

## SETTING UP AN OAS INSTRUMENT FOR OPTIMUM SOUND QUALITY

### PART 1 – GAIN CONTROLS

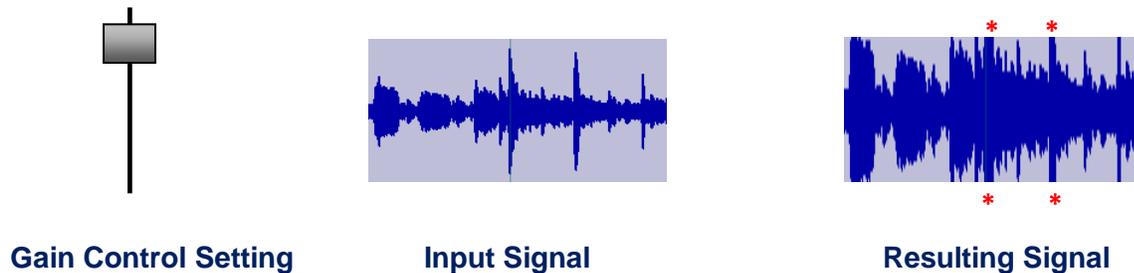
#### Basic Principles

In any audio system where several types of sounds have to be combined together, signals flow from the various sound sources through the mixer controls to the amplifier and on to the loudspeakers. Gain controls located on the mixers allow these signals to be increased or decreased as they pass through the system. In this way the various sound sources can be balanced and the overall volume of the mix defined. Setting these controls correctly ensures that a strong, clean signal is propagated through the system. Gain controls are typically calibrated in Decibels (abbreviated to dB). A setting of 0 dB generally indicates that a signal is passed from the sound source through the mixer unaltered. A positive dB value will increase the signal whilst a negative dB value will decrease the signal. Setting the gain too high or too low can have an adverse effect on sound quality.

To demonstrate this effect we shall take a typical input signal of varying height (amplitude).

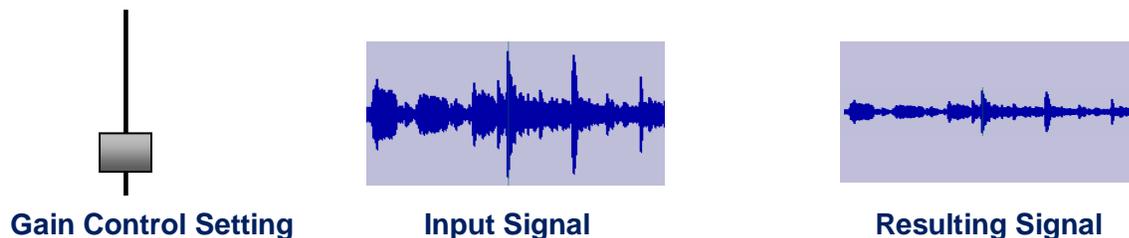
#### ***Gain Too High***

If the gain is increased too far the resulting signal is then much larger and can overdrive the amplifier producing a waveform that is clipped at its larger positive and negative peaks (indicated by the \* below). The waveform is not now a copy of the original and the resulting sound is distorted.



