PS ENGINEERING® INCORPORATED

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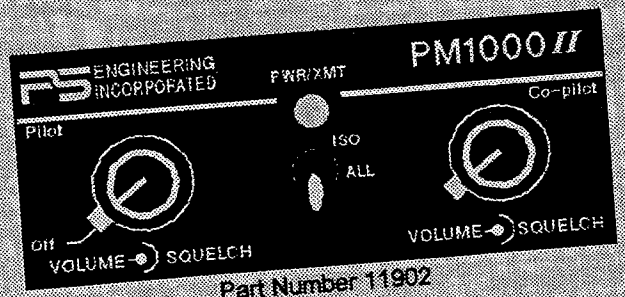
PM1000*II*

Operator's And Installation Manual

Four Place Panel Mount
Aircraft Intercom



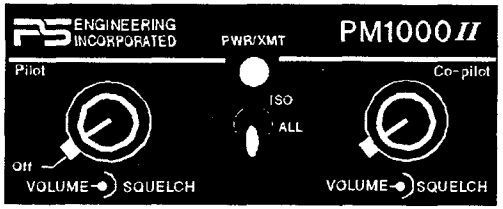
Part Number 11902

Document No. 01039402
13-April-98

Panel Mount Intercom

Introduction

Congratulations on your purchase of a PS Engineering product. Please read this manual completely before installation to minimize the risk of damage to the instrument and increase the effectiveness of its use.



Front Panel View of the **PM1000*II***

Description

The **PM1000*II***, part #11902, is a panel mounted, 4-place intercom (expandable to 6 places with the Expansion Unit #11918). The **PM1000*II*** has individual volume and squelch controls for the pilot and copilot. The copilot's squelch control adjusts the trip level of the copilot and passengers. If the expansion unit (part #11918) is used, the **PM1000*II*** is then installed as a two place intercom while the four passengers are connected to the expansion unit. They will share one volume and squelch control located on the unit itself.

A multi-position mode switch allows the pilot to select one of three possible configurations. The **"ALL"** mode places all headsets on a party line, hearing aircraft radio, entertainment and intercom. The **"ISO"** mode isolates the pilot from the intercom and is connected to the aircraft radio. The passengers can continue to communicate with each other and listen to entertainment without distracting the pilot.

The optional **"CREW"** mode provides an independent channel for the Pilot and Copilot, while the passengers are isolated by themselves. This mode can be obtained either internally or externally, depending on the number of stations required. This mode can be obtained internally by choosing the 11908 (PM1000II with built in Crew and digital recorder), or by installing the expansion unit with the 11902, part #11918. *(See Page 4 "Mode Select" for more details)*

The **PM1000*II*** has an automatic fail-safe interconnect to the aircraft radio. If power to the intercom is disrupted , an internal relay connects the pilot's headset to the aircraft radio, allowing continuous radio communications. Note: The copilot will not hear aircraft radio when power is removed.

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

Provisions for an entertainment input are provided allowing the pilot, copilot and passengers the option to listen to music during flight. During ICS (**Inter Com** System) or aircraft radio activity, this music will automatically mute to allow communications without distraction. When the activity ceases, the *Soft Mute* circuit will gradually return the music to the original listening volume.

If the PMA1000*II* part number 11908 or 11902 and 11918 expansion unit is installed, two entertainment devices can be played at the same time while in the CREW mode. Auxiliary input #1 will be distributed to the pilot and copilot while Auxiliary input #2 will be heard by the passengers. The auxiliary input #2 is muted while in the Crew Mode during ICS activity, but mute can be inhibited (*Karoake Mode*) by an additional installed switch.

Since the degree of importance of the aircraft radio varies during various phases of flight, the PM1000*II* can be tailored to meet these dynamic conditions. The "ISO" mode provides distraction-free 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 or CREW 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 radio transmit capability. The **PM1000*II*** allows only the audio of the person who presses their PTT to be transmitted 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.) For pilot priority, the unit can be placed in the fail safe mode.

An optional Intercom Recording System (IRS) is also available. *(See Appendix C)*

Specifications

- Input power: 12-28 Volts DC
- Current Drain: < 250 mA Externally fused at 1 Amp
- Headphone Impedance: 150-1000 ohms Typical
- Audio Distortion: <10% @75mW into 150 ohm load
- Aircraft Radio Impedance: 1000 Ohms Typical
- 3 dB Mic Frequency Response: 350 Hz-6000 Hz
- 3 dB Music Frequency Response: 200 Hz -- 15 kHz
- Net weight: 12 Ounces
- Dimensions: 1.25" H X 3.00" W X 5.50" D

The **PM1000*II*** comes with all necessary hardware for installation. When you buy part #11918 expansion unit, a new face plate will be included that has the word CREW on it.

