PS ENGINEERING INCORPORATED®

Sound Quality. Sound Engineering.

PM1000II

FAA-Approved
4-Place, Panel Mounted Intercom

Operator's and Installation Manual

Part Number 11920 (with Crew) and 11922 (without Crew)
FAA-TSO C50c

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NOTICE: 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 **PM1000*II***, is an FAA-TSO approved, panel mounted, 4-place intercom system (ICS). Please read this manual completely before installation to minimize the risk of damage to the unit and to become familiar with all the features.

PM1000II, p/n 11920, Front Panel

1.2 Scope

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

Model	Description	Part Number
PM1000*II*	4-place intercom system w/Pilot ISO	11922
PM1000*II*	Same as above w/internal crew	11920

1.3 Description

The **PM1000*II*** is a 4-place, panel mounted intercom with individual volume and squelch controls for the pilot and copilot. The copilot's squelch control adjusts the trip level of the copilot and passengers.

A front panel mode switch allows the pilot to select multiple intercom configurations:

"**ISO**" mode isolates the pilot from the intercom and connects to the aircraft radio. The passengers can continue to communicate with each other and listen to entertainment without distracting the pilot. They do not hear radio communications.

"**ALL**" mode places all headsets on a party line. Each one hears aircraft radio, entertainment and can use the intercom.

"CREW" (11920 only) allows the pilot and copilot positions to hear the aircraft radios and use the intercom, while the rear passengers can have their own intercom conversation without disturbing the crew. This also activates music 2 input.

The **PM1000*II*** has an automatic fail-safe interconnect to the aircraft radio. If power to the intercom is disrupted, an internal relay will connect the pilot's headset to the aircraft radio. This allows continuous radio communications. Note: The copilot will no longer hear aircraft radio when power is removed.

The 2-color LED shows green when power is on and blue during radio transmissions. This functions as a stuck mic indicator.

A music input allows the pilot, copilot and passengers the option to listen to music during flight. During intercom or radio activity, music is automatically muted. When the activity ceases, the Soft Mute circuit will gradually return the music.

The "ISO" mode provides uninterrupted aircraft radio communications for the Pilot. Because the pilot's intercom volume control does not affect the aircraft radio volume, it is possible to select various balances of volume level between the ICS and the aircraft radio while in the ALL mode. Reducing the intercom volume, the pilot places the aircraft radio in the foreground while the ICS is in the background.

Both pilot and copilot have transmit capabilities over the radio. The **PM1000*II*** allows only the person who presses their PTT to be heard over the aircraft radio. If both pilot and copilot press the PTT at the same time, the copilot will override (Ideally suited for training environments).

1.4 Approval Basis

The **PM1000*II***, part numbers 11920 and 11922 are FAA-approved under TSO-C50c.

1.5 Specifications

Input power:	13.8 - 27.5 Volts DC
Current Drain:	< 250 mA (Externally fused at 1 Amp)
Headphone Impedance:	150-1000 ohms typical
Audio Distortion:	<10% @ 75 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:	12 Ounces (0.342 kg)
Dimensions:	1.25" H x 2.60" W x 5.50" D (3.2 x 6.6 x 14 cm)
Environmental and technical qualifications:	RTCA DO-160B/DO-170
Temperature	-20ºC to +55ºC
Altitude	50,000 ft.

1.6 Equipment required but not supplied

A.Headphones, 150Ω monaural, up to four as required

B.Microphones, up to four, as required

C.Interconnect wiring

D.Circuit Breaker—1 Amp.

1.7 License Requirements

None

Section 2 Installation

2.1 General Information

The **PM1000*II*** comes with all necessary hardware for installation.

Installation of the **PM1000*II***, using the available wiring and hardware supplied, does not require special tools or knowledge other than described in FAA Advisory Circular 43.13-2B. It is the installer's responsibility to determine the approval basis for this installation. An FAA From 337, or other approval *may* be required. See Appendix B for example of FAA Form 337.