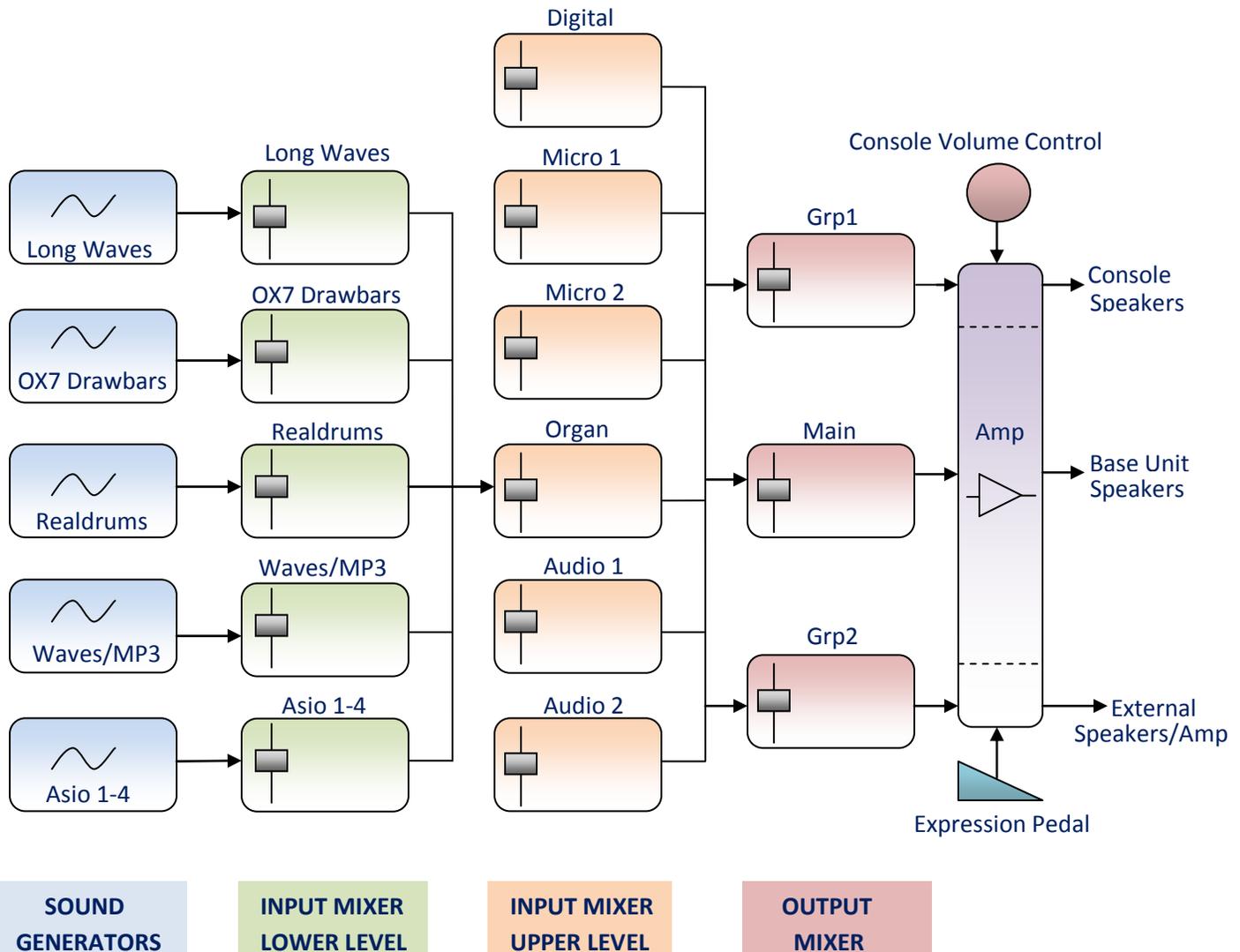
#### ***Gain Too Low***

If the gain is decreased too far the resulting signal is then much smaller. Audio waveforms are very complex in their structure and some of this detail in the waveform can be lost, resulting in a sound that can lack clarity and definition. Additionally, weak signals usually have to be boosted elsewhere in the audio system by other gain/volume controls to acceptable listening levels. This can also amplify any inherent internal and/or external noise that resides in the system resulting in a degradation of sound quality.



## The OAS Gain Controls

The gain controls on an OAS instrument are located on the input and output mixer menus. These menus appear to be separate and independent of each other. They are however part of an integrated system that controls signal flow from the sound generators (OX7 drawbars, realdrums, wave/mp3 files and long waves for the manuals, accompaniment and drums) to the amplifier and out to the speakers. The following diagram illustrates the signal flow, adopting the same structure that is seen on the input/output mixer menus.



At first sight this may seem a somewhat complicated representation, but like all mixer systems it comprises basically the same type of control repeated many times over. Let's follow the signal flow through the system. At the beginning of the signal flow are the sound generators, Drawbars, Long Waves, Realdrums and Waves/MP3. These comprise the digital hardware and software that translate the digital samples stored in computer files into waveforms for all the sounds on the organ. The four Asio (Audio Stream Input/Output) Sound Generators (**Asio 1-4**) enable additional sound software resident on the instrument's PC, such as the B4 and VB3 VST (Virtual Studio Technology) drawbar packages, to feed their audio into the mixer system.

In order that we can hear some or all of these various sounds simultaneously they need to be superimposed on one another. This is the function of the Input Mixer.

The Input Mixer has two levels. At the lower level there are separate gain controls for each of the signals coming from the sound generators. These controls allow the volume of each individual signal to be adjusted. After the gain controls these signals are combined together to form a composite signal and fed to the **Organ** gain control on the upper level. This control allows the overall volume of the composite organ signal to be adjusted. Also at this level we need the capability to add in signals from the external connectors on the instrument such as microphones (**Micro 1** and **Micro 2** controls), external audio sources (**Audio 1** and **Audio 2** controls) and the digital audio from the instrument's CD Player (**Digital** control). Signal flow through these external controls is not considered here since we are primarily concerned with the organ sounds, but signals from all sources are treated in exactly the same way. We now have a new composite signal which comprises all the audio signals being generated and/or input to the instrument. This signal is now passed to the Output Mixer.

At the Output Mixer the signal is routed through three separate channels, each with its own gain control. The **Main** control adjusts the overall volume of the organ's full frequency internal speakers located in the base unit of the instrument. The **Grp1 (Group 1)** control adjusts the overall volume of the organ's smaller speakers located in the console. These are essentially monitor speakers but can be used to enhance the mid range and higher frequencies. The **Grp2 (Group2)** control adjusts the overall volume of speakers connected externally to the organ.