A custom wire harness can be tailor-made to your specifications by the factory. Call for more details.

Installation

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 envelope includes the following:

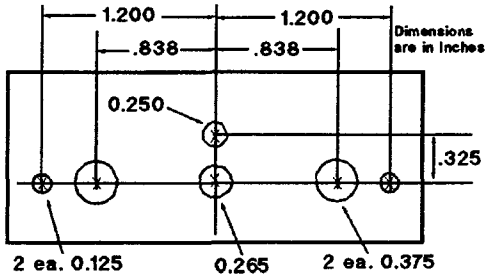
A. 2 ea. #4-40 Black round head machine screws

B. An aluminum, reversible, (vertical and horizontal) faceplate

C. Two sets of dual concentric knobs (4 knobs)

D. One 25 pin Sub-D male connector with hood

E. 4 sets of jacks with insulation washers



F. 1 ea. music jack

Hole placement

1. Drill six holes for the unit on the instrument panel in a location convenient to the pilot position(s). A hole placement diagram and template is included.

2. Once the holes have been drilled, insert the **PM1000*II*** from behind the instrument panel through the four holes for the knobs, LED, and switch.

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

4. To complete the installation, a wire harness must be made and routed to the following locations as depicted on the back of this manual.

CAUTION: Use the wiring diagram that matches the intercom you are installing. Make note of the model number of the intercom and select the correct wiring diagram.

WARNING: You *must* use separate shielded cables for the microphone and headphone jacks. Combining these two wires **WILL** cause loud oscillations and prevent the use of the intercom. The oscillation is caused by the coupling between the large headphone signal with the small mic signal. The result is feedback heard as a high pitch squeal that varies with the volume adjustment.

If the aircraft already has pilot and copilot headset jacks installed, you may re-use them. Remove all wires from the copilot headset jacks and discard them. You may use the existing pilot headset jacks as the Auxiliary Aircraft Radio Headset of Jacks, but it is strongly suggested they are moved to a new location so as not to be confused with the pilot's headphone jacks. These Auxiliary Aircraft Radio Headset Jacks will be used for; initial installation of the intercom to the aircraft radio, trouble shooting, and if the intercom has to be removed for any reason, access to the aircraft radio system.

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

Electrical Noise Issues

Due to the variety of radio equipment often found in today's general aviation aircraft, there is the potential for 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 may not eliminate all noise when the amount is excessive. There must be at least 13.8 Volts DC present at the **PM1000*II*** for the power supply to work in its designed regulation, otherwise, it may not be able to adequately attenuate noise.

Shielding can reduce or prevent radiated noise (rotating beacon, electric gyros, switching power supplies, etc.) However, installation combinations can occur wherein minor interference is possible. The **PM1000*II*** was designed in a RFI hardened chassis and has internal bypass capacitors on all input lines.

Ground loop noise occurs when there are two ground paths for the same signal, i.e. airframe and ground return wire. Large cyclic loads such as strobes, inverters, etc., can inject audible signals onto the airframe. Follow the wire 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.

It is very important that insulation washers are installed isolating the ground return path from the aircraft chassis on all microphone and headphone jacks.

Power Requirements

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

Side Tone

If the aircraft radio does not have sidetone (the ability to hear your transmissions during radio transmissions) the PM1000II can be modified to provide sidetone. Diodes D11 and D22 must be removed. Refer to Service Aid 98-02 for details.

Auxiliary Input

An entertainment device (CD player, cassette player, etc.) can be connected to the **PM1000*II*.** An 1/8" monaural connector can be installed in a convenient location to connect an entertainment device into the system. The entertainment will be automatically muted when the ICS or aircraft radio becomes active. The *Soft Mute* feature will slowly return the music to full volume when the ICS or radio is inactive.

If you have install the 11908, or the 11902 and 11918 expansion unit, a second auxiliary input can be connected to the

system. The distribution of the two auxiliary inputs is as follows: Auxiliary #1 will be heard by all passengers while in the ISO or ALL mode. While in the CREW mode, auxiliary #2 will be heard only by the passengers while the Pilot and Copilot can continue to listen to auxiliary #1.

DO NOT USE SPEAKER OUTPUT LEVELS. This will cause damage. Use only the low level output of the entertainment device to the PM1000*II*. Maximum signal input is 1 Volt Peak to Peak.

