequency Emission	21.0	Equipment tested to Category B
Lightning Induced Transient Susceptibility	22.0	Equipment tested to Category K
Lightning Direct Effects	23.0	Category X, not tested
Icing	24.0	Category X, not tested