PS ENGINEERING ® INCORPORATED

9800 Martel Road

Lenoir City, TN 37772

IntelliPAX Intercom Expansion Unit

Unit Part Numbers
11606, 11606R
for use with PMA7000-Series and PAC24

11626 11626R
for use with PM1000-DAP

11636R
for use with PMA8000D

Passenger Intercom System

Installation and Operation Manual

US Patent No. 6,493,450

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Rev	Date	Change
5	11/2005	Corrected Karaoke description in section 3.4
6	10/2006	Corrected PMA4000 interconnect
7	12/2006	Added 11626 for use with PM1000DAP
8	8/2007	Added PM1200 remote installation drawing and picture
9	4/15/08	Added installation kit part numbers
11	11/19/08	Changed PAC24 applicability from 11606 to 11616
12	2/26/09	Change PAC 24 BACK to 11606
13	7/13/09	Refer PAC24 wiring to PAC24 IM for details
14	1/23/12	Added 11636 for PMA8000D

Section I – General Information

1.1   Introduction

The **IntelliPAX** is a panel mounted, multi-place intercom expansion unit used to add up to six extra stations to an intercom system. Please read this manual completely before installation to minimize the risk of damage to the unit and to become familiar with all the features.

1.2   Scope

This manual contains installation and operational instructions for the following PS Engineering units:

Model	Description	Part Number
IntelliPAX	intercom expansion unit for PMA7000 and PAC24 Series	11606
IntelliPAX Remote	blind-mount expansion unit for PMA7000- and PAC24 Series	11606R
IntelliPAX Remote	blind-mount intercom expansion unit	11616R
IntelliPAX	intercom expansion unit for PM1000 Dual (DAP)	11626
IntelliPAX Remote	blind-mount intercom expansion unit for PM1000DAP	11626R
IntelliPAX Remote	**blind- mount intercom expansion unit for PMA8000E**	**11636R**

1.3   Description

The **IntelliPAX** (11606) is an intercom expansion unit with intercom volume control for the passengers. This unit is designed to work in combination with the PMA7000-Series audio panel. It contains PS Engineering's proprietary intercom protocol, *IntelliVox*®. This system uses digital processing on each of the six individual microphones to eliminate manual squelch adjustments. Because of the automatic squelch, the unit can be blind mounted, and the 11606R is designed to be remote-mounted, with the volume control removed. The volume control is factory set for optimum level. Part numbers, 11616 and 11616R units are designed to be used with the PM1000II (11922)
and specifically modified PM1200 intercoms to provide up to 6 additional passenger stations.

The Part Number 11626 (11626R) is specifically designed for use with the PM1000-DAP, allowing entertainment in the expansion unit, while not available in the crew portion.

The part number "R" version is designed for remote, or blind mounting.

The part number 11636R is for expanding the PMA8000E system to 6 or 12 places. This unit is only available as a remote unit.

1.4   Approval Basis **NONE**

None. It is the installer's responsibility to determine the applicable approval basis for this installation. This unit is not designed for use in any flight crew situations, and has no effect on any critical aircraft systems. There is no significant weight or electrical load presented to the aircraft.

1.5   Specifications

Input power:	from main unit
Headphone Impedance:	150-1000 Ω typical
Audio Distortion:	<10% @ 35 mW into 150 Ω load
Aircraft Radio Impedance:	1000 Ω typical
3 dB Mic Frequency Response:	350 Hz — 6000 Hz
3 dB Music Frequency Response:	200 Hz to 15 kHz
Unit weight:	7.2 Ounces (0.20 kg)
Dimensions:	1.25" H x 3.00" W x 5.50" D (3.2 x 6.6 x 14 cm)

1.6   Equipment required but not supplied

A. Headphones, 150Ω stereo, up to six as required per expansion unit
B. Microphones, up to six, as required
C. Interconnect wiring
D. Intercom, PMA8000E, PAC24, or PMA7000, primary unit
E. Headphone and microphone jacks (as required)

Section II – Installation

2.1 General Information

The **IntelliPAX** comes with all necessary hardware for a typical installation. The unit is installed either in the panel (11606, 11616, 11626) or mounted blindly (11606R, 11616R or 11626R). If panel mounted, it can be installed near the main unit, or near the passengers. If blind mounted, it can be mounted nearly anywhere. The 11606R and 11616R volume control for the passengers is factory set for a balanced output, but can be field adjusted through the holes in the side of the unit.

