

Thank you for purchasing the Novation V-Station Powercore software synthesizer.

The V-Station Powercore virtual analogue synthesizer recreates the power and rich sound of the K-Station synth as a plug-in for Powercore PCI or Firewire systems running on Macintosh or Windows platforms.

At the core of the V-Station Powercore is Novation's 'Liquid Analogue' synthesis engine, delivering rich, dense sounds that offer vast creative potential. The plug-in combines these with a clear and responsive front panel interface with all the key sound shaping controls you need.

Main features

- 3 audio oscillators deliver a wide range of waveforms.
- Noise generator authentically models analogue noise generator circuits.
- Ring modulator for clangy, bell-like textures.
- FM synthesis for the accurate creation of electric pianos and tuned percussion sounds.
- 5-channel mixer for combining and balancing the oscillators, noise generator and ring modulator.
- Resonant 'Liquid Analogue' multimode filter with low pass, band pass and high pass 12dB/Octave and 24dB/Octave settings.
- Randomise feature for immediate inspiration.
- 2 x ADSR envelope generators.
- 2 x multi-wave, MIDI syncable LFOs.
- Portamento with exponential and linear slopes.
- Unison mode puts all eight voices (with detune) on one note for a huge sound.
- Arpeggiator with variable patterns, range and gate time. MIDI syncable to host sequencer.
- 6 x simultaneous multi-effects including delay (echo), reverb, chorus/flanging/phasing, EQ, distortion and panning.
- Multiple instances in your sequencer host
- Transfer sounds to/from a K-Station.
- Easy to use 'knobby' panels that emulates a hardware synth.
- 400 memory locations (200 factory presets / 200 user presets).

Minimum requirements

OPERATING SYSTEMS - PC

Windows 2000 (Service Pack 3)
WindowsXP

HARDWARE

Pentium III 1GHz (or equivalent Athlon)
256MB RAM or more

SEQUENCER HOSTS

LOGIC V5.5
SONAR 1.3.1 (minimum) and a suitable VSTi > DXi adapter. (e.g., DirectiXer 2.3)
CUBASE SX Version 1.05.58

OPERATING SYSTEM - Apple Macintosh

MAC OSX V10.2.8

HARDWARE

450MHz G3 / G4
256MB RAM

SEQUENCER HOST

LOGIC V 6.1

POWERCORE DRIVER VERSION – All Platforms

Powercore 1.9 drivers are a minimum requirement for the V-Station Powercore
And as they always say.....
Or greater / higher.

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Installation for internet enabled DAWs

If the Audio workstation is connected to the internet insert the V-Station Powercore CD and double click the Plug-in installer icon. A setup splash screen will appear. Press the 'continue' button.

A dialogue box will appear titled 'Plug-In Setup'. Click 'Next'

Fill in the Plug-In serial number. This is found on the V-Station Powercore box. Enter your valid email address. A download link for a personalized version of the V-Station Powercore plug-in will be emailed to this address.

The authentication ID of your Powercore device is recognized automatically. If multiple Powercore devices are used, you can choose which Powercore device the V-Station Powercore is to be authorized for. The Powercore system allows for a plug-in that has been authorized on one Powercore device to run on all Powercore devices in the same system. Consequently TC recommend that if a Powercore Firewire is installed in a Powercore system, that the V-Station Powercore is authorized for the Powercore Firewire in preference to any Powercore PCI cards.

The set up will install the files needed for the V-Station Powercore. The default internet browser will open the Plug-in download page on the TC website. Verify all the information entered is correct paying particular attention to the email address given. Press the 'Request Download' button. An email will then be sent from TC to the email address supplied with a download link to your personalized V-Station Powercore.

Installation for DAWs without internet

If the Audio workstation is not connected to the Internet, the V-Station Powercore can still be installed. A different computer with an Internet connection and valid email account must be used instead to complete the installation.

Insert the V-Station Powercore CD into the CD drive of the Audio workstation and double click the Plug-in installer icon. A setup splash screen will appear. Press the 'continue' button.

A dialogue box will appear titled 'Plug-In Setup'. Click the 'Off-line' button.

