Mix PSX

User Guide

B 2.1.4

Incomplete, subject to change, etc.

For PSX Alpha users only, not to be circulated beyond PSX Alpha forum members.

Contents

Overview

'Mix PSX' is an audio mixing program that complements the virtual Audio Control Panels (ACPs) simulated by PSX. 'Mix PSX' provides mixing of actual audio streams on standard PC hardware, such as USB headsets and soundcards, based on the PSX audio configuration.

Features

- One interface for all crew audio (Captain, F/O and Observer)
- Configurable mapping of almost any off-the-shelf PC sound hardware to the virtual audio circuits (radios, speakers etc)
- Accurately handles:
  - Transmit line selection
  - Listen line selection
  - Discrete line volume
  - Intra-crew communication
  - Cabin speakers
  - OBS OVRD
  - CAPT VHF L DIRECT
  - SERV INT
  - CAB INT
  - All radio and ACP power and failure modes in PSX
  - much more…
- Is written in Java to maximize cross platform compatibility
- Is designed to be set and forget (auto-connect etc.)

Limitations

Audio Devices

On startup 'Mix PSX' examines each of the audio devices on your system looking for specific controls required to mix audio streams. Some audio devices do not expose these controls to the OS, or they cannot be accessed via Java, so the devices will not appear in 'Mix PSX'.

USB devices always seem to have the required controls, while some onboard soundcards do not.

For the technically minded, 'Mix PSX' requires the ability to create TargetDataLines on Microphones/Inputs, and SourceDataLines on Speakers/Outputs. For more information on these please see the Java SDK.

Handheld Mic and Oxygen Mask Comms

Neither of these audio endpoints are catered for in 'Mix PSX' as they are not simulated in PSX and are not part of the core audio function of the ACPs. If the user wishes to implement these features they should be simple to do with hardware or software outside of 'Mix PSX' .

License

Attributions

'Mix PSX' contains code supplied by Hardy Heinlin (used with permission).

Panel images in this documentation are from Precision Simulator X and copyright Hardy Heinlin.

Requirements

Software

- · The latest version of Java, but at a minimum Java v6.01 (www.java.com)
- · An operating system that can run Java, typically;
    - · OSX
    - · Windows 7
    - · Linux

NOTE: A bug in the 64bit version of Java for Windows 7 may result in Audio devices not being displayed for assignment. If you are unable to see all your audio devices, uninstall the 64 bit version of Java from your machine, and install the 32 bit.

Hardware

- · Audio hardware that allows the creation of SourceDataLines and TargetDataLines in Java (typically 'DirectSound' devices such as USB headsets, soundcards etc). Any modern device generally does this.
- · 'Mix PSX' can run on the same PC as PSX, however it is recommended it have a dedicated system due to the overhead imposed by processing audio streams.

Other

- · If you need to capture sound from an application and pipe it into 'Mix PSX', you may need additional hardware (cables) or software to 'loop' the audio into a device so that it can be accessed by 'Mix PSX'.

    A good software solution for Windows is 'Virtual Audio Cable'.

Using 'Mix PSX'

Where to get it

Private testing only TBC

Quick Start

TBC

Installation

Extract all the contents of the zip file to a directory or folder, maintaining the folder structure.

Before Use - Hardware Connection

Without headsets and other audio devices, 'Mix PSX' will not have any sound to mix!

· Ensure any hardware you wish to use is connected and working **BEFORE** starting 'Mix PSX'.
· Set suitable gain levels for Mics and speakers in your OS to ensure different devices provide the same experience – e.g. don't have the input level of one Mic set to 10, and the other set to 100 – 'Mix PSX' cannot correct for imbalances at the OS level!
· If you intend to use the 'Mix PSX' sidetone, ensure the microphones do not have loopback of audio enabled (varies by OS).

Starting Mix PSX

Once you have the hardware connected, you can start 'Mix PSX' and continue configuration.

To start the program;
· Navigate to the folder where you unzipped the files
· Run 'Mix PSX'.jar *

The Management Interface will open.

NOTE: the program may appear as just ''Mix PSX'', depending on your OS settings.