Installation of the **IntelliPAX**, using the available wiring and hardware supplied, does not require special tools or knowledge other than described in 14 CFR 65.81(b) and FAA Advisory Circular 43.13-2B

It is the installer's responsibility to determine the approval basis for this installation. An FAA Form 337, or other approval <u>may</u> be required. See Appendix B for example of FAA Form 337.

2.2 Unpacking and preliminary inspection

The **IntelliPAX** was carefully inspected mechanically and thoroughly tested electronically before shipment. It should be free of electrical or cosmetic defect.

Upon receipt, verify that the parts kit includes the following:

<p align="center">250-250-0000 IntelliPAX Panel Mount Installation Kit</p>

<p align="center">250-250-0001 IntelliPAX Remote Mount Installation Kit</p>

		250-250-0000			250-250-0001			
Part Number	Description	11606	11616	11626	11606R	11616R	11626R	11636R
475-442-0002	#4-40 Machine screws, black	2	2	2				
625-003-0001	Soft Touch Knob "D" shaft	1	1	1				
575-250-0001	IntelliPAX Faceplate	1	1	1				
425-025-0009	25 pin Sub-D connector shell	1	1	1	1	1	1	
425-020-5089	Male Crimp Pins	25	25	25	25	25	25	
625-025-0001	Connector hood	1	1	1	1	1	1	
475-002-0002	Connector Thumbscrews	2	2	2	2	2	2	

Also, a PM1000II w/Crew faceplate, P/N 575-002-0002 is included with the intercom expansion units, Part Numbers 11616, 11616R, 11626, 11626R

2.3   Equipment installation procedures

2 ea. 0.125

NOT TO SCALE
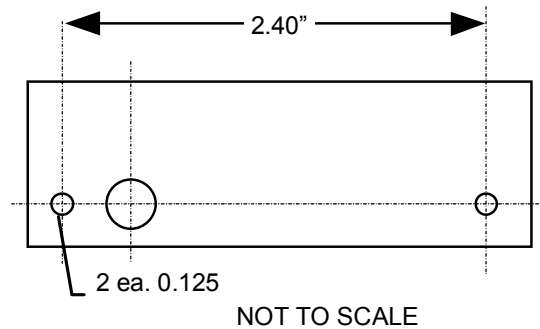
For panel mounted installation (11606, 11616, 11626)
1. Using the template, drill three holes in the instrument panel in a location convenient to the pilot or passengers position(s).
2. Insert the **IntelliPAX** from behind the instrument panel, aligning the holes for the knobs.
3. Place the aluminum faceplate over the knob shaft and secure, using the two # 4-40 round head screws provided.
4. Install the volume knob over the volume control shafts.

Blind mounting: (11606R, 11616R, 11626R, 11606-SA 11636R)
1. Install the unit on an avionics shelf or other appropriate structure.
2. If desired, the volume can be adjusted at installation, there are two holes in the side of the unit, one for left, and another for right channel.
3. If desired, a remote switch (not included) can be installed to override the SoftMute™ function. This should be located convenient to the passengers.

2.4   Cable harness wiring

To complete the installation, a wire harness must be made as shown in Appendix C. PS Engineering can make a custom-tailored wiring harness for the installer. All harnesses use Mil-spec quality components with professional techniques, and are fully tested before shipment. Contact PS Engineering for more information. The IntelliPAX connects to the main unit through a 4- or 5-conductor, shielded cable.

2.4.1 Electrical Noise Issues

WARNING: You must use separate shielded cables for the microphone and headphone jacks. Combining these two wires WILL cause loud oscillations and degrade the intercom function. The oscillation is caused by the cross-coupling between the large headphone signal and the small microphone signal. The resulting feedback is a high-pitched squeal that varies with the volume controls.

Shielding can protect the system from radiated noise (rotating beacon, power supplies, etc.). However, installation combinations occur where minor interference is possible. The **IntelliPAX** was designed in an interference -protected chassis and has internal filter capacitors on all input lines.

Ground loop noise occurs when there are two different return paths for the same signal, such as airframe and ground return wire. Large cyclic loads such as strobes, inverters, etc., can inject audible signals onto the airframe return path. Follow the wiring diagram very carefully to help insure a minimum of ground loop potential. Radiated signals can be a factor when low level mic signals are bundled with current carrying power wires. Keep these cables separated.