External PTT Hook Up

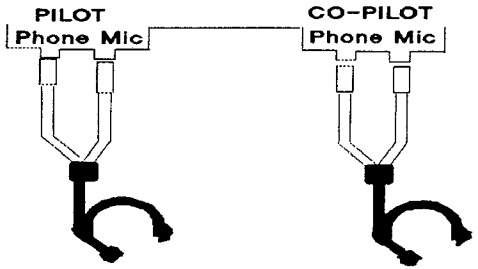
Part of the installation includes the installation of PTT (Push To Talk) switches that allows the use of your aircraft radio for radio transmissions.

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

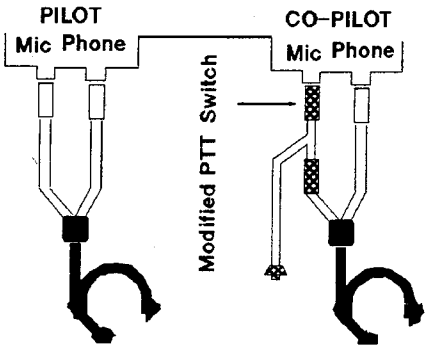
Simply install the plugs from the headset into the aircraft headphone jacks. Then use the yoke mounted PTT to transmit.



No other action is required.

CASE II

Built in PTT only on the pilot side only

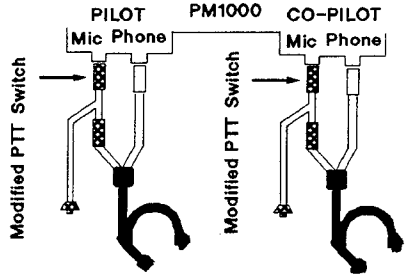


This configuration requires a *modified* external PTT switch plugged into the copilot's mic jack. *(See Appendix D)* When the copilot's PTT is depressed, this activates an internal relay that switches the mic audio to the aircraft radio from the pilot to the copilot.

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 Appendix D)*

OPERATING INSTRUCTIONS

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.

Adjusting The Volume

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 and passenger 1 & 2 intercom level, but does not effect aircraft radio volume. If model #11908 has been purchased, the copilot volume control will not change the passenger's volume level. The passenger's volume level must be adjusted by the volume level control located on their headset.

The amount of overall total audio output level for both passengers can be adjusted by a screwdriver potentiometer located on the right side of the intercom (as viewed from front). This level is set at the factory at the maximum undistorted output level. It is possible to either increase or decrease the overall output power to the passenger headsets by changing this potentiometer.

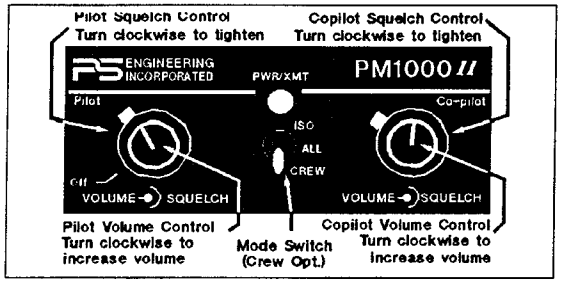
Adjusting The Squelch Control

Because the **PM1000*II*** provides separate VOX circuits for the pilot and copilot mics, the number of mics open at any one time is minimized. This dramatically reduces the amount of background noise in the intercom. The ability to adjust the trip level of these VOX circuits (squelch control) allows the use of dissimilar headsets. This helps eliminate clipping the first syllables.

The standard **PM1000*II*** has two squelch circuits, one each for the pilot and copilot. With the optional expansion unit (11918)

there are three more VOX circuits for the additional headset capability.

To adjust the trip level: Set the squelch with the engine running by slowly rotating the squelch control knob clockwise until you no longer hear noise in the earphones. When the microphone is positioned properly (1/2" from your lips), normal speech levels should open the channel. When you have stopped talking, there is a delay of about 1 second before the channel closes, preventing closure between words. This eliminates choppy communications.



Front Panel View of the **PM1000*II***

Mode Select

The center switch is a three position mode switch that allows the pilot to tailor the intercom function to best meet the his needs. **Regardless of configuration, the pilot will always hear the aircraft radio.** **NOTE**: If there is a power failure to the **PM1000II**, 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 radio. He will hear the aircraft radio reception and his sidetone during radio transmissions. Co-pilot and passengers will hear themselves and music, but not the aircraft radio receptions or transmissions.

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): (This function is available with the 11908, or when installing the 11902 and the 11918). Pilot and copilot are connected on one 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 auxiliary input #1. Passengers can continue to communicate with themselves without interrupting the Crew and may listen to auxiliary input #2.