Using Mix PSX

All aspects of Mix PSX can be set and controlled from the GUI. When connected to PSX, many options are not able to be changed, and these are greyed out while connected. To change these settings you must disconnect, change the setting then reconnect to PSX.

In addition, 'Mix PSX' can be managed via an instance of Jeroen Hoppenbrouwers' MCDU - http://www.hoppie.nl/mcdu/ - which allows management of core functions by the flight crew.
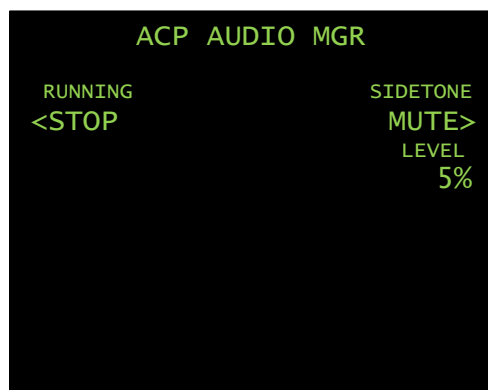
Using the MCDU

Note: This section focuses only on the specific interactions for Mix PSX – for general information on the MCDU, including configuration and use, visit http://www.hoppie.nl/mcdu/

The MCDU interface for 'Mix PSX' is designed to allow for basic connection management by the flight crew without leaving the flightdeck environment.   For information on the GUI and configuration options see 'The Management Interface' on the next page.

As crews may not be aware that 'Mix PSX' is the application controlling ACP audio, the program is described in the MCDU as 'ACP MGR'.

```
                  MENU
<ACP MGR




                              CONFIG >
```
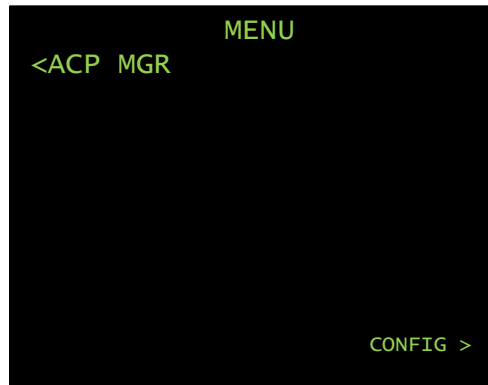
Selecting ACP MGR from the MCDU menu presents the following:

```
               ACP AUDIO MGR

    RUNNING                SIDETONE
<STOP                         MUTE>
                               LEVEL
                                  5%
```

- **LSK L1- STOP (or START):** The current running state is annunciated in small font above this option; you can stop the audio simulation (and disconnect from PSX) or start the audio simulation (and connect to PSX) by Line Selecting this option.
- **LSK R1 - SIDETONE (MUTE / UNMUTE):** Toggles whether you hear your own voice when transmitting.
- **LSK R2 - LEVEL (x%)**: Set the level at which you hear your voice as sidetone. To change the level, Line Select a value between 0 and 100 to this line. Invalid values will be ignored.

The Management GUI

- · **Monitor** – the default tab, displays what it thinks PSX is doing and provides access to the Debug information
- · **Configuration** – mapping of all audio hardware to virtual circuits, and other options.
- · **About** – about 'Mix PSX'.

All options have tool-tips – hovering the mouse over an option or output will provide additional information to assist in your use of the interface. General connection options and feedback are always visible at the bottom of the window.

Configuration

Some configuration is required before connection to PSX for the first time.

Note: Settings made in 'Mix PSX' are automatically saved when the program is closed, and automatically loaded when the program is run. The settings are stored in the file 'Mix.properties' in the same folder as 'Mix PSX'.jar. If the file is not found (such as when the program is first run) some basic settings are used.