Insulating washers are **required** on all mic and headphone jacks to isolate them from aircraft ground.

2.4.2 Power Requirements

The **IntelliPAX** was designed to work with the main intercom unit. No other power is required.

The Stand Alone unit is connected to a 1A breaker to the avionics bus (2A for dual).

2.4.3 Interconnection with main unit

Interface between the IntelliPAX and the main intercom is through a 4-wire shielded cable.

Function		PMA7000	PM1200	PM1000 Series	PAC24	PMA8000E Expansion 1	PMA8000E Expansion 2
Expansion Power		C	8	15	a	J2 39	J2 41
Expansion Ground		R	4	2	c	J2 36	J2 38
Audio Input (rt) Audio Input (lt)		S		16	23	**J1** 41 **J1** 40	**J1** 41 **J1** 40
Audio Output		P	3	3	22	J2 35	J2 37

On the PMA8000D, the expansion is connected to the copilot's audio panel, except for paralleling pin 3 to the pilot audio panel. The PMA8000D can support two expansion units, for up to 12 passenger stations.

2.4.4 Auxiliary Inputs

An entertainment device can be connected to the **IntelliPAX**. Install a 1/8" music jack convenient to the passengers to connect the stereo entertainment device into the system. A "Soft Mute" system is installed in the **IntelliPAX** that will mute the music during conversation on the local intercom. Radio traffic or conversation on the main intercom <u>will not</u> mute the music.

A second, monaural input is provided for other purposes, such as public address cabin briefing, or providing radio interface for cases where the intercom does not have radio on the expansion bus (PM1000D for example).

NOTE:
The **PM1000D** is not compatible with a music input, due to the specialized interface nature. If this is used, <u>connect the entertainment input to the IntelliPAX</u> (11626) alone.

A soft mute inhibit switch (not included) can be installed between IntelliPAX connector pins 12 and 24. Closing this switch places the IntelliPAX into Karoake mode.

WARNING: Local oscillators and other internal signals from CD or radio equipment can cause undesired interference with VHF navigation and communication equipment. Before takeoff, operate the entertainment device to determine if there is any adverse effect on aircraft systems. If any unusual operation is noted in flight, immediately switch the entertainment device off.

2.5 Post Installation Checkout

After wiring is complete, verify power is ONLY on pin 1 of the connector, and ground on pin 14 (with main unit operating. Failure to do so will cause serious internal damage and void PS Engineering's warranty. With all units plugged in and operating, verify that all active stations can communicate on the intercom, and that any music sources are present, and the SoftMute inhibit control operates correctly (if installed).

Section III – OPERATION

3.1 Power

Switching on the intercom or audio panel automatically activates the IntelliPAX unit. The Stand Alone unit is active when power is applied to the Avionics Bus.

3.2 Adjusting the Volume

For the P/N 11606R, operating with a PMA7000B or copilot's PMA8000D, the audio panel's Passenger volume control (PASS) affects the expansion intercom volume.

The 11616 volume control only affects the headsets connected to the IntelliPAX directly, and not the main unit. The Remote (11616R) versions have a service adjustable volume, which is accessible through a pair of openings on the side of the unit. These are 20-turn potentiometers, so may require many turns to make a difference. The volume is set to maximum at the factory. Users can reduce the volume at individual stereo headsets.

When combined with a PAC24, the expansion volume should be set near minimum, and the copilot knob on the PAC24 should be used to adjust the volume.

3.3 IntelliVox® *Squelch*

No adjustment of the *IntelliVox®* squelch control is required or possible. Through independent processors on each microphone, the ambient noise appearing in all microphones is constantly being sampled. Non-voice signals are blocked. When someone speaks, only their microphone circuit opens, placing their voice on the intercom.

For best performance, the headset microphone **must** be placed within ¼ inch of your lips, preferably against them. 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.

PS Engineering, Inc. recommends installation of a Microphone Muff Kit from Oregon Aero (1-800-888-6910). This will optimize *IntelliVox®* performance.

3.4 Music Mute

If a remote switch is installed between pins 12 and 24, the "SoftMute" will be enabled. When the switch is closed, the music will mute whenever there is intercom conversation in the IntelliPAX. Audio coming from the main unit, such as radio or intercom, will not mute the IntelliPAX music.