A new dialogue box will appear called 'Plug-in Download', click the 'Install' button. This will copy additional files required by the V-Station Powercore to the DAW. Instructions will appear within this window to show how to request a personalized plug-in from a different computer.

Make a note of the V-Station Powercore plug-in serial number shown on the product box and the Powercore authentication ID. If multiple Powercore devices are used, you can choose which Powercore device the V-Station Powercore is to be authorized for. The Powercore system allows for a plug-in that has been authorized on one Powercore device to run on all Powercore devices in the same system. Consequently TC recommend that if a Powercore Firewire is installed in a Powercore system, that the V-Station Powercore is authorized for the Powercore Firewire in preference to any Powercore PCI cards.

From an internet ready computer, open a web browser and visit

www.tcelectronic.com/requestplugin.

This will bring you to the Powercore optional plug-in download page. Select the Request Authorised V-Station Powercore option. Enter and verify all the requested information and press the 'Request Download' button. An email will be sent to the email address that has been submitted to the form. This email will have a link to your personalized plug-in. Click this download link to begin to download the plug-in. It will be necessary to save this to removable media (CDR, flash disc, external HD etc) so that this can be transferred to the Audio workstation.

Installing the V-Station - Apple Macintosh

Click the download link that will have been received if the Audio workstation is connected to the internet. The download will start. Alternatively copy the downloaded file from removable media to the Audio workstation. The plug-in will have been archived to reduce the file size (either WinZip or Stuffit Expander will be needed to uncompress the plug-in).

Run the installer program. 'V-Station Powercore Installer' included in the download.

The installer will copy the V-Station Powercore audio unit version to the following folder on the system drive:

/LIBRARY/AUDIO/PLUGINS/COMPONENTS/

and the installer will also copy the V-Station Powercore VSTi version to:

/LIBRARY/AUDIO/PLUGINS/VST/POWERCORE

Installing the V-Station - Microsoft Windows

Click the download link that will have been received if the Audio workstation is connected to the Internet. The download will start. Alternatively copy the downloaded file from removable media to the Audio workstation. The plug-in will have been archived to reduce the file size (either WinZip or Stuffit Expander will be needed to uncompress the plug-in).

Run the installer program. 'V-Station Powercore Installer' included in the download.

The installer will copy the plug-in 'V-Station Powercore' to the VST plug-ins folder of the sequencer, eg C:\Program Files\Steinberg\VST Plugins. Note if the installer does not select the correct file, copy the V-Station Powercore.dll file into the correct plug-in folder for the sequencer used.

Inserting the V-Station into a track

To insert the V-Station into a track, you should consult your sequencer's operator's manual where it will tell you what you need to do. Each sequencer handles this differently and it is almost impossible to explain every variation on the process here.

Using this manual

This manual consists of several chapters: Introduction, Getting Started, a Synthesis Tutorial and then detailed descriptions of the functions found on each of the V-Station's panels. For easy reference, the chapter name is printed in the footer margin of each page.

If you plan to print this manual out, it is designed for single face printing and the left of the page has a wide margin to accommodate a hole punch for inserting into a ring folder.

It is recommended that this manual is read in sequence chapter by chapter. If sound synthesis is an unfamiliar subject, then the Synthesis Tutorial will provide a useful introduction to the techniques used to create sounds using an analogue music synthesizer.

If you are familiar with synthesis techniques, you can skip to the various 'operation' chapters that describe each control and switch in detail.

The screen shots used throughout this manual are principally from a Mac running OSX. Whilst some of the windows and prompts may look different to those found on a PC and the various flavours of Windows, their operation is basically the same.

Using the V-Station

If you are already familiar with analogue synthesizers and VSTi / Audio Unit plug-ins, you can probably get started immediately. The most important parameters are on the MAIN panel but other, lesser used functions can be found on sub-pages EXTRA, CONTROLS and GLOBAL. These are accessed by clicking on the buttons at the top right of the window and should be fairly self-explanatory. Further details regarding operation of these panels are included later in this operator's manual.

Selecting programs

Probably the best way to get a feel for the V-Station Powercore is to play the factory presets that are supplied.