All settings can be made via the various tabs under 'Configuration'.
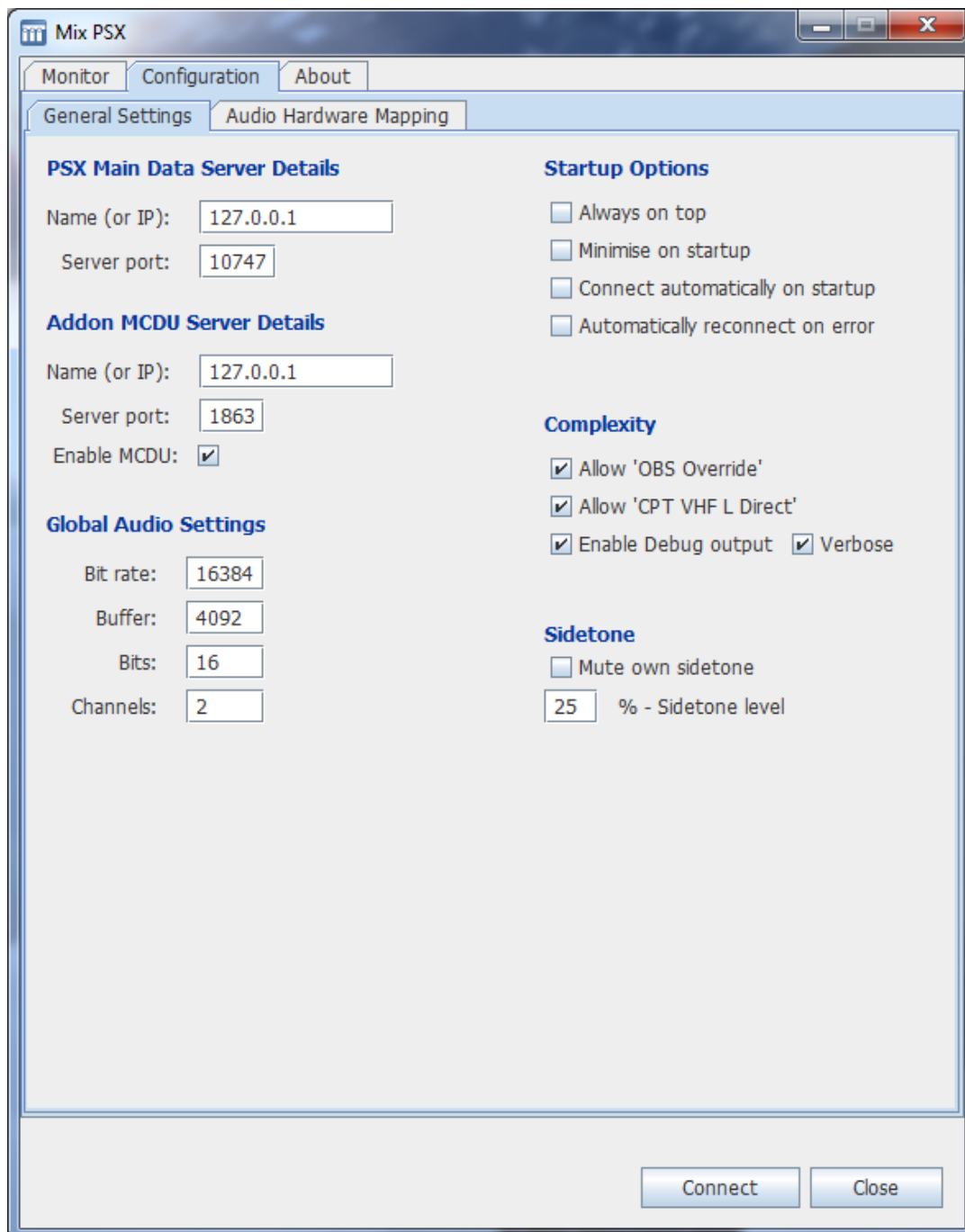
General Settings

This Tab contains common or required settings - A brief explanation of each can be found below.

PSX Main Data Server

Name (or IP)	The network address of the PSX 'main server'. This may be PSX, or an instance of the PSX Router. You can enter either an IP address, or a name that has a DNS entry; · 192.168.0.1 · PSXServer
Server Port	The network port of the server (default is as per default PSX server port).

Addon MCDU Server Details

Name (or IP)	The network address of the MCDU 'server'. This may be a PSX Router or a direct connection to a specific MCDU You can enter either an IP address, or a name that has a DNS entry; · 192.168.0.1 · Router
Server Port	The network port of the MCDU server (default is as per default PSX server port).
Enable MCDU	If enabled, Mix PSX will continuously try to connect to an MCDU on the address and port specified below.

