## SETTING UP AN OAS INSTRUMENT FOR OPTIMUM SOUND QUALITY

PART 4 - BASS CONTROLS

Basic Principles

Sound output from an audio system is converted by the speakers into sound waves that produce variations in the air pressure surrounding the speakers. These waves travel through the air as a series of compressions and expansions which are then picked up by our ears and converted back into sound.

To demonstrate this effect we shall consider the transmission of a simple sine wave.
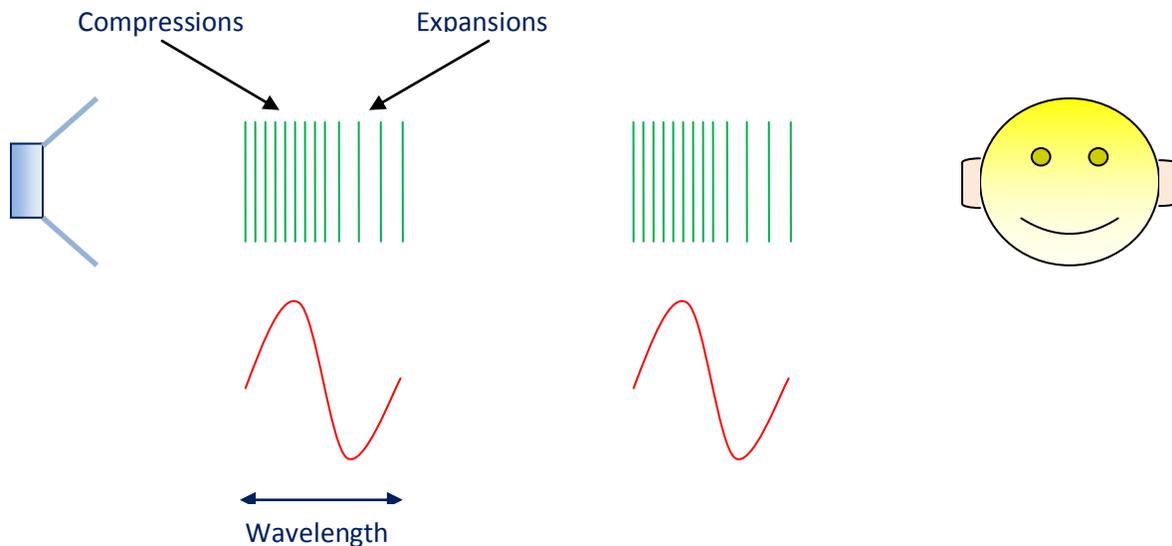
The sound waves occupy a physical length of air that we call the *Wavelength*. The wavelength is related to the speed of sound through the air and the frequency of the sound wave. The lowest note on an OAS instrument would be bottom C on the pedalboard, which with a 16' drawbar selected would be 32.7032 Hz. The formula relating these quantities is:-

Wavelength = Speed of Sound / Frequency

Using a value for the speed of sound in air as 1125 feet/second this gives us:-

Wavelength = 1125 / 32.7032 = **34.4 feet** or **10.5 metres !!!**

So to hear sound waves of this frequency with good quality we would need a room with a length at least equal to this dimension. In a large building such as a concert hall or a cinema this wouldn't be a problem but most domestic living rooms don't extend to this size. The effect of this restriction causes the sound waves to distort as they impact with the confines of the walls, floor and ceiling as well as other obstructions in the room such as furniture and fittings. Consequently the sound quality degrades such that we can hear a bass 'thump' rather than a deep rich tone.

There are two other limitations on the ability of an audio system to handle frequencies of this nature. One is the size of the speakers and the other is the dimensions of the speaker cabinet. Ideally we need large diameter speakers to handle the low frequency vibrations and large speaker enclosures to provide sufficient volumes of resonating air. Inevitably both of these are also compromised in a domestic installation

One further factor can affect the quality of the bass sounds that we hear, namely their tonal content. Traditionally on pipe organs, church and theatre, pedalboard stops such as Bourdons, Bass Flutes and Diapasons are provided. These are sinusoidal in nature and form excellent foundation stops when combined with sounds that have a more complex harmonic content such as strings and reeds.