Opening the switch places the unit music, "Karaoke Mode," and music muting is inhibited.

For the 11606 and PMA7000-Series, intercom audio in the expansion unit *will not* mute music in the audio panel.

For the PMA8000D, the music sources connected to the copilot's audio panel are fed into the expansion unit, and if the expansion unit music is also playing, BOTH sources will be heard. Refer to the PMA8000D installation manual for more information.

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 a FAA- 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 harness must be used for the warranty to be valid.

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

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

4.2   Factory Service

The **IntelliPAX** is covered by a one-year limited warranty. See warranty information.

Contact PS Engineering, Inc. at (865) 988-9800 or www.ps-engineering.com/support.shtml before you return the unit. This will allow the service technician to provide any other suggestions for identifying the problem and recommend possible solutions.

After discussing the problem with the technician and you obtain a Return Authorization Number, ship product via an approved carrier (do not ship U.S. Mail) to:

PS Engineering, Inc.
Customer Service Department
9800 Martel Road
Lenoir City, TN 37772
(865) 988-9800 FAX   (865) 988-6619

Appendix A Instructions for FAA Form 337 and Airworthiness

5.1   Sample text for FAA Form 337

One method of airworthiness approval is through an FAA Form 337, *Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance)* In the case of the IntelliPAX part number 116( ), you may use the following text as a guide.

Installed intercom expansion unit, PS Engineering IntelliPAX, part number 11616 in (*location*) at station _____. Installed per AC43.13-2B, Chapter 2, Installed per PS Engineering *Installation Operators Manual* p/n 200-250-xxxx, revision X, dated ( ).

Interface to existing audio system in accordance with installation manual and in compliance with practices listed in *AC43.13-2B*, Chapter 2. All wires are Mil-Spec 22759 or 27500. No connection to the aircraft dimmer bus is required. No additional connection to aircraft power is made.

Aircraft equipment list, weight and balance amended. Compass compensation checked. A copy of the operation instructions, contained in PS Engineering document 200-250-( ), revision ( ), Dated ( ), is placed in the aircraft records. All work accomplished listed on Work Order_____.