Global Audio Settings

Bit Rate	Audio bit rate (bits) – a higher value gives better quality, but will result in higher latency (audio delay). Leave at 16384. This is 'telephone quality'.
Buffer	The size of the buffer (bits) that captures audio to be routed. Must be a factor of Bit Rate. Leave at 1024.
Bits	Can be 16 or 8. Leave at 16.
Channels	1=Mono, 2=stereo

Startup

Always on Top	'Mix PSX' will float on top of all windows.
Minimise on Startup	'Mix PSX' will start up minimised to the dock or task bar of your OS.
Connect Automatically on Startup	As soon as 'Mix PSX' starts up it will continuously try and connect to the PSX Server with the stored Network settings. To stop the connection attempts, click the 'Stop' or 'Disconnect' button.
Automatic Reconnect on Error	When selected, 'Mix PSX' will continuously attempt to reconnect to the server if it is not connected. To stop the reconnect attempts, click the 'Stop' or 'Disconnect' button. (Note this doesn't change the setting)

Complexity

Allow OBS Override	If selected, when the OBS Switch is moved from NORM to CAPT or F/O the audio for the selected crew member is controlled from the OBS ACP.
Allow CPT VHF L Direct	If selected, when the VHFL Direct switch is set, the Captain's audio will be tied into VHF-L only, and the volume fixed at 100%.
Enable Debug Output	Pipe all console output to the Debug tab. • To see only system errors, leave 'Verbose' off. • To see all notifications, ensure 'Verbose' is ticked

Sidetone

Mute own Sidetone	If selected, 'Mix PSX' will **not** feed audio back to the party transmitting.
Sidetone Level (%)	If 'Mute own Sidetone' is NOT selected; The gain of the Mic audio will be reduced by this percentage when fed back to the headset of the transmitter as sidetone. As there is some latency in the processing, fainter audio will prevent the confusion caused by hearing yourself delayed while speaking.

A Note On Audio Settings

Based on information from
http://docs.oracle.com/javase/1.4.2/docs/api/javax/sound/sampled/AudioFormat.html

Channels: Sounds may have different numbers of audio channels: one for mono, two for stereo.

Bit (Sample) Rate: The sample rate measures how many "snapshots" (samples) of the sound pressure are taken per second, per channel. (If the sound is stereo rather than mono, two samples are actually measured at each instant of time: one for the left channel, and another for the right channel; however, the sample rate still measures the number per channel, so the rate is the same regardless of the number of channels. This is the standard use of the term.)

Bits (Sample Size): The sample size indicates how many bits are used to store each snapshot; 8 and 16 are typical values. For 16-bit samples (or any other sample size larger than a byte), byte order is important; the bytes in each sample are arranged in either the "little-endian" or "big-endian" style.
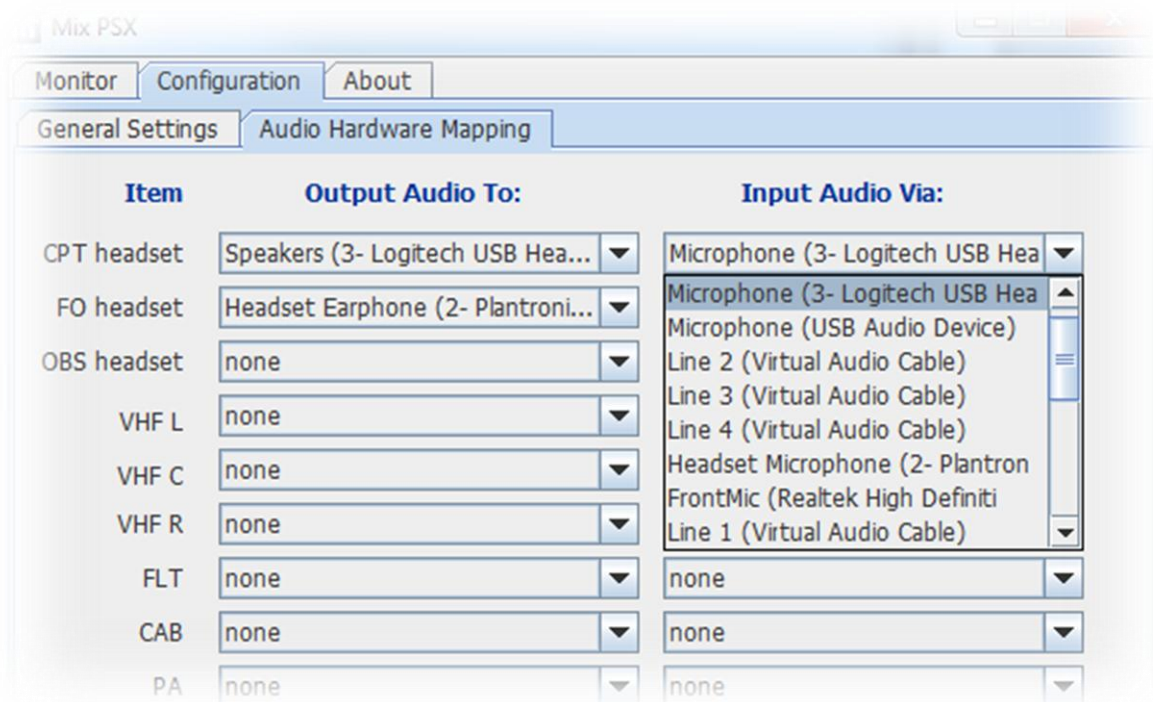
Audio Hardware Mapping