In a pipe organ, sounds build up gradually because it takes time for the air inside the pipe to start resonating. This we usually refer to as a *Soft* Attack. In electronic instruments we also like to have the option of a faster or *Direct Attack* for more rhythmic playing. Additionally, to achieve a smoother baseline it's also advantageous to have varying degrees of pedal sustain available and also the facility to mix different bass pitches.
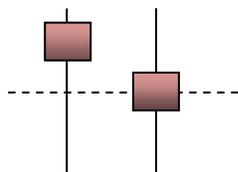
The OAS Bass Controls

The controls that most affect the bass sounds of an OAS instrument are the equaliser controls on the Input and Output Mixers as discussed in Part 2. As a prerequisite for obtaining a deep, rich tonal quality it's advantageous to set up these controls such that the lower frequencies are accentuated.

On the Output Mixer Equaliser the **Bass** and **Mid 1** frequency controls can be accentuated. Two of the following previously recommended patterns will achieve this.

Bass   Mid 1   Mid 2   Treble

0 dB

Warm, Rich and Full Bodied

Bass   Mid 1   Mid 2   Treble

0 dB

Full and Clear

Bass   Treble

On the Input Mixer Equalisers the **Bass** frequencies for the various sound generators would be correspondingly accentuated to replicate this pattern.

Sound Quality Strategy

The strategy for obtaining optimum sound quality is threefold. Firstly we need to ensure that the input and output equaliser controls are set to accentuate the bass frequencies. This will provide the foundation for deep rich sounds to be obtained on the manuals and pedalboard. Secondly there should exist a bass sound for the pedalboard that has a tonal quality suitable for blending with a wide range of instrumental and drawbar sounds. As previously discussed, this should ideally be sinusoidal. Thirdly we need a facility to adjust the attack of the sound, a variable sustain function and an ability to set and mix various bass pitches. The need to incorporate these additional features makes it preferable to design a customised bass sound rather than just using the lower footages from one of the drawbar systems. The latter option will not meet all these requirements. Additionally, the ability to customise bass sounds provides the opportunity to compensate for the effect on sound quality of inadequate room, speaker and cabinet sizes.

The first requirement is implemented with the input and output equalisers, the second is implemented with the OAS Drawbar Editor which creates the basic sound, and the third is implemented with the Long Waves Editor which takes this basic sound and builds in the additional features.

Input and Output Equalisers
The configuration of the equalisers on the input and output mixer menus in order to achieve a preferred sound quality has already been discussed in Part 2.

OAS Drawbar Editor
The OAS Drawbar Editor enables a sinusoidal waveform to be generated from a particular drawbar setting together with a facility to set its level of attack and the length of its sustain. Using these features it will be possible to construct a range of bass sounds for the pedalboard that incorporate a variety of attack, sustain and pitch settings suitable for a range of different musical styles.

Long Waves Editor
The Long Waves Editor enables the bass sounds defined in the OAS Drawbar Editor to be stored as Long Waves sounds

The editor also provides the facility to add additional effects to the sound such as Volume, Reverb 1, Reverb 2, Chorus, Delay, Octave and Panorama.
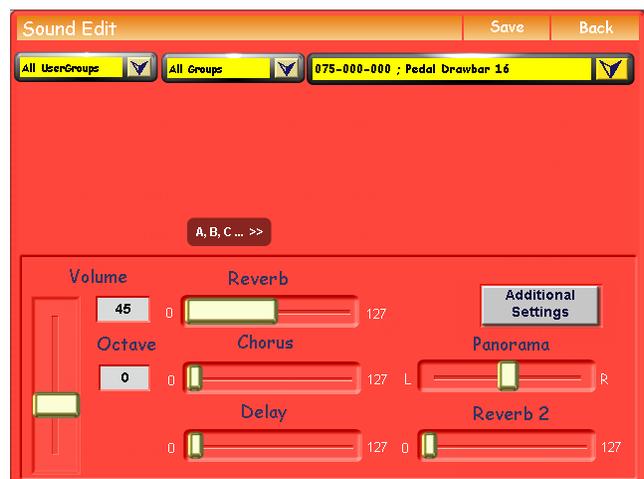
The following implementation will construct a deep rich bass sound suitable for use on the pedalboard.

Input and Output Mixer Equalisers
Refer to the *Implementation* section in Part 2 to accentuate the bass frequencies on the Input and Output Mixer equalisers if you do not already have this setting.

OAS Drawbar Editor
Call up the Settings menu from the Main Display page by selecting the **Settings** button from the top menu bar. From this menu select the **Edit OAS Drawbars** option to display the Main page of the Wersi Drawbars editor. The necessary parameters are set up as follows to produce a clean bass sound with suitable attack and sustain.

