PS ENGINEERING® INCORPORATED

Sound Quality. Sound Engineering.

PAC45L System

With MultiTalker®
Flying Never Sounded So Good!®

Pilot's Guide
and
Operation Manual
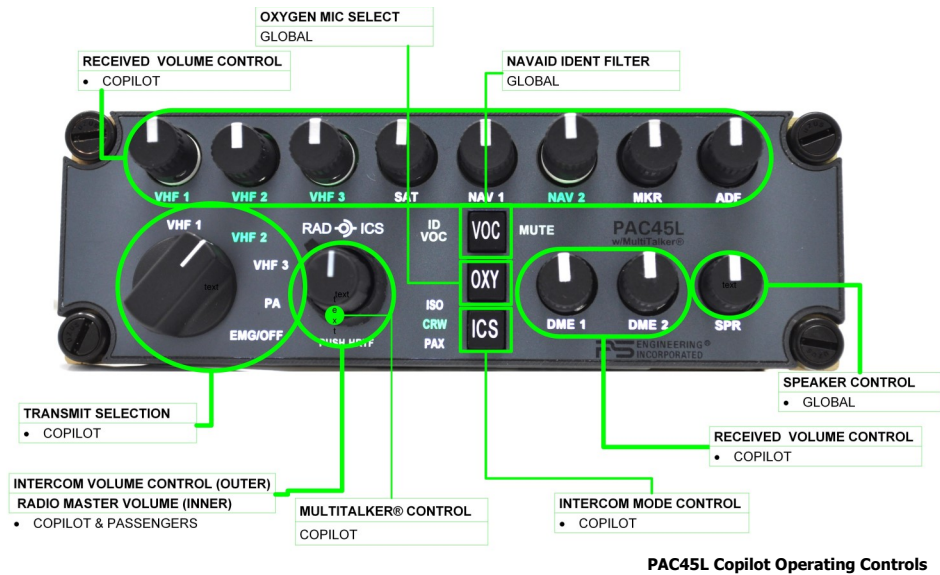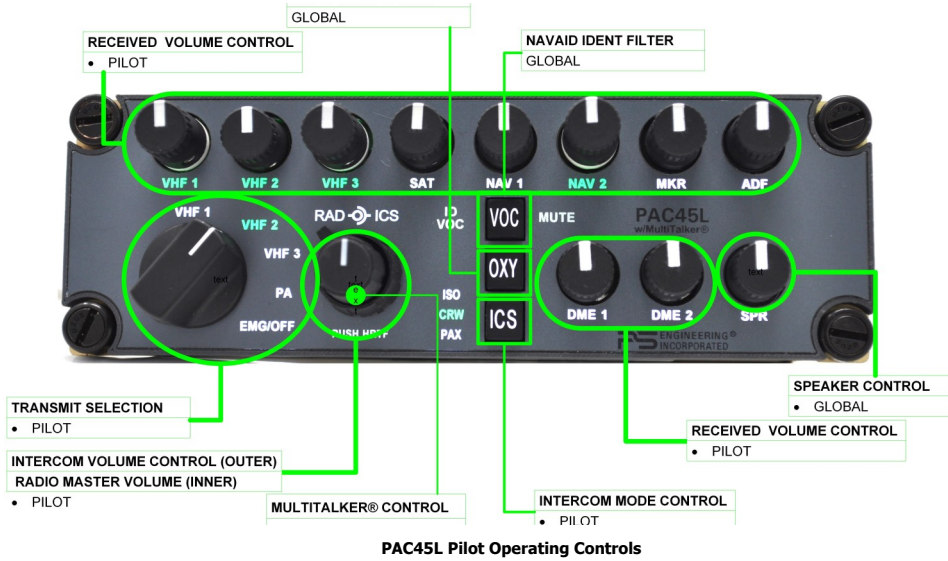
FOR <u>DUAL</u> CONTROL HEAD SYSTEMS

PS ENGINEERING® INCORPORATED

This pilot guide provides detailed operating instructions for the PS Engineering PAC45L, Audio Selector Panel/Intercom Systems. Please read it carefully before using the equipment so that you can take full advantage of its capabilities. **NOTE: Because of user customization of the labels, appearance may differ from illustrations**