5.2   Instructions for Continued Airworthiness:

Section	Item	Information
1	Introduction	Installation of passenger 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 main unit into "OFF," the fail-safe mode. This allows normal 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	Removal: Remove Volume knob (if equipped (11606, 11616), 2 ea. then #4-40 black machine screws mounting the unit. Remove unit from behind panel. Place metal faceplate in a safe area. Installation: Align the volume knob shaft (if equipped, 11606, 11616) and the mounting holes with the panel and front plate. Secure using 2 ea. #4-40 black screws, provided.
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 B Installation
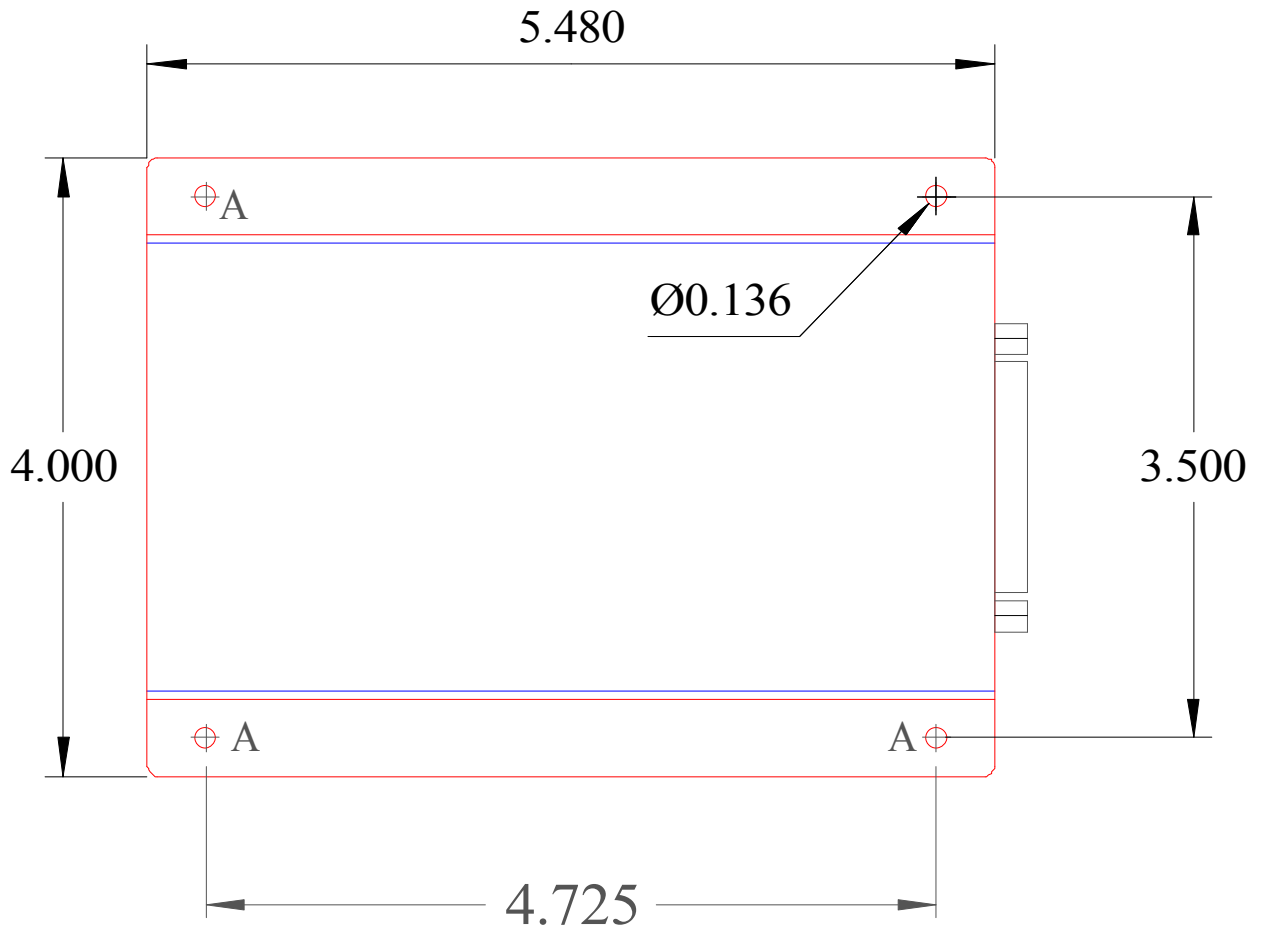
Figure 6-1 Remote unit outline