The V-Station Powercore comes supplied with 400 program memory locations of which the first 200 are occupied with factory presets. These presets can be selected and auditioned simply by clicking on the PROGRAM up/down buttons to the left of the LCD in the bottom left of the window. It is worthwhile going through these to get a feel for the sounds the V-Station is capable of. Amongst them you will find a wide range of synth basses, pads, arpeggiators and other dramatic sounds to get you started.

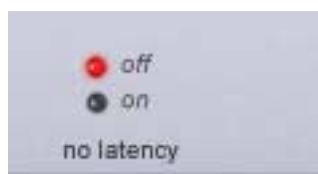
It is also possible to select sounds using your computer's numeric keypad - simply type in a three digit number (100-400) to select a specific program number.

To select sounds using your computer keyboard's numeric keypad, the NUMPAD PROGRAM SELECT preference must be enabled in the GLOBAL page.

Note : Some sequencers use the numeric keypad for play, stop, locating and other functions. Some sequencers allow you to re-assign these so that you can use the keypad for other purposes. Others, however, do not. If your sequencer doesn't allow you to re-assign the numeric keypad, you won't be able to select programs numerically. You should switch NUMPAD PROGRAM SELECT off.

Latency

DSP based cards such as the TC Powercore introduce a slight delay before returning a signal back to a host application. This delay is very noticeable when playing the V-Station in real time. The Global page of the V-Station contains a very useful control called 'no latency' to work around this.



When the no latency control is set to on the V-Station can be played in real time. The no latency mode will put a significant load on the host CPU. However no latency mode is ideal for recording or playing the V-Station. The no latency mode can be selected to reduce the CPU load when playing back a recording made with the V-Station.

Editing sounds

The V-Station Powercore panel(s) can be edited much like the K-Station's real panel - not *quite* as direct perhaps as reaching out and tweaking a knob but....

Simply move your mouse over the control you want to change. On the Mac, the cursor will change to a 'hand' and on a PC, the cursor will change to a 'cross-hair' symbol. The selected parameter and its value will be shown on the LCD:

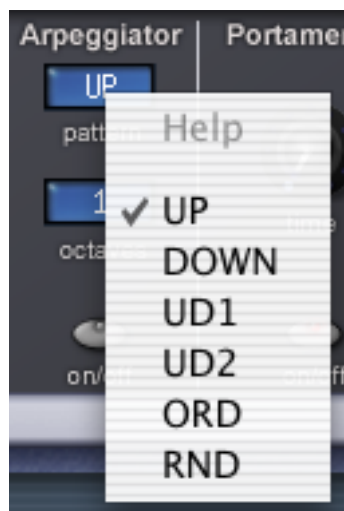


Click on the control and move the mouse up or down. As the control is moved, the value changes in the display. You will also note that 'LEDs' around the control will illuminate to give you visual feedback of the control's setting as it is adjusted.

Switches can be enabled / disabled simply by clicking on them. Also, some selections such as oscillator and LFO waveforms, oscillator octave, filter slope, effects selection, etc., are selected by clicking on their LEDs directly:



Other parameters such as those shown below are set by selecting an item from a drop down menu:



Click and hold on these and make your selection by dragging down the drop down list and releasing the mouse on the value you want to set.

Note : If you have a mouse that is equipped with a wheel, you can use this to great effect with the panels. When the cursor is over a knob or slider, simply use the wheel to move it and set a value - no need to click... just place the cursor over the control and scroll the mouse wheel.

The mouse wheel can also be used with drop down menus as well... place the mouse over a drop down and scroll.

Using the COMPARE function

After making any changes to a sound it may be useful to compare it with the originally stored program.

To illustrate this, select any program and tweak the panel controls - move the filter, change an oscillator's octave setting, whatever. Now click and hold down the COMPARE button. The sound you will hear will now be the originally stored program. Releasing the COMPARE button will switch to listening to the edited sound again. In this way, you can decide whether the changes you have made are worthwhile or should be abandoned

Writing a program

If you make a change to a sound that you like, the chances are that you will want to keep it for use later on. Sounds may be saved in any memory location. However, it is recommended that the user locations (300 - 499) are used early on for saving new sound creations if only to prevent losing the original factory presets (but if you are confident enough to overwrite the factory presets with your own creations, feel free... it's up to you to decide!).