Two more controls have an effect on overall volume, the Console Volume Control and the Expression Pedal. Here it is important to understand the difference between the function of the gain controls and that of the volume control. A gain control sets the maximum strength of a signal and we hear this at a certain level of loudness. The volume control enables this level to be further adjusted from its set maximum level when the volume control is fully clockwise down to zero when the control is fully anti-clockwise. The expression pedal enables the overall volume to be adjusted from zero to the level set by the volume control.

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### Sound Quality Strategy

The strategy for obtaining optimum sound quality is threefold. Firstly we need to ensure that a strong, clean, undistorted signal is passed through the mixer system. Secondly we need to equalise the signals coming from the sound generators so that they are propagated through the system at comparable strengths. Thirdly we need to set the overall volume of the instrument so that a comfortable listening level is achieved commensurate with good control of the expression pedal. The first two are implemented by the Input Mixer, the third by the Output Mixer.

#### ***Input Mixer***

As we have seen from the discussion in the Basic Principles section, optimum sound quality is obtained when the gain controls are set well away from their extreme values. In practical terms this means setting them as close as possible to their mid-point 0 dB levels. We can then adjust these settings up or down so that the signal volumes from the various Sound Generators are balanced. This ensures that when sounds are layered together on the manuals and pedals they don't have to be substantially boosted or attenuated to achieve compatibility in volume. As it happens most of the signals emanating from the sound generators are at similar strengths so that most of the gain controls can be adjusted directly to their 0 dB setting.

## Output Mixer

Here we are principally concerned with setting the **Main** gain control. The **Grp1** control can be used to add additional treble to the sound as we shall see in later in Part 2, but for the moment it will be disabled. The Console Volume Control is useful in situations where external speakers are employed. The control can then used to adjust the volume of the organ's main speakers which are now acting as monitors. In a typical domestic installation however this control provides no useful function and will be disabled to avoid changing the tonal balance if constantly re-adjusted either accidentally (when cleaning the console) or intentionally. Consider the **Main** control as the master volume control for the instrument and set this accordingly to limit the overall volume of the organ to a comfortable listening level. It is recommended that this should occur when the expression pedal is somewhere in the region of three quarters of its maximum position. This ensures that there is power in reserve for when required (think of a car accelerator pedal which, unless you are a boy racer, is never driven flat to the floor !!) whilst at the same time giving good resolution on the pedal such that small movements don't result in large changes in volume. In practice all of this will usually mean setting the **Main** gain control to a small negative value given the power of the amplifier and the size of most living rooms.

### Implementation

**Before making any gain control adjustments, ensure that the Console Volume Control is at its maximum clockwise setting. Later on we shall disable this control.**

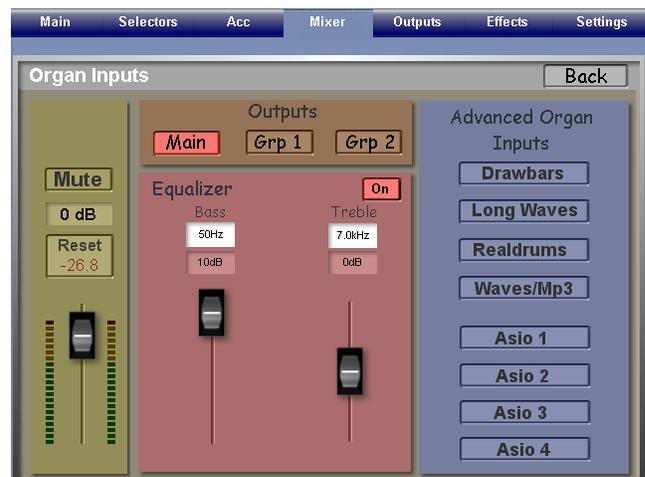
## Mixer Inputs Gain Controls

Call up the Input Mixer menu from the Main Display page by selecting the **Mixer** button from the top menu bar. Now you will see the upper level of the mixer (Mixer Inputs menu) with the organ and external gain controls displayed. Slide the **Organ** and **Digital** controls to their 0 dB setting. The digital control enables audio from the internal PC's CD player. If you are not using the other external sound sources you may wish to set all other gain controls to their minimum level and/or activate their **Mute** buttons. This prevents any external noise from being mixed in with the organ audio. The menu should now look as shown opposite.



## Organ Inputs

Now move to the lower level of the mixer menu by selecting the **Edit** button on the **Organ** gain control. The lower level of the mixer (Organ Inputs menu) will now be displayed, as shown opposite. On this and all other subsequent menus ensure that the **Main** output button is activated and the **Grp1** and **Grp2** buttons are de-activated.