Appendix C Wiring Information
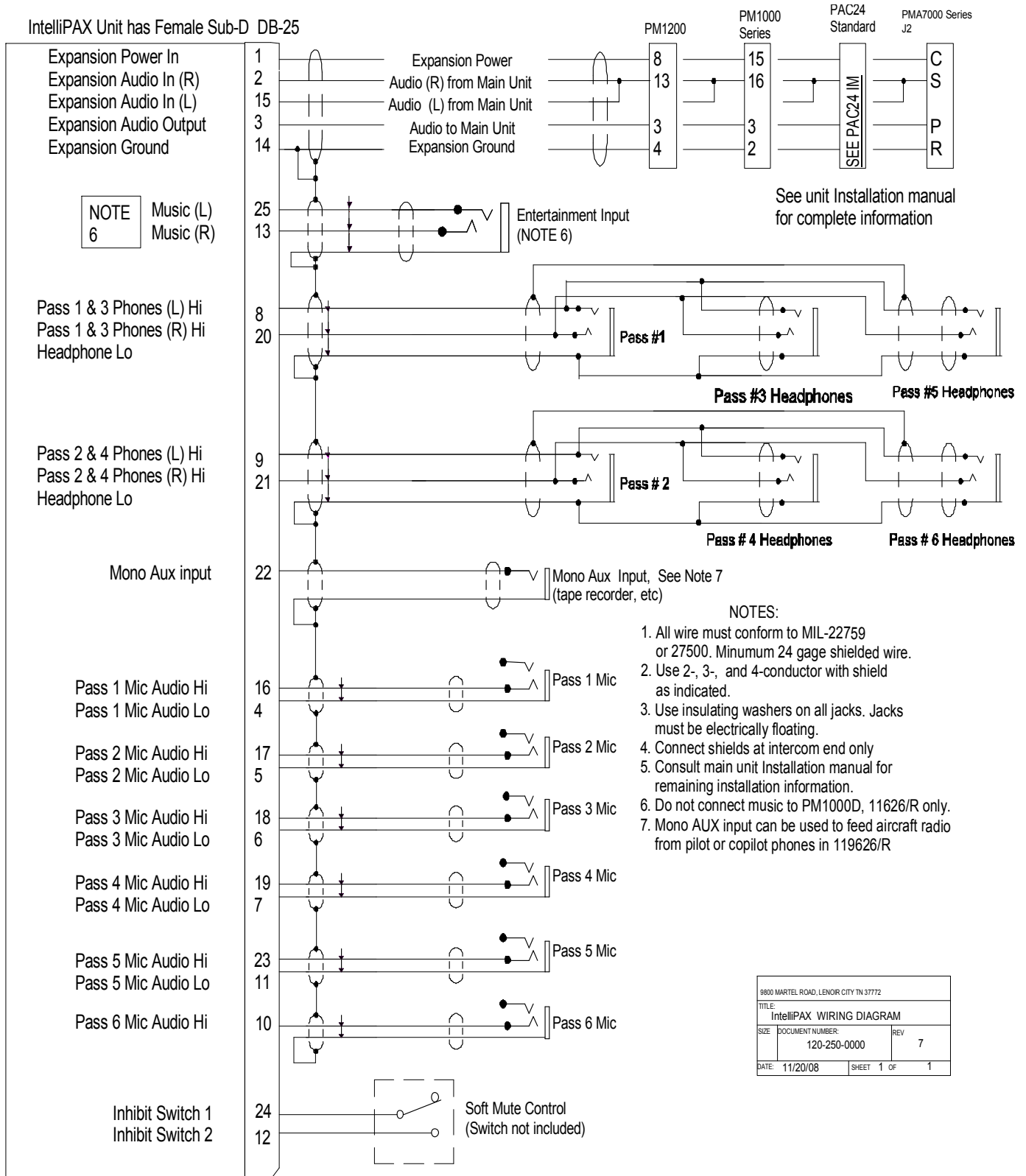
IntelliPAX Unit has Female Sub-D DB-25

		PM1200	PM1000 Series	PAC24 Standard	PMA7000 Series J2

Expansion Power In — 1 — Expansion Power — 8 — 15 — C
Expansion Audio In (R) — 2 — Audio (R) from Main Unit — 13 — 16 — S
Expansion Audio In (L) — 15 — Audio (L) from Main Unit — — — P
Expansion Audio Output — 3 — Audio to Main Unit — 3 — 3 — R
Expansion Ground — 14 — Expansion Ground — 4 — 2 —

SEE PAC24 IM

See unit Installation manual
for complete information

NOTE 6   Music (L) — 25
         Music (R) — 13

Entertainment Input (NOTE 6)

Pass 1 & 3 Phones (L) Hi — 8
Pass 1 & 3 Phones (R) Hi — 20
Headphone Lo

Pass #1
Pass #3 Headphones
Pass #5 Headphones

Pass 2 & 4 Phones (L) Hi — 9
Pass 2 & 4 Phones (R) Hi — 21
Headphone Lo

Pass # 2
Pass # 4 Headphones
Pass # 6 Headphones

Mono Aux input — 22
Mono Aux Input, See Note 7
(tape recorder, etc)

NOTES:
1. All wire must conform to MIL-22759 or 27500. Minumum 24 gage shielded wire.
2. Use 2-, 3-, and 4-conductor with shield as indicated.
3. Use insulating washers on all jacks. Jacks must be electrically floating.
4. Connect shields at intercom end only
5. Consult main unit Installation manual for remaining installation information.
6. Do not connect music to PM1000D, 11626/R only.
7. Mono AUX input can be used to feed aircraft radio from pilot or copilot phones in 119626/R

Pass 1 Mic Audio Hi — 16 — Pass 1 Mic
Pass 1 Mic Audio Lo — 4

Pass 2 Mic Audio Hi — 17 — Pass 2 Mic
Pass 2 Mic Audio Lo — 5

Pass 3 Mic Audio Hi — 18 — Pass 3 Mic
Pass 3 Mic Audio Lo — 6

Pass 4 Mic Audio Hi — 19 — Pass 4 Mic
Pass 4 Mic Audio Lo — 7

Pass 5 Mic Audio Hi — 23 — Pass 5 Mic
Pass 5 Mic Audio Lo — 11

Pass 6 Mic Audio Hi — 10 — Pass 6 Mic

9800 MARTEL ROAD, LENOIR CITY TN 37772
TITLE: IntelliPAX WIRING DIAGRAM
SIZE | DOCUMENT NUMBER: 120-250-0000 | REV 7
DATE: 11/20/08 | SHEET 1 OF 1