Fully extend the 16' Drawbar and push in all the rest

- Fixed <> Free – Set to **Fixed**, this prevents accidental alteration of the drawbar setting
- Organ Type – Set to **Clean**, this gives the best sinusoidal tonal quality
- Attack – Set to **16**, his gives a medium attack with a degree of punch
- Sustain – Set to **105**, this gives a medium sustain
- Percussion – Set to **Off**, this disables the Percussion option
- Vibrato – Set to **Off**, this disables the Vibrato option
- Rotor – Set to **Off**, this disables the Rotor option

The Main page of the editor should now look as shown below

Select the **Advanced** button to display the Advanced page of the menu and enter the following.

- Keyclick – Set to **Off**, this disables the Keyclick option

The Rotor settings are not relevant since the Rotor option has been disabled.

The Advanced page of the editor should now look as shown below

Once having set up this customised sound it is necessary to save this so that it is permanently stored in your list of sounds and can be modified by the Long Waves Editor. Select the **Save** button on the menu and choose a free location from the drop down list. These will have the MIDI program numbers 00-068-000-XXX. Make a note of your chosen MIDI number for later recall in the Long Waves Editor. You can give the sound a suitable name by selecting the grey name bar and entering the name with the displayed keyboard. Save by selecting the **Save** button.

Select the **Back** button to exit the editor.

Long Waves Editor
Call up the Settings menu again from the Main Display page by selecting the **Settings** button from the top menu bar. From this menu select the **Edit Long Waves** option to display the first page of the Sound Edit menu. Select the downwards arrow from the top right drop down list to display the list of sounds. These are best seen itemised with their MIDI program numbers and names (**A,B,C_>>** button showing). Locate the pedalboard sound you created in the OAS Drawbar Editor and select.

The necessary parameters are set up as follows to enhance the pedalboard bass sound with suitable volume, pitch and reverberation settings.

- Volume – Set to **45**, this defines a medium level volume
- Octave – Set to **0**, this allows the original 16' pitch
- Reverb – Set to **63** – this adds 50% reverberation for Reverb 1
- Reverb 2 – Set to **0** – this adds no reverberation for Reverb 2
- Chorus– Set to **0**, this adds no Chorus effect
- Delay – Set to **0**, this adds no Delay effect
- Panorama – Set to **Halfway** – this centres the sound

The first page of the editor should now look as shown below


Select the **Additional Settings** button to display the Additional Settings page of the menu.

Check that the parameters for Attack, Decay and Release have been successfully picked up from the values set in the OAS Drawbar Editor as follows.

- Attack – Set to **16**
- Decay – Set to **63**
- Release – Set to **105**

The parameters in the *Individual Sound Controls*, *Filter* and *Specials* sections of the menu can be left at their default values.