This tab is used to allocate audio hardware to particular roles.

When the program is run the OS is scanned for compatible devices.   All selections are automatically saved when the program is closed.

Use the dropdown lists to select which particular input or output will be used by PSX for each role.

NOTE: for best performance, make sure your configuration of hardware device to audio role is 1 to 1 - i.e. don't allocate the same device to multiple roles. This is especially important for Inputs (Microphones and Line Ins) – these will fail if you try and 'share' devices.

Understanding Inputs and Outputs

The concept of Inputs and Outputs can be a little confusing, but basically;

 All references are in relation to the 'Mix PSX' program itself.

Outputs	Mixed audio that leaves 'Mix PSX' to be heard on these devices, e.g. · Headset earphones · Speakers · External radio (outbound to ATC etc)
Inputs	'Mix PSX' will receive incoming audio to be mixed and routed from these devices, e.g. · Physical Headset microphones · External radio (incoming audio from ATC)

Other (NAV etc from PSX)

As PSX generates premixed NAV audio, this PSX audio can be patched straight into 'Mix PSX'.

- **For Each PSX Audio Source:** In PSX, Under 'Preferences', 'Audio', unselect all but one headset audio (e.g. Captains Headset) and patch to a discrete audio device on the Mix PSX computer.
- Assign each audio feed to the correct Headphone in Mix PSX

NOTE: If you are using external comms for ATC etc, make sure you disable the internal PSX ATIS, ATC, crew voices etc to prevent these feeding into Mix PSX.

Monitoring

This pane updates in real time to show the configuration in use by 'Mix PSX'.

To learn more about a field, hover the mouse over it and a tooltip with more information should display.

Mix PSX

Monitor | Configuration | About

PSX Monitor | Debug

Left ACP

Mic: VHF-L   PTT:

Receive:

Volume: | 33 | 77 | 0 | 19 | 44 | 80 | 32 | 87 | 92 | 24 | 67 | 76 | 62

Power: OK

Right ACP

Mic: VHF-R   PTT:

Receive:

Volume: | 90 | 42 | 30 | 89 | 69 | 79 | 77 | 85 | 23 | 50 | 49 | 81 | 61

Power: OK

OBS ACP

Mic: PTT:

Receive:

Volume: | 48 | 70 | 9 | 67 | 0 | 99 | 51 | 1 | 2 | 2 | 83 | 40 | 0

Power: OK

Other

CPT Audio: NORM   INT Serv: OFF

OBS Ovrd: NORM   INT Cabin: OFF

Radio Fail:

Radio Freq: 127125 | 137000 | 121730 | 22786 | 23999

CONNECTED - client 3   [Disconnect] [Close]

About

This pane contains information about the application your system that can be relevant for troubleshooting.