Inhibit Switch 1 — 24 — Soft Mute Control
Inhibit Switch 2 — 12 — (Switch not included)

Figure 7-1 IntelliPAX Wiring (11606, 11606R, 11616, 11616R, 11626, 11626R)

PMA8000E Dual Audio Panel Expansion
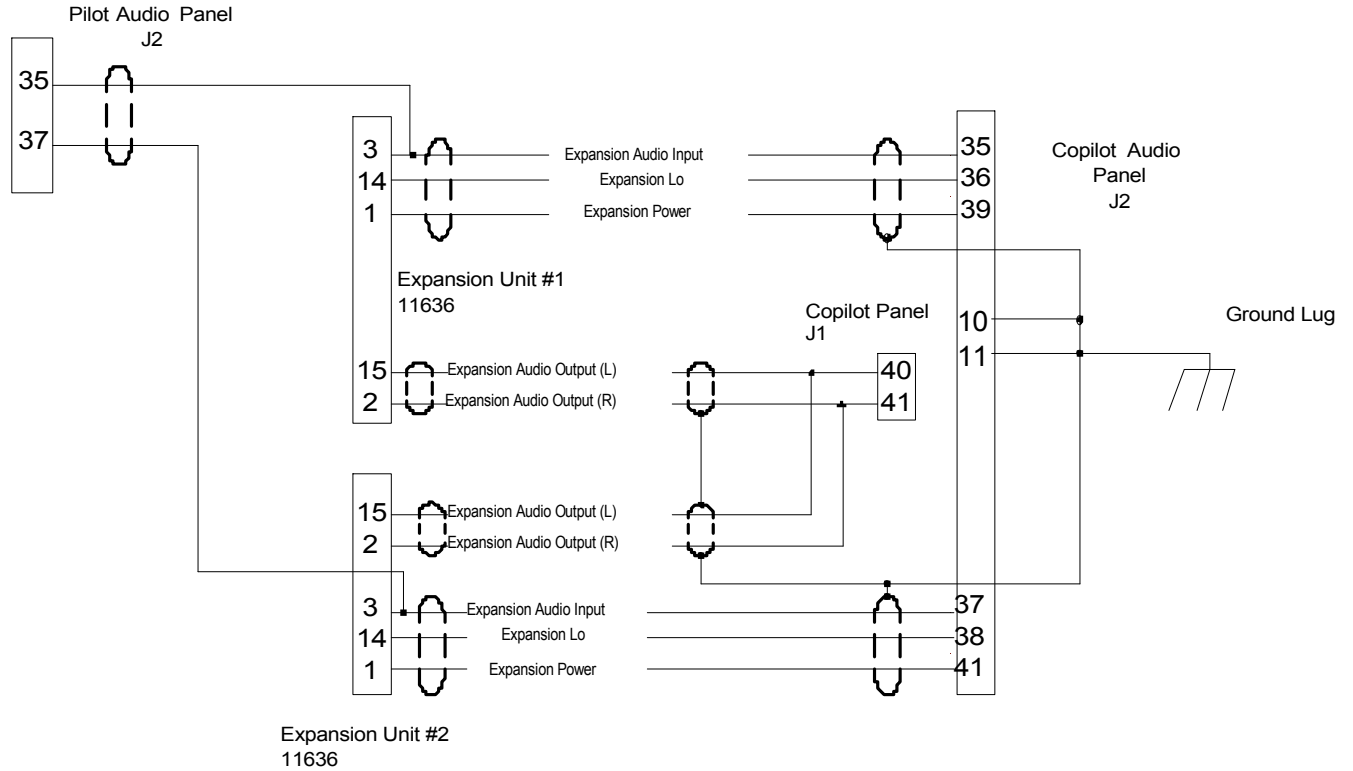
See PMA8000D Installation Manual, Document 200-890-0304 for complete information