Adjustment of Entertainment Mute Trip Level

The entertainment mute trip level determines at what volume level the aircraft radio reception must be before the music mutes. This is adjusted at the factory. If your entertainment appears to be always muted (music stays at a constant low level even when the ICS is being used) the mute trigger level must be adjusted. The mute trigger level is changed by turning the screw driver potentiometer located at the rear of the intercom. This is a twenty turn pot, so you may need to turn the screw several rotations before the adjustment is complete.

Mode	Pilot Hears	Copilot Hears	Passenger Hears	Comments
Isolate	A/C Radio sidetone only during xmt.	Copilot Passengers Aux #1	Passengers Copilot Aux #1	This mode allows the pilot to communicate with the ground without the copilot or the passengers hearing the conversation. Copilot and passengers can continue to communicate with themselves.
All	Pilot A/C Radio Copilot Passengers Aux #1	Copilot A/C Radio Pilot Passengers Aux #1	Passengers A/C Radio Pilot Copilot Aux #1	This mode allows the pilot, the copilot and passengers to communicate with each other. All will hear aircraft radio. Music is muted (lowered in level) during intercom or radio communications. Music and intercom are disabled during radio transmissions.
Crew (Optional)	Pilot Copilot A/C Radio Aux #1	Pilot Copilot A/C Radio Aux #1	Passengers Aux #2	This mode is available with the 11908, or through the use of the 11918. While in the Crew mode, the pilot and copilot are on one channel while the passengers are on a separate channel. Using 11918 music source input #2 will mute during intercom communications.

Warranty

PS Engineering, Inc. warrants this product to be free from defect in material and workmanship for one year from the date of installation. If required by regulation, an FAA Form 337 must accompany the registration card for this warranty to be in effect.

During the warranty period, the unit must be returned to **PS Engineering, Inc.** and, at its option, will be repaired or replaced at no charge. **IMPORTANT:** Any labor charges associated with the removal of product or related trouble shooting by any firm other than **PS Engineering, Inc.** will not be covered.

This warranty is not transferable. Any implied warranties expire at the expiration date of this warranty. WE 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.

Service

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

Call **PS Engineering, Inc.** at (423) 988-9800 and ask for a technician, he may be able to diagnose the problem and offer a solution without the need for returning the unit. If the unit does need servicing, ship product in UPS approved packaging to:

PS Engineering, Inc.
Service Department
9800 Martel Road
Lenoir City, TN 37772
(423) 988-9800 – FAX (423) 988-6619

Appendix A

Built-in CREW Function

With the purchase of part number 11908 (Built in CREW function and digital recorder) the PM1000II will have the CREW function installed inside the intercom without the need of the expansion modules. This feature provides the same capability that is described in Mode Select Section on page 4.

This option allows six place capability, as well as two entertainment devices to be used at the same time (in the CREW mode). The volume level is factory set at the highest possible undistorted l evel. An optional volume control is included in the kit to allow a reduction of volume to all of the passengers headsets if desired. Additionally, there is a volume control adjustment on the intercom to either increase or decrease the overall output power. This adjustment is located on the right hand side as viewed from the front, and is a twenty turn potentiometer. Most modern headsets will have a volume control on them which is the best way to tailor the listening levels.

Appendix B

Expanding Beyond Four Headsets

You may expand headset capability of the PM1000II intercom by installing the 4-place expansion unit. (11918).
The expansion unit (11918) is self contained, panel mounted passenger expansion unit that will provide the CREW function, a stereo music input with switchable "Soft Mute", and an input for tape recorded messages to be distributed to all passengers. It has a single squelch control that adjusts three VOX circuits and one volume control that adjusts all output amplifiers. It has the same physical size and appearance and the PM1000II. It comes complete with a horizontal a vertical faceplate. It can also be mounted remotely.
A blind mounted unit (11918R) can also be installed. This version can be remote mounted underneath a seat, on the fire-wall, any where out of the way. However, a VOX squelch control must to be mounted on a panel for VOX adjustment.

NOTE: When the p/n 11918 is used with the PM1000II (p/n 11902), the 11902 is connected to the Pilot and Copilot headsets only , others are connected to 11918.

Appendix C

Optional Intercom Recording System (IRS)

The Intercom Recording System (listed here as the IRS), is a digital recording system allowing automatic storage and immediate playback of all incoming aircraft radio receptions.
Operating as a continuous loop recorder, (first message received will be the last heard), the recorder has one minute of recording time divided into as many as 16 messages. With its built in VOX circuit, there are no buttons to press to start recording,. The system automatically starts to record the instant the radio becomes active. Only aircraft radio audio is recorded and only the pilot will hear the playback audio.