2.2 Unpacking and inspection

The **PM1000*II*** 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:

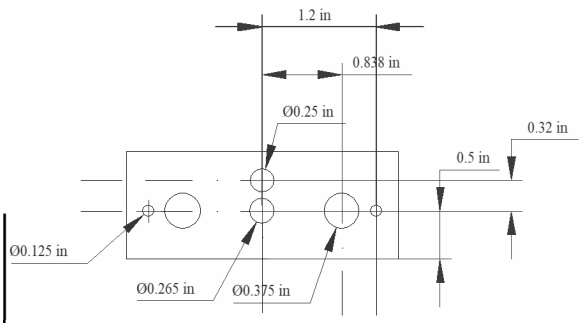
Part Number	Description	Quantity
475-442-0002	#4-40 Machine screws, black	2
625-002-0004	Concentric inner knobs	2
625-002-0001 625-010-0002	Outer knob Cap with pointer	2
425-025-0095	25 pin Sub-d connector shell	1
425-020-5089	Male Pins– Crimp	25
625-025-0001	Connector hood	1
575-002-0004 575-002-0002	Reversible aluminum face plate Reversible face plate w/crew	11922 11920
11910	4-place mono jack kit ,(incl. phones and mic jack, insulating washers and 1/8" music jack)	1
202-123-0001	Pilot's Guide	1
122-102-0001	Drill Template	1

2.3 Equipment installation procedures

1.Using the template, drill six holes in the instrument panel in a location convenient to the pilot position.

2.Insert the **PM1000*II*** from behind the instrument panel, aligning the holes for the knobs, LED, and switch.

3.Place the aluminum face-plate over the knob shafts and secure, using the two # 4-40 round head screws provided.



PM1000II Hole spacing (Not to scale)

4.Install the knobs over the volume and squelch control shafts.

Note, an optional mounting plate for 2¼" round instrument hole is available. See page 7.

2.4 Cable harness wiring

To complete the installation, a wire harness must be made as shown in Appendix D.

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.

If the aircraft already has pilot and copilot headset jacks installed, you may re-use them. Remove and discard all wires from the copilot headset jacks. You may use the existing pilot headset jacks as the Auxiliary Aircraft Radio Headset Jacks, but they should be moved to a new location to avoid confusion with the pilot's headphone jacks. In the event the intercom has to be removed for any reason, these jacks provide access to the aircraft radio system.

To connect intercom into the aircraft audio system, parallel the appropriate set of cables from the intercom to the Auxiliary Aircraft Radio Headset Jacks. Finally, install new headset jacks into the aircraft and connect them directly to the appropriate pins of the **PM1000*II***. See the wiring diagram for all details of the wire harness interconnects.

NOTE: Auxiliary microphone and headset jacks are **required** for a complete installation. These provide troubleshooting and a back-up access to the aircraft radios.

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.

Due to the variety of the radio equipment found in today's general aviation aircraft, there is the potential of both radiated and conducted noise interference. The **PM1000*II*** has a specially designed power supply to reduce conducted electrical noise on the power bus of the aircraft by at least 50dB. Although this is a very large amount of attenuation, it does not eliminate all noise when the amount is excessive. There must be at least 12 Volts DC present at the **PM1000*II*** for the power supply to work within its designed regulation. Otherwise, it will not be able to attenuate noise properly.

Shielding can protect the system from radiated noise (rotating beacon, electric gyros, switching power supplies, etc.). However, installation combinations can occur where minor interference is possible. The **PM1000*II*** 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. The use of a conductor instead of a shield for ground return eliminates these ground loop paths.

2.4.2 Power Requirements

The **PM1000*II*** was designed to work with either 12/28 volt DC negative ground systems. The **PM1000*II*** must be externally protected with a one ampere (1A) circuit breaker or fuse.