GLOBAL

RECEIVED VOLUME CONTROL
• PILOT

NAVAID IDENT FILTER
GLOBAL

VHF 1   VHF 2   VHF 3   SAT   NAV 1   NAV 2   MKR   ADF

VHF 1   RAD ⊙ ICS   ID VOC   VOC   MUTE   PAC45L w/MultiTalker®
VHF 2
VHF 3   OXY
PA   ISO
EMG/OFF   CRW   ICS   DME 1   DME 2   SPR
PAX

TRANSMIT SELECTION
• PILOT

SPEAKER CONTROL
• GLOBAL

INTERCOM VOLUME CONTROL (OUTER)
RADIO MASTER VOLUME (INNER)
• PILOT

MULTITALKER® CONTROL

RECEIVED VOLUME CONTROL
• PILOT

INTERCOM MODE CONTROL
• PILOT

PAC45L Pilot Operating Controls

OXYGEN MIC SELECT
GLOBAL

RECEIVED VOLUME CONTROL
• COPILOT

NAVAID IDENT FILTER
GLOBAL

VHF 1   VHF 2   VHF 3   SAT   NAV 1   NAV 2   MKR   ADF

VHF 1   RAD ⊙ ICS   ID VOC   VOC   MUTE   PAC45L w/MultiTalker®
VHF 2
VHF 3   OXY
PA   ISO
EMG/OFF   CRW   ICS   DME 1   DME 2   SPR
PAX

TRANSMIT SELECTION
• COPILOT

SPEAKER CONTROL
• GLOBAL

INTERCOM VOLUME CONTROL (OUTER)
RADIO MASTER VOLUME (INNER)
• COPILOT & PASSENGERS

MULTITALKER® CONTROL
COPILOT

RECEIVED VOLUME CONTROL
• COPILOT

INTERCOM MODE CONTROL
• COPILOT

PAC45L Copilot Operating Controls

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Power and Fail Safe

Unit power is controlled by the transmitter (XMT) selector knob. In the "EMG" or off (fully clockwise) position, the pilot headset is connected directly to COM 1 as well as alerts and unswitched input #1. This allows communication capability regardless of unit condition. NAV1 audio is also provided to the pilot in the other ear of a stereo headset.
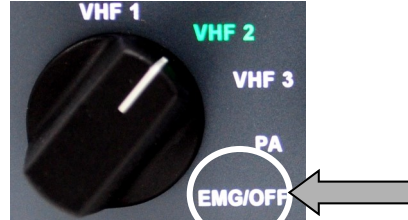
In Fail Safe (EMG) on the Copilot panel, that position will hear COM 2. The copilot can place the control panel in EMG without affecting pilot operation.

Any time power is removed or turned off, the audio selectors will revert to fail-safe mode. If fail-safe audio is present in both ears of a stereo headset, or completely absent, verify that a stereo headset is used and is selected for stereo mode.

The power controls all audio selector panel functions and intercom.

Communications Transmit (XMT) Selection

The PAC45L has a rotary control knob to select communications transceiver functions. To select a transceiver for transmit; turn the knob to select the desired radio.

The radio is automatically selected to receive incoming radio calls when the XMT is selected. With a PAC45L, you will never transmit on a radio that you are not receiving. The selected audio is indicated by both knob position and the green text. The pilot and copilot controllers can select any of the installed transceivers. In the case where both have selected the *same* radio for transmission, the pilot will have priority when he uses the radio push to talk.

OXY Selector

The OXY button Activates the Oxygen Mask microphone inputs if configured.

COM Audio Selector

The communications receiver audio sources are controlled by a combination pull on-push-off switch/volume control. Communication audio from another radio, not selected for transmit, can be heard by pulling out the

associated RCV switch. The selected audio is indicated by both knob position and the green nomenclature text.

You will always hear the audio from the selected transceiver, even if the selected comm audio is turned all the way down on the audio controller because it cannot turn the selected receive audio all the way off.