Installation

To install the IRS, a momentary push button switch is required. This switch can be located any where in cockpit convenient to the pilot's reach. The switch must be connected to the supplied 1/8" phone jack. This jack is inserted into the back of the unit to complete the installation. Please see the wiring diagram .

Operation

Recording is automatic, there is nothing for you to do. 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.

Appendix D

PTT Modifications

When received from the manufacturer, a 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.

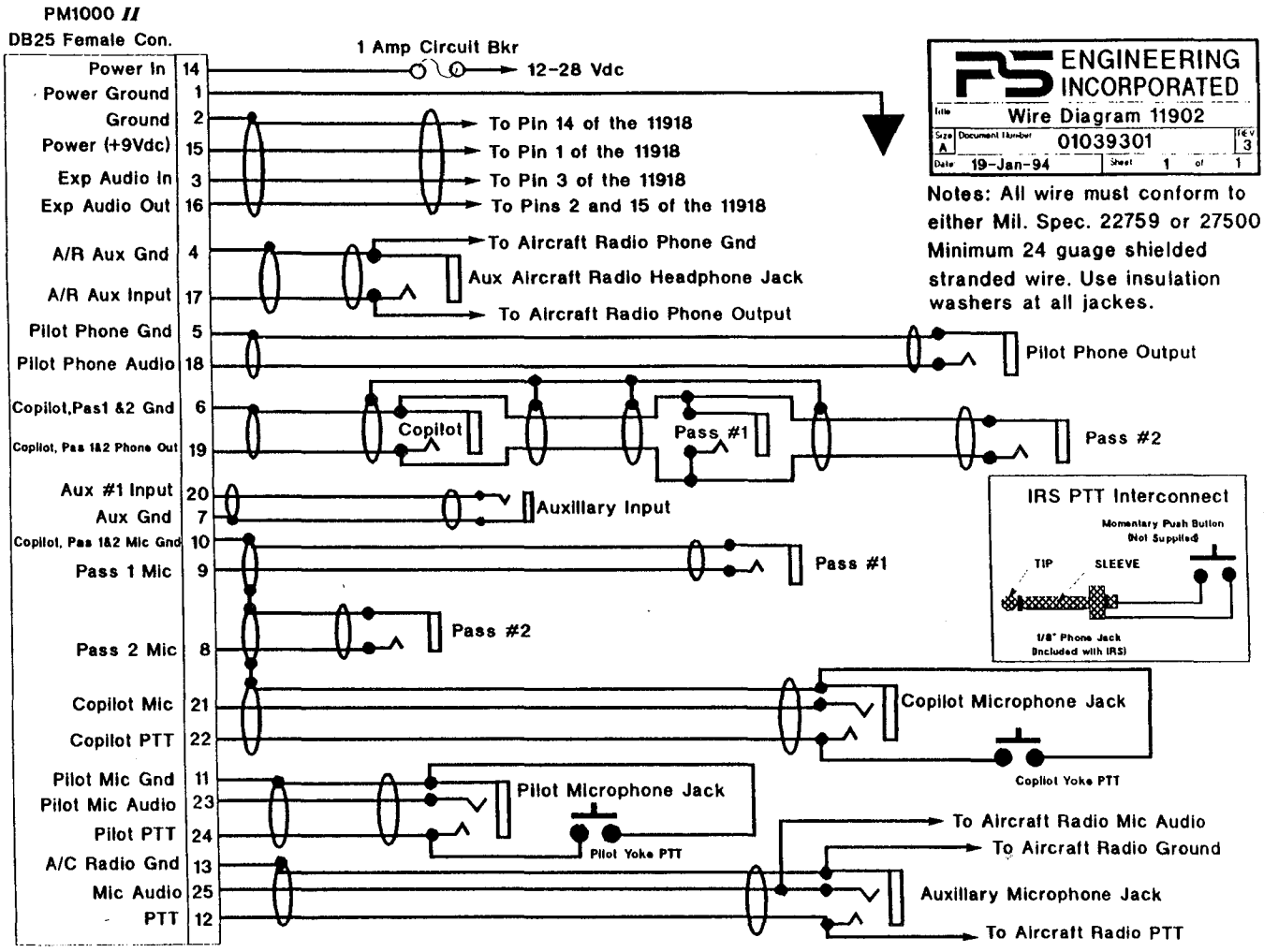
Procedures For David Clark's PTT

- 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 the Telex's 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 the Telex's 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* already soldered to it.
- Replace the round black plastic cover

PM1000II (#11902 Standard or #11906-With Builtin Recorder)