2.4.3 Entertainment Input

Entertainment devices can be connected to the **PM1000*II***. Install 1/8" jacks convenient the pilot to connect the entertainment device into the system. A "Soft Mute" system is installed in the **PM1000*II*** that will mute the music during intercom or radio activity.

The 11920 has two entertainment inputs.

In the ALL or ISO modes, Music #1 is heard by everyone (except by the pilot in ISO mode). In the CREW mode, pilot and copilot will hear Music #1 while the passengers will hear entertainment #2.

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.

Note: Use the low level (or line) output from any music device to connect to the PM1000II. Maximum input level is 2 V peak-to-peak.
DO NOT USE SPEAKER OUTPUT.
These levels will cause internal damage.

2.4.4 External PTT hook-up

Part of the installation includes the installation of PTT (Push To Talk) switches that allow radio transmissions from pilot and copilot positions.

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 Appendix A) 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 may be required. (See Appendix A)

2.5 Post installation checkout

After wiring is complete, verify power is ONLY on pin 14 of the connector, and airframe ground on pin 1. Failure to do so will cause internal damage and void PS Engineering's warranty.

1. Apply power to the aircraft and avionics.
2. Plug headsets into the pilot, copilot and passenger positions.
3. Verify that the pilot position can transmit and receive with the **PM1000*II*** in the OFF position (left hand volume knob fully counter-clockwise).
4. Rotate the pilot volume clockwise, about half way. Verify that the Pwr/Xmt light comes on, and shows green. If the LED is red, stop testing and trouble-shoot the microphone PTT installation.

5. Verify that the pilot can transmit and receive on the com transceivers.
6. Verify that the LED in the intercom changes from green to red when a microphone is keyed.
7. Verify proper intercom operation for pilot, copilot and passengers. For more information, consult Section III.
8. Verify proper transmit and receive operation on the copilot position, noting that the copilot PTT switch allows proper transmission on the selected transceiver.
9. Verify proper Intercom system operation in the ALL, ISO And CREW (if equipped) modes.
10. Verify that the intercom 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.

Section III OPERATION

With the installation complete, turn the **PM1000*II*** on by rotating pilot's volume control. This also engages the automatic fail-safe system. The pilot's volume control does not control the volume of the aircraft radio, allowing an additional degree of aircraft radio listening flexibility.

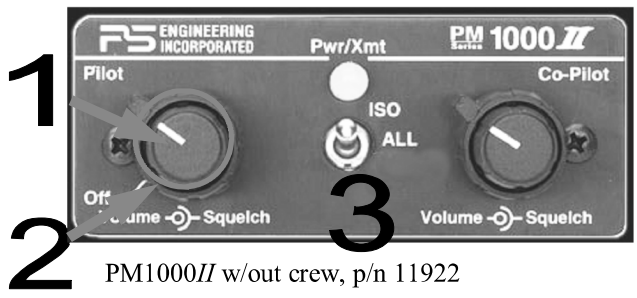
3.1 Adjusting The Volume (1)

The pilot's volume control knob adjusts the loudness of the intercom and music for the pilot's headset only. It has no effect on aircraft radio volume level. The copilot's volume control adjusts the volume for the copilot.

In the 11920 units, the volume level for both passengers can be adjusted by a screwdriver adjusted potentiometer located on the left hand side of the intercom as viewed from the front. It is possible to adjust the overall output power to the passenger headsets by changing this potentiometer. Rotating the potentiometer counterclockwise increases the passenger volume.

3.2 Squelch Control (2)

The **PM1000*II*** provides individual VOX circuits for



PM1000*II* w/out crew, p/n 11922

the pilot and copilot. The ability to adjust the trip level

PM1000*II* w/crew, p/n 11920

of these VOX circuits (squelch control) allows the use of dissimilar headsets without the frustration of clipping the first syllables. The **PM1000*II*** has three squelch circuits, one for the pilot, copilot, and one for the passengers. With individual VOX circuits, background noise is dramatically reduced.