The volume of the received source is adjusted by rotating the knob. PS Engineering recommends a lower volume *at the radio and higher audio panel setting* to minimize noise.

Receiver Activity Indication (-RXI)

PAC45L systems have a Receive Activity Indicator that flashes the *selected* receiver indicator when a signal is present on that receiver. This allows the user to spot an active radio, even if the volume is turned down. This function is set at the factory at the installer's request, and can be changed at the factory.

MultiTalker® Head Related Transfer Function (HRTF)

Communication receiver audio signals are presented to the DSP and processed to "appear" in a different location to the crew. "MultiTalker" (US Patent #7,391,877) specifies up to nine locations. This helps the crew to better comprehend speech by locating it in a manner more easily differentiated by the human brain.

Intercom and other audio is not spatially processed, only the three communications transceivers.

You must use stereo headsets, in stereo mode for this feature.

MultiTalker® places the communications receiver audio in one of nine apparent locations in the crew's headset. This has been scientifically shown to allow the brain to focus on multiple conversations and improve comprehension for the listener.

Pressing the concentric volume knob (Push HRTF) toggles the PAC45L MultiTalker spatial function on (receiver sources distributed) or off (receiver audio sources neutral). The HRTF button on the pilot and copilot panels control the function for the user of that panel.

Audio Location

This adjustment allows the three Spatial Audio inputs to be "relocated" on any of nine (9) pre-defined "Head Related Transfer Function" (HTRF) locations.
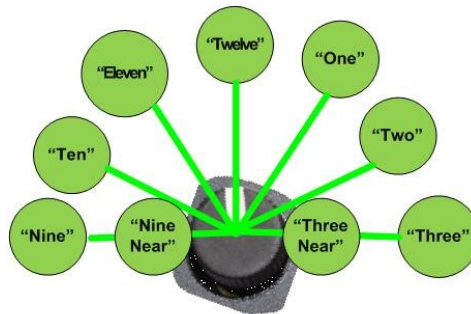
The *pilot panel* can control the locations for the six receive audio locations for all users. Press and hold the OXY button for >3 seconds on the pilot's panel until the HRTF button and all COM nomenclature start blinking green.

Rotate the desired COM receive volume knob so the pointer indicates the approximate location of the desired location. A voice announcement will accompany the knob rotation with the clock positions. Received audio will then be presented from that location.

Press the OXY (or HRTF) button again to exit the mode. The audio Controller will remember last state through power cycles.

Navaid Audio Selection

Navigation receivers are selected in the same manner as the communication receiver, pull on/push off the knob associated with the desired navigational aid, and rotate to adjust the receiver volume.

Speaker operation

To activate the cockpit speaker, pull the SPR knob out and adjust the volume as desired. This will place all received audio over the cockpit speaker. Both pilot & copilot have their own separate cockpit speaker selection.

Satellite/Telephone control

The volume control selector connects the audio controller to either a Bluetooth®-enabled cell phone or a wired cellular/ satellite phone.

Pull out the volume control to select (answer or make phone call) and adjust the receive audio volume. This knob must be out to use the telephone function.
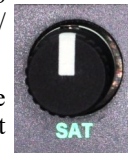
To hear the ringer of the Bluetooth phone, the volume control should be around the 12 o'clock position. Selecting the SAT switch in the OUT position is not required.

Intercom Operation

IntelliVox® Intercom VOX-Squelch

No adjustment of the IntelliVox® squelch control is necessary. 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-214A, §1.3.1.1 (a)).

NOTE

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

The IntelliVox® is designed to work with normal aircraft cabin noise levels (70 dB and above). It loves aircraft 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.

Intercom Volume Control

The intercom volume control knob adjusts the loudness of the intercom for the intercom stations(s) connected to the audio controller panel. It has no effect on selected radio levels, or music input levels.

In 2-control panel installation, the pilot panel controls pilot intercom volume only, copilot panel controls copilot and passenger intercom volume.

Monaural headsets

The pilot and copilot positions work with stereo or mono headsets. However, MultiTalker will not be presented correctly unless stereo headsets are used, and oriented correctly on the head, left and right.