ACPs and 'Mix PSX'

The 747-400 ACP is a complex audio management device. As 'Mix PSX' and PSX aim to provide a realistic simulation this section will attempt to shed some light on expected behaviours.

*Note: I will be referring to **'lines'**; these are the sources that can be selected on the ACP. Some are radios (VHF-L, -R etc) and some are intra-crew communications (FLT, PA etc). Even though some are radios and some are intercoms, the way you interact with all lines is identical.*

Summary

There are 3 ACPs in PSX – the Captains, First Officers and Observers (or Standby) ACP.

In the real aircraft (and 'Mix PSX') each ACP is connected to the corresponding headset, speaker and microphone for that crew member allowing the crew member to listen to or transmit on any line, and adjust each volume individually. When a selection is made on an ACP, you are making selections for the associated crew members headset, speaker and microphone alone. There are two exceptions to this, which we'll get to later.

e.g. The left ACP makes selections for the Captains Headset, Speaker and Mic. The Right ACP makes selections for the FO's Headset, Speaker and Mic.

A great interactive look at using the ACP can be found at Jerome Meriweather's site;

http://www.meriweather.com/747/ped/audio.html

Listening to a Line

To listen to a line, press the volume knob for that line and release. The green LED will light up to indicate this line is now active. You will hear any transmissions on this line at the selected volume. To stop listening to a line, press the volume knob again and the LED will extinguish.

Setting Volume

Turn the knob associated with the line to adjust the level. Note this adjusts the level on both the headset and (proportionally) the on-side speaker, if selected (see 'Speaker' below).

Selecting a Transmit Line

Whilst each crew member can listen to multiple lines at once, they can each select only one line on which to transmit. Each ACP (ie crew member) can have a different transmit line selected.

To select a line for transmission press the black button above the corresponding volume knob– 'MIC' will light up on the button to indicate this is selected for transmission on the ACP.

Note: When you select a line to transmit (MIC) the line is automatically selected for listening - you will always hear all transmissions on that line, regardless of whether you have specifically selected that line for listening. Note that MIC selection does NOT cause the green 'listening' LED to illuminate.

When you wish to transmit on a different line, simply press the black button that corresponds to the other line and the 'MIC' annunciation will move across to verify the selection.

Note: If you hadn't manually selected the first line for listening (LED not illuminated) you will no longer hear any audio from the first line.

Transmitting

There is **NO HOT MIC** and **NO VOX** on any circuit in the real aircraft. All transmissions, whether internal amongst the crew or on external radios MUST be accompanied by a Push to talk (PTT) button press (whether PTT R/T or PTT INT).

Note: There is a latching INT PTT on the real aircraft yoke – this is just a 'locking' PTT.

Transmitting on the Current MIC Line:

- Press and hold the transmit button on the onside Glare shield or yoke.
  or
- Hold the PTT switch on the onside ACP in the 'R/T' position.

Transmitting on Flight Interphone (FLT):

Select the FLT line by pressing the MIC button for this line and use the regular PTT. Alternatively, you can transmit on FLT by holding the PTT switch on the ACP in the 'INT' position at any time ***regardless of which line is currently selected for transmission (MIC)***. Using the 'PTT INT' ignores any MIC selections and always transmits on the INT circuit.

*Note: PTT INT **DOES NOT select the line for listening**, so it is possible to transmit on FLT and not hear anything reply!*

Typically the FLT circuit is always selected for listening as part of the initial cockpit prep.

What you hear when you transmit:

- **ALL** speakers are muted while **ANY** PTT switch is pressed.
- The person transmitting hears themselves (sidetone) faintly in their headset. This is the only time you should hear yourself.

What others hear:

If another crew member:

- Is listening to the line on which you are transmitting, or
- Has selected that line as their transmission line (MIC)

They will hear your transmission - otherwise they will not. As mentioned, there is no hot mic or voice activated intercom circuit on the 744.