With the engine running, set the squelch control knob by slowly rotating the squelch control knob clockwise until you no longer hear the background noise in the earphones. When the microphone is positioned properly near the lips, normal speech levels should open the channel. When you have stopped talking, there is a delay of about one second before the channel closes. This prevents squelch closure between words, and helps eliminates choppy intercom conversations.

3.3 Mode Select (3)

The center switch is a three position mode control that allows the pilot to tailor the intercom function to suit flight conditions. Regardless of configuration, the pilot will always hear the aircraft radio. NOTE: If there is a power failure to the **PM1000*II***, or if the power switch is turned off, the copilot will not hear the aircraft radio. Only the pilot is connected directly to the aircraft radio.

ISO (Up Position): The pilot is isolated from the intercom and is connected only to the aircraft radios. He will hear the aircraft radio reception (and sidetone during radio transmissions). The pilot will not hear anything when he speaks into the mic on intercom. Copilot and passengers will hear themselves and music but not the aircraft radio traffic.

ALL (Middle position): All parties will hear the aircraft radio, intercom, and music. However, during any ICS or radio communications, the music volume automatically mutes. The music volume increases gradually back to the original level after communications have been completed.

CREW (Down Position) (ONLY version with crew, part number 11920): Pilot and copilot are connected on one intercom channel while the passengers are on a separate and independent channel. The pilot and copilot are connected to the aircraft radio and may listen to Music #1. Passengers can continue to communicate with themselves without disturbing the pilot and copilot and may listen to Music #2.

Section 4
Warranty and Service

4.1 Warranty

In order for the factory warranty to be valid, the installations in a certified aircraft must be accomplished by an FAA- certified avionics shop and authorized PS Engineering dealer. If the unit is being installed by 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. The customer is responsible for return shipment costs.

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 which may vary from state to state. Some states do not allow the exclusion of limitation of incidental or consequential damages, so the above limitation or exclusions may not apply to you.

4.2 Factory Service

The **PM1000*II*** is covered by a one-year limited warranty. See warranty information.

The unit is covered by a one-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 Road

Lenoir City, TN 37772

(865) 988-9800 FAX (865) 988-6619.

NOTE:

PS Engineering is not responsible for units shipped US Mail.

If no method of payment is provided, the units will be returned COD.

Appendix A
PTT 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. When the PTT is between the intercom and the headset, the intercom function will not work until the PTT switch is depressed. A simple modification can be performed to allow proper intercom operation. NOTE: This mod does not alter normal operation. The following are sample procedures for common PTT switches. Contact the PTT manufacturer if you require more information.

Procedures for the David Clark PTT

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

Procedures for the Telex PT-200

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

Procedures for the Telex PT-300

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

Appendix B
Instructions for FAA Form 337

It is up to the installer to determine if the installation is a major or minor aircraft alteration. (Refer to AC 20-177). One possible method of airworthiness approval is through an FAA Form 337, *Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance)* In the case of the PM1000*II* , you may use the following text as a guide.

Installed 4-place intercom, PS Engineering PM1000II, part number (xxxxx) in (*location*) at station _____. Installed per AC43.13-2B, Chapter 2,. Installed per PS Engineering *Installation Operators Manual* p/n 200-123-0003, revision 1, dated _____.