NOTE: For the full effect of MultiTalker® Dimensional Sound, stereo headsets must be used, and the left/right orientation observed.

All passenger headsets are connected in parallel. Therefore, if a monaural headset is plugged in to a PAC45L Stereo installation, one channel will be shorted. Although no damage to the unit will occur, all passengers with stereo headsets will not hear one channel, unless they switch to the "MONO" mode on their headset.

NOTE: Mono headsets that short the tip and ring (i.e. older models) will introduce some audio distortion when used. Modern, stereo headsets are recommended in all positions.
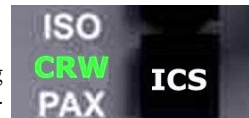
Intercom Modes

The "ICS" pushbutton switch on the panel provides the selection of the intercom modes

The intercom mode defaults to "CRW" at power up. Then the button cycles through the intercom modes, from bottom to top, then top to bottom: PAX CRW ISO, CRW. A green indicator shows which mode is currently active.

Iso: Each control head has their own ISOLATE selection. The control head is isolated from the intercom stations and is connected only to the aircraft radio's that are selected system. They will hear the aircraft radio reception (and sidetone during radio transmissions).

Crw: Pilot and copilot are connected on one intercom channel and have exclusive access to the aircraft radios. The pilot or copilot control head will decide when the system will be in the ALL mode by pressing their ICS switch. The observers can communicate with each other and passengers in ALL or OBS mode or select ISO mode.

Pax: Pilot and copilot have the option to add passengers to their intercom channel by holding down the ICS button for 4 seconds. This will then all passengers to speak with that crew station. Cycling power will place system back into the Crew mode and no passengers.

Remote ICS Mode Control

An optional external switch can act as a remote intercom mode selector. Pressing the switch will increment the intercom mode selector from ISO--CRW-ISO-PAX, etc. each time the button is pressed.

Bluetooth® connection

The PAC45L has an internal Bluetooth module, no external boxes required. The audio controller is always "discoverable," so you just need to search for the PAC45L from your Bluetooth-equipped phone or music source. Default access code is not required. Once the PAC45L has been "paired" with your Bluetooth device, the TEL distribution will act as described below.

Pairing Bluetooth® devices

The PAC45L can be paired with up to eight individual devices, but will only connect to one at a time. When that number is exceeded, the PAC45L will drop a device to allow the new device to be added.

If the audio controller is turned on before the Bluetooth device, you will have to manually connect from your Bluetooth device. Otherwise once paired, the audio controller should connect automatically.

Hint, if your devices are not recognized by the PAC45L, you may need to reset the Bluetooth module, Press and hold VOC and ICS buttons for more than three (>3) seconds.

Bluetooth® Telephone Mode

The PAC45L serves as a full duplex interface for telephone systems such as portable cellular phones with Bluetooth connectivity.

Warning: United States FCC Regulations contained in 47 CFR § 22.925 currently contain prohibition on airborne operation of cellular telephones. "Cellular telephones installed in or carried aboard airplanes, balloons or any other type of aircraft must not be operated while such aircraft are airborne (not touching the ground). When any aircraft leaves the ground, all cellular telephones on board that aircraft must be turned off."

To answer an incoming call, or initiate a call from the PAC45L, select the TEL volume control to the **out position**.

In CREW mode, the pilot and copilot are connected to the telephone. The pilot and copilot will have transmit capability on the selected transceiver, simply by using their respective PTT switch.

In PAX intercom mode, all crew and passengers will be heard on the phone when they speak. All will hear selected audio. Com audio is automatically heard in the headsets.

In ISO intercom mode, when the PAC45L is in the TEL mode, the pilot position is in the "Phone Booth." Only the pilot will hear the telephone, and only he will be heard. He will also have access to Com 1 or 2, and will transmit on that radio using the PTT. All selected audio is provided.
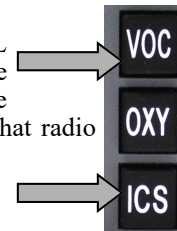
NOTE

PS Engineering does not guarantee compatibility with personal cellular telephones.