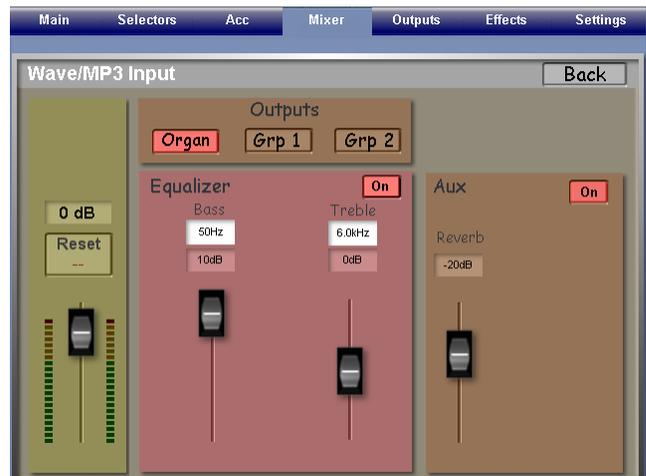
### OX7 Inputs Gain Control

Select the **Drawbars** button from the Advanced Organ Inputs menu on the right to display the OX7 Inputs menu. Ensure that only the **Organ** button is activated. Adjust the gain control at the left hand side of this menu to its 0 dB position. Don't worry about the other non-related settings on this or subsequent menus, these will be covered in later parts of the guidelines. The menu should now look as shown opposite.



### Long Waves, Realdrums, Waves/Mp3, Asio Inputs Gain Controls

Select the **Back** button on this menu to return to the Organ Inputs menu and repeat this process with the **Long Waves**, **Realdrums** and **Waves/Mp3** menus (also any of the **Asio 1 – 4** menus if you have VST packages installed) by selecting them from the Advanced Organ Inputs menu on the right hand side of the screen. Ensure that the **Organ** button is activated and the **Grp1** and **Grp2** buttons are de-activated. Set all the left hand gain controls to 0 dB. The exception to this may be the Realdrums control which you might find has to be set lower since it's a stronger signal. Later you may wish also to lower the Wave/MP3 and Vst 1 – Vst 4 gain controls. The various menus should now look as shown below.



Once having set up the Input Mixer it is necessary to save this configuration as a mixer preset and set this as your standard setting so that it is permanently stored for use in your total presets. Repeatedly select the **Back** button to return to the Mixer Inputs menu. Select the **Save** button on the Mixer Inputs menu and chose a free location from the drop down list. You can change the name of the preset if you wish by selecting the grey name bar, entering a new name with the displayed keyboard and confirm by selecting the **Enter** button. Now select the **Save Preset** button to store the preset. To set this as your standard setting select the **Standard** button on the Mixer Inputs menu and confirm by selecting the **Yes** button when asked 'Do you want to save this setting as Standard'

### Mixer Outputs Gain Controls

Select the **Outputs** button on the top menu bar to display the Mixer Outputs menu. Here you will see the gain controls for the Main, Grp1 and Grp2 outputs. Ensure that the **Main** gain control is not muted and that the **Grp1** and **Grp2** gain controls are set to their minimum level and/or muted. As before this prevents possible extraneous noise in the system.

Now select a reasonably loud sound for the organ e.g. a full out drawbar setting or a ensemble brass sound, set the expression pedal to somewhere near three quarters of its maximum setting and adjust the **Main** gain control downwards from its 0 dB setting until a comfortable listening level is obtained. You can make further fine adjustments to this setting later on if required.

The Mixer Outputs menu should now look similar to that shown opposite, with your specific settings.



### Console Volume Control

To disable this control select the **Edit** button on the **Main** gain control on the Mixer Outputs menu to display the Main Output menu.

Locate the General Volume button at the top of this menu and select this to **Off** as shown opposite. Now check that adjusting the console volume control has no effect on the overall volume. Return to the Mixer Outputs menu by selecting the **Back** button.



As with the Input Mixer we need to save this configuration and set this as your standard setting. Follow the same procedure as before but this time on the Mixer Outputs menu

**Note:** It's always good practice to establish a failsafe position for controls that are not currently activated in case of accidental switch on, so it's recommended that you turn the console volume control down to its minimum setting. If you use standard mixer presets in your total presets then with the new setup this control will never be activated. If however some of your total presets contain mixers presets that are non-standard and also have the console volume control activated then the failsafe position occurs. Selecting these presets with the console volume control set to its maximum level could result in a marked increase in volume if the output mixer gain control was set high, whereas setting the console volume control to its minimum level will silence the instrument. Should this situation occur you will need to modify these mixer presets. Simply de-activate the console volume control in the output mixer of the preset and set its gain control to an acceptable level.

This concludes the gain control part of the setup procedure. You can now proceed to Part 2 to set up the Equalisation Controls of the instrument.

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