This unit is FAA-Approved under TSO C50c

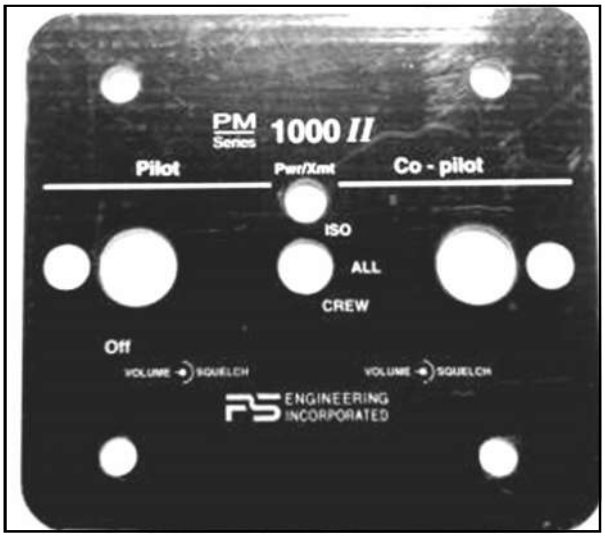
for audio amplifiers, and meets environmental tests outlined in RTCA DO-170B as appropriate or this aircraft.

Interface to existing aircraft radios in accordance with installation manual and in compliance with practices listed in *AC43.13-2B*, Chapter 2. All wires are Mil-Spec 22759 or 27500. No connection to the aircraft dimmer bus is required. Power is supplied to the unit through a 1A circuit breaker (type and part number), and total electrical load does not exceed _____% of the electrical system capacity with the PM1000II added.

Aircraft equipment list, weight and balance amended. Compass compensation checked. A copy of the operation instructions, contained in PS Engineering document 202-123-0001, revision _, Dated:_____, is placed in the aircraft records. All work accomplished listed on Work Order_____.