Bluetooth Reset

If the Bluetooth stops connecting to a device, or operates incorrectly first try turning Bluetooth off, and back on from your device. If also me be necessary to reset the Bluetooth module, clearing out the connected devices. Press HRTF and ICS for more than three seconds. This may be necessary if the Bluetooth stops connecting to a device, or operated incorrectly.

Music Muting Control

The PAC45L incorporates PS Engineering's trademark "SoftMute. The SoftMute™ circuit will mute the music whenever there is conversation on the radio or the intercom. When that conversation stops, the music returns to the previous level comfortably, over a second or so.

Holding down VOC button for three (3) seconds will turn the music muting on/off.

When in mute off mode, the intercom, radio & PTT will not mute the music. The music muting will reset to mute on mode at each power cycle. *Any* control head will switch the muting on or off for *all* users.

Wired Satcom/Cell Phone input

The PAC45L can accommodate a wired telephone input as well as a Bluetooth connection. This operates the same as the Bluetooth Telephone .

Navaid Identifier

The PAC45L is equipped with an identifier filter that will enhance the 1030 Hz Morse Code identifier (ID Mode), or reduce the Morse Code identifier for clearer reception of voice transmissions or VOR (VOC).

The ident filter is added to Nav 1, NAV 2 and ADF inputs.

Alert Audio

The PAC45L incorporates an independent alert audio system that can store nine audio messages recorded by the user, and played back when triggered by an external source.

Once triggered, the alert audio will continue until the ACK button (front panel or external) is pushed, or the trigger input returns to normal.

The alert inputs are ignored for the first 60 seconds after power is applied, to reduce nuisance alerts during startup.

Alerts are provided to the pilot in fail safe, if the audio systems' alert power is connected, and a stereo headset is used.

Storing Alert Audio

The PAC45L system can store nine audio alerts. You must record all nine when the unit is in audio program mode. You cannot change only one at a time. If you wish to replace just one message, we recommend you write

down all the messages before starting the procedure. To record and use te Alert function, a remote Acknowledge (ACK) button must be installed.

To record messages from the pilot's headset:

1. Custom messages may be stored by the user. All Alerts shall be recorded when the unit is in program mode. To record messages from the Pilot's station:

2. Press & Hold remote ACK until a chime is heard in the headset, and then release the button.

3. COM1 RCV shall blink, to indicate the recording of Alert 1.

4. Start speaking message.

5. When finished with Alert 1, press the remote ACK.

6. Now COM2 RCV shall blink, to indicate the recording of Alert 2.

7. Speak message.

8. When finished with Alert 2, press the remote ACK

9. Repeat this procedure until all alerts are recorded (indications for recording Alerts 1-9 shall be COM1-8 and AUX1 RCV respectively).

10. A chime indicates recording is now finished.

11. If ACK is not pressed to indicate end of recording, it shall record for five seconds, and then advance to next alert. After all slots are timed out, the system shall exit the alert recording mode.

Stereo Helmet Conversion

For optimum performance, and for any effective Head Related Transfer Function, stereo headphones must be used.

Several companies modify flight helmets to add stereo capability, and change the microphone to high impedance civil aviation if it is military, or low impedance.

Companies Include:

acousticom

Phone: 574-293-0534

www.acousticom.com

FLIGHTHELMET.COM
Phone: (800) 531-4898
www.FlightHelmet.com

Headsets Inc.
Phone: 800-876-3374

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Warranty & Service

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 two (2) years from the date of retail sale by authorized PS Engineering dealer. During the first **twelve (12) months** of the two-year warranty period, PS Engineering, Inc., at its option, will send a replacement unit at our expense if the unit should be determined to be defective after consultation with a factory technician. For the remaining **twelve (12) months** of the two-year warranty period, PS Engineering will send a no-cost replacement unit at customer shipping expense.

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

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

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

Factory Service

The units are covered by a two-year limited warranty. See warranty information. Call PS Engineering, Inc. at (865) 988-9800 before you return any unit. This will allow the service technician to provide any other suggestions for identifying the problem and recommend possible solutions.

After discussing the problem with the technician and you obtain a Return Authorization Number, ship product to:

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

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