The Additional Settings page of the editor should now look as shown below
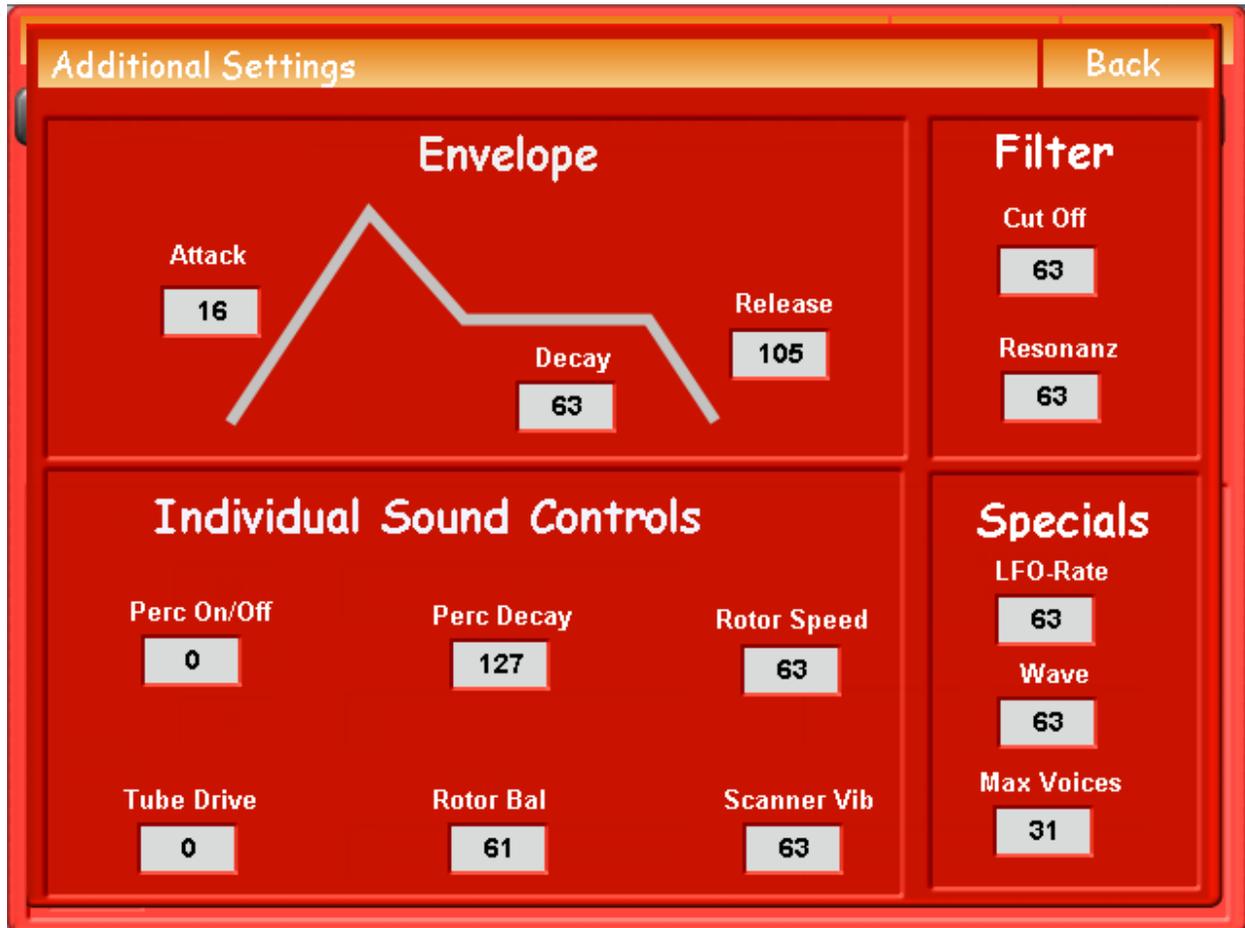
Once having set up the enhanced customised sound it is necessary to save this so that it is permanently stored as a Long Waves sound. Select the **Save** button on the menu and choose a free location from the drop down list. Long Waves sounds will have the MIDI program numbers 00-075-000-XXX. To avoid confusion it is recommended that you give the sound a different name than that specified for the OAS Drawbar sound by selecting the grey name bar and entering the name with the displayed keyboard. Save by selecting the **Save** button.

Select the **Back** button to exit the editor.

Testing the Pedalboard Sound
Select your new pedalboard sound for the pedals and use the grey Pedal volume slider to adjust its volume. Should you wish to change any of the parameters of the sound (for example Volume, Attack, Release etc.) these can be easily modified by re-entering the Long Waves Editor, making the required changes and re-saving the sound.

You may also find it necessary to adjust the mixer equaliser settings in order to balance the volume of the bass sound with those on the manuals.

Creating More Pedalboard Sounds

The method described will enable you to create a whole library of different bass sounds with different characteristics simply by specifying alternative values for pitch, attack, release etc.

Here are some suggestions. As before, create the sound in the OAS Drawbar Editor then select, modify and save in the Long Waves Editor. The Editor column in the following table details which of the two editors will facilitate the intended characteristic.

Sound	Editor Action	Editor
8' Pitch	Set Octave to 1	Long Waves
Slow attack for legato playing	Increase the Attack value	OAS Drawbar or Long Waves
Fast attack for rhythmic playing	Decrease the Attack value	OAS Drawbar or Long Waves
Short sustain	Decrease the Release value	OAS Drawbar or Long Waves
Long sustain	Increase the Release value	OAS Drawbar or Long Waves
Mix of 16' and 8' pitches	Set 16' & 8' drawbars to preferred levels	OAS Drawbar
Add the console rotor setting	Set Rotor to On	OAS Drawbar
Add the console vibrato setting	Set Vibrato to On	OAS Drawbar

Additionally if you have an instrument with two pedal layers there are even more possibilities available. For example you can select a 16' customised sound on one layer, an 8' customised sound on the other and use the Pedal volume sliders to mix the two. Alternatively you can set a customised bass sound on one layer and add any of the other OAS Long Waves sounds on the other. This latter option provides a very effective combination of deep rich bass with a distinctive instrumental bass sound.

Conclusion

This concludes both the bass control part of the setup procedure and the entire sound quality configuration.

I hope by now you have an instrument capable of producing the highest tonal quality and the necessary knowledge to continually refine its sound to your preference.

Happy playing and enjoy your new quality of sound !!

Jeff Ormerod
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