Appendix C
Instructions for Continuing Airworthiness

The **PM1000*II*** is considered an "on-condition" maintenance item. It is checked prior to each flight during normal operation. There are no additional considerations for continuing airworthiness other than the practices detailed in AC 43.13-1A, Chapter 11. This includes, inspecting the unit to be sure it is securely fastened in its location, and that the wiring harness is not chafed or pinched, and remains secure. All panel jacks should be checked at each periodic inspection to ensure that they are tight and not in contact with other items behind the instrument panel.



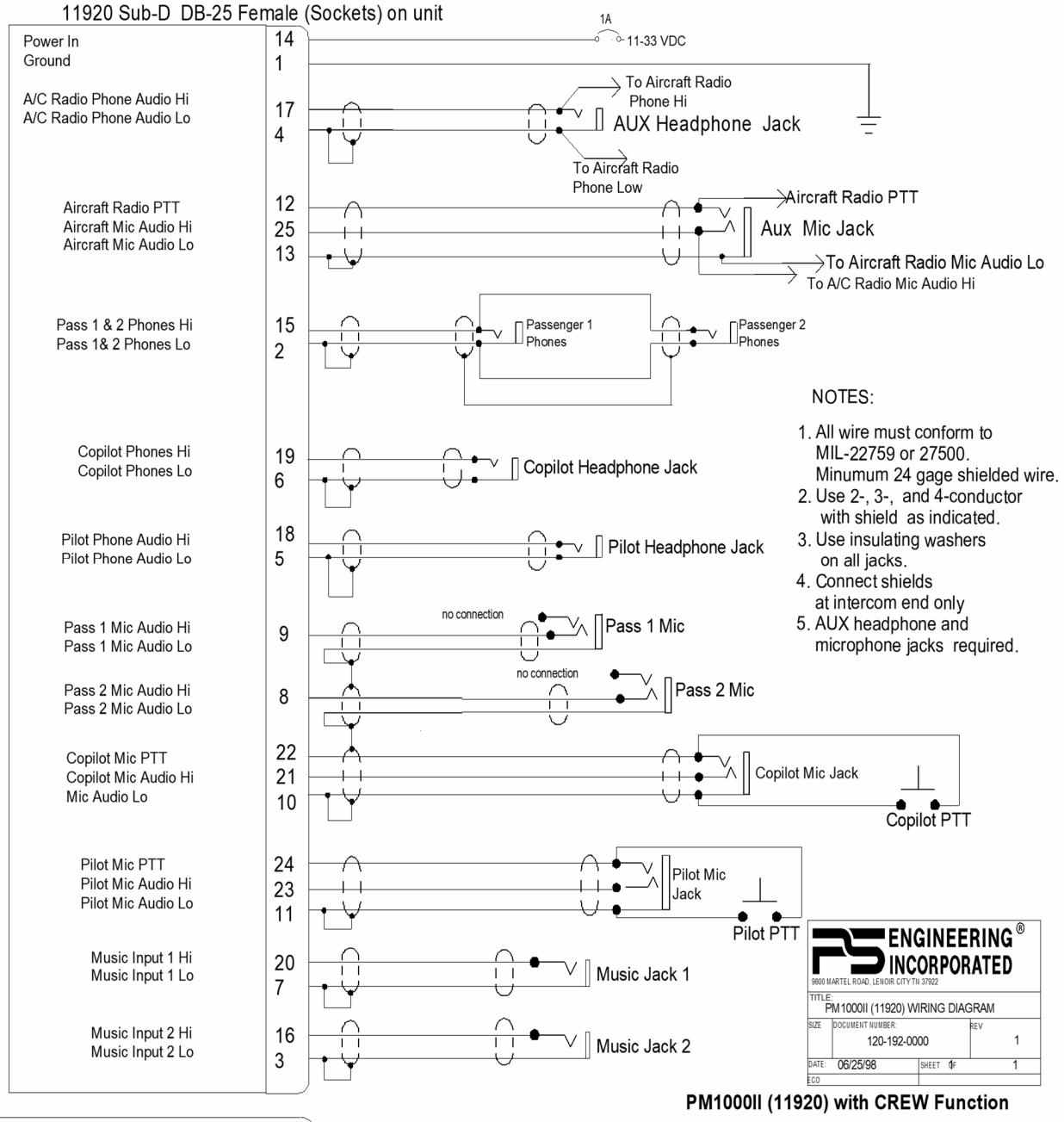
Optional:

Mounting plate for standard 2 1/4-inch instrument mounting hole (clock).

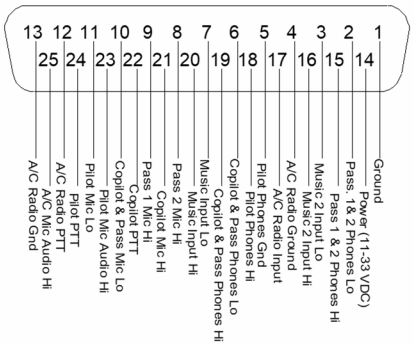
P/N 575-002-0006 with crew (shown) for 11920

P/N 575-002-0008 *without* crew for 11922

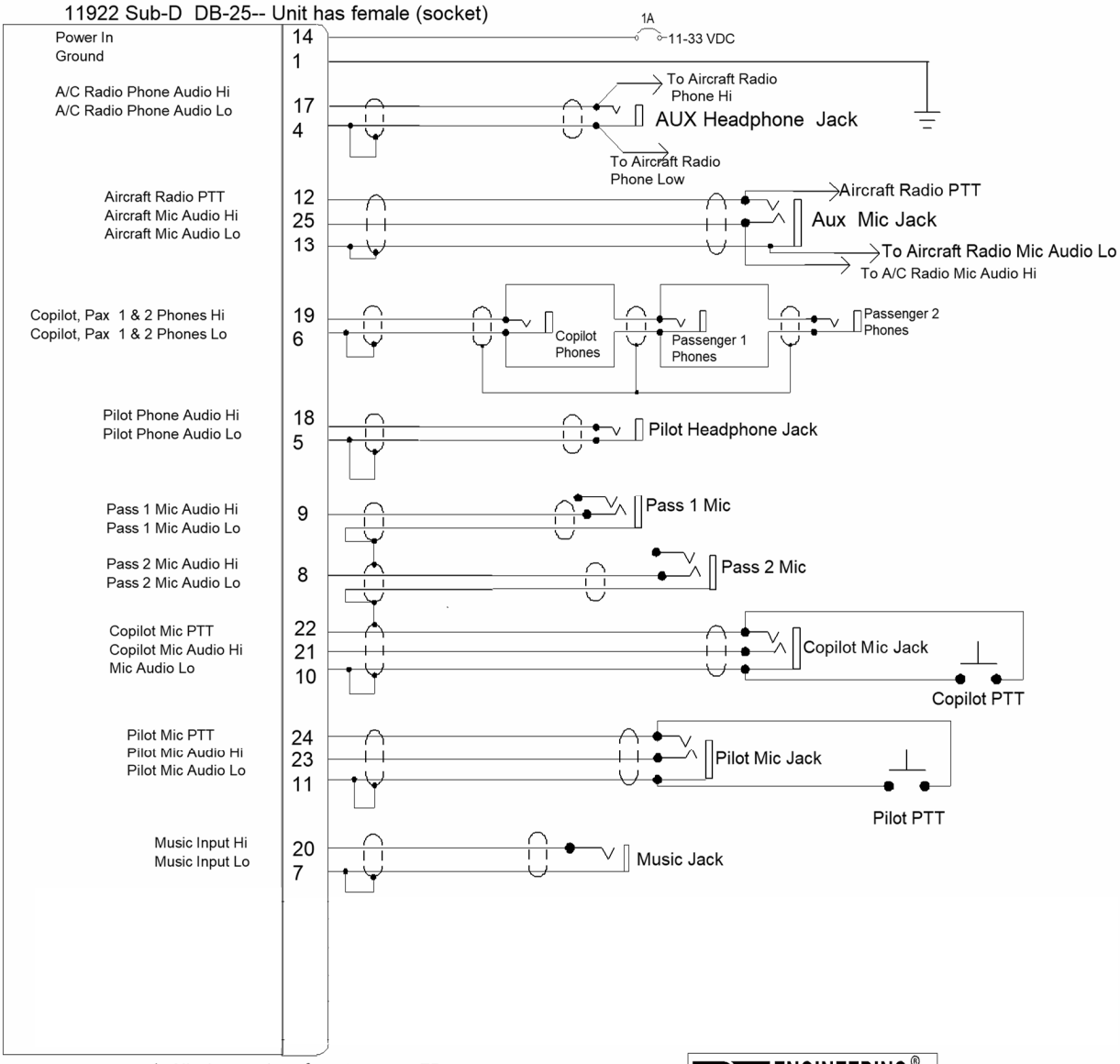
PM1000*II* **with** crew, p/n **11920**



PM1000II (11920) with CREW Function



11920 Connector layout, viewed from rear



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.
4. Connect shields at intercom end only
5. AUX headphone and microphone jacks are required.

ENGINEERING INCORPORATED
9800 MARTEL ROAD, LENOIR CITY TN 37772

TITLE: PM1000II (11922) WIRING DIAGRAM		
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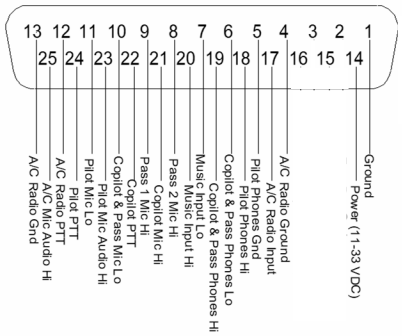
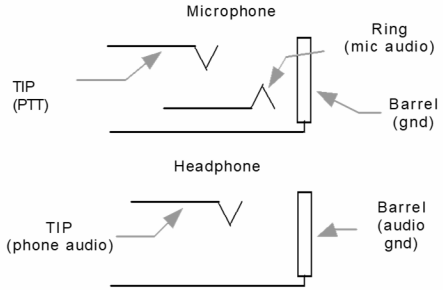
11922, PM1000II without CREW



11922 Connector layout, viewed from rear



Monaural Headset Jack Details