Speaker

The Speaker is a special line on the ACP. If you select the SPKR line you will hear all audio as selected on the ACP through your overhead speaker as well as the headset. This speaker has an additional master volume control allowing you to set the speaker audio at a comfortable level. Note that the set volume of the individual lines still affects the maximum level you will hear – you can never hear a line louder over the speaker than the level at which it's individual volume is set for the headset. e.g. consider the following;

- VHFL volume set at 50%
- Speaker volume set at 50%
- VHF level as heard over the speaker is 50% of 50% - i.e. 25%
- If we adjust the Speaker level to 100%, we then hear VHF L at 50% over the Speaker.

Radio Failure

If a radio fails (VHF L, C, R, HF L, R) you will not hear any audio on this radio, and none of your transmissions on this radio will be heard by external parties.

Note an actual radio failure is not a Radio Control Panel failure – if an RCP fails, another RCP can be used to tune radios. An RCP failure no effect on whether radios are audible via an ACP, just which frequencies you can tune.

- No audio will be heard from a failed radio on any ACP.
- No transmissions made on the failed radio will be heard externally
- Sidetone still works.

ACP Power

If an ACP has no power, you will not hear any audio or be able to transmit on any line on the headset and speaker associated with that ACP.

On Loss of Power:

- All lights on ACP go out.
- All audio to the connected Headset and Speaker will cease.

On Restoration of Power:

- The ACP has no 'memory' that survives a loss of power, so any line or MIC selections are lost and the panel is blank.
- No audio will be heard until MIC or line selections are made.

HF SENS

If you are using the native PSX Headset feeds AND your own source is also feeding HF to Mix PSX, remember you can adjust the HF SENS on each HF radio to remove any background static on the PSX provided HF feed.

OBS AUDIO SYSTEM

This switch allows the Captain or FO to use the OBS ACP to control the Captains or FOs audio in the event of a failure of their own ACP.

For all intents and purposes, when the switch is moved to CAPT or FO, the OBS audio panel becomes 'theirs'; changes made on the OBS audio panel are applied to the selected CAPT or FO Headset, Speaker and Mic.

Whiles the switch is out of NORM, the Observer's mic cannot be used for transmit, but they **will** hear all audio as selected *(the manual says they shouldn't, but real world feedback says they will.)*

CPT AUDIO VHF-L DIRECT

When VHF–L DIRECT is selected, the Captain's headset is tied directly to VHF-L radio, bypassing the ACP.

- The only radio heard by CAPT is VHF-L
- The only radio the CAPT can transmit on is VHF-L
- There is **no volume control**, all the audio is at full volume
- No interphone (FLT, PA or INT PTT)

SERV INT

This switch disconnects the non-flightcrew from the FLT INT circuit (ie the ground crew).

When this is selected to OFF;

- No coms from the INT input will be heard on the FLT line.
- Crew comms on INT and FLT are not affected and proceed as normal

CAB INT

- TBC

Notes on ATIS

At many airfields the ATIS is available via the Navaids as well as the VHF radios. This is accurately simulated by the internal ATIS generation in PSX.

If you find you are hearing an ATIS even though the VHF radios are not tuned to the ATIS frequencies, check the Navigation Filter Selector on the ACP (bottom centre):

- V – Voice – any voice signals (including ATIS) from the Navaid will be heard
- B – Both - both Voice and Range Audio heard
- R – Range – Range Audio (morse identifier) heard

Troubleshooting

Audio device doesn't show	While 'Mix PSX' is designed to work with most modern sound devices, it will only display devices that can provide certain functions via Java. Windows: There is a known bug in the 64 bit version of Java for Windows – you can uninstall via Add - Remove programs, and then download and install the 32 bit version.
Sound is choppy	'Mix PSX' endeavours to provide a clean audio experience, however there is a lot of processing involved in mixing all the audio channels. • Disconnected Mix PSX from PSX, and reconnect again. • Try reducing the number of applications running on your machine, or dedicate a machine to running 'Mix PSX' on its own.
Slight delay when transmitting.	Mix PS does al mixing in software, and Inevitably there is a slight, fraction of a second delay as the various bits are manipulated. This should only be a concern when you hear 'sidetone', as you shouldn't hear yourself at other times. You can either reduce the volume of the sidetone by setting a different value in the 'Advanced' tab, or disable sidetone altogether.