The factory preset sounds are in locations 100 to 299 and may be overwritten if desired. Once these factory presets are overwritten, they may only be retrieved by performing a factory restore. To actually save the sound, click on the WRITE button below the LCD. The display will prompt you to select a memory location:



If you want to over-write the existing sound, simply click on CONFIRM - the sound will be written to the current location.

Note : The destination memory is always initially set to the currently selected program's number. Take care not to accidentally overwrite a treasured preset!

If you want to save the sound in a different location (thereby retaining the original sound in its original location), using the PROGRAM up/down buttons, select the destination memory and click on CONFIRM.

To cancel the WRITE operation, simply click on WRITE again.

Loading and saving banks

Most sequencer hosts allow you to load and save banks of sounds. This is useful if you want to create your own library of sounds and you could, for example, create a set of, say, 'techno' sounds on your V-Station - these could be saved as a bank named "Techno". You might also create a series of 'vintage' synth emulations - again, these could be saved as a bank called "Vintage". Whatever... you can subsequently load all these sounds back into your V-Station at any time. In this way, you can build up your own private library of V-Station sounds. It's also likely that banks of sounds will appear on the Internet which can be downloaded and used with your V-Station.

You should consult your sequencer's documentation for details on loading and saving banks.

Note : We have used the term 'bank' to describe a collection of sounds that can be loaded / saved on a plug-in. Different sequencers use different terminology for the same thing.

Notes about loading and saving generally

There are generally three ways to load and save items within your sequencer and to confuse the issue, different sequencers either deal with this differently and/or use their own terminology for what is basically the same process!

At the top level, you can save your song. This will not only save the music you have recorded but it will also save the current settings of the V-Station (and any other plug-in(s) you may have running). When you subsequently load that song, the V-Station's sound(s) will also be recalled. Even if you have edited a sound, the edited version will be recalled when the song is opened again.

At the next level, you can save (or 'write') individual sounds to the V-Station's 'internal' memory. Thus, whenever you use the V-Station in any song, the sounds you have edited / created can be used in that song.

However, once you start building up lots of sounds of your own creation, you can save these as a bank (or or 'preset' or 'setting' or whatever it is your sequencer calls them) and these can be loaded into the V-Station Powercore quite separately from the song. To illustrate this, you could be working on a song but can't find the right sound. You can load a different bank of sounds into the V-Station where you have access to 400 different sounds.

Some sequencers also allow you to save single sounds and these can subsequently be loaded into the V-Station at a later date.

Don't be confused by all of this, however - most of the time, you will simply insert instances of the V-Station Powercore into your song, select sounds as required (maybe even tweak them to suit the song) and then you'll just save the song's sequence file. When you load that song again, the instances of the V-Station Powercore will be recalled along with the sounds you selected / edited. The WRITE and SAVE / LOAD BANK (or whatever) options are more for building up a library of your own sounds.

Elements of a sound

To gain an understanding of how a synthesizer generates sound, it is helpful to have an understanding of the components that make up a sound, be it musical or non-musical.

The only way that a sound may be detected is by air vibrating the eardrum in a regular, periodic manner. The brain interprets these vibrations (very accurately) into one of an infinite number of different types of sound.

Remarkably, any sound may be described by just three elements, and all sounds always have them. They are :

- * Volume
- * Pitch
- * Tone

What makes one sound different to another is the proportion of these three qualities initially present in the sound and how these three terms change throughout the duration of the sound.

With a musical synthesizer, we deliberately set out to have precise control over these three elements and, in particular, how they can be changed throughout the duration of the sound. These elements are often given different names: volume is sometimes referred to as amplitude and/or level, pitch as frequency and tone as timbre.

Pitch

Taking the example of air vibrating the ear drum, pitch is determined by how fast the vibrations are. For an adult human the lowest vibration perceived as sound is about twenty times a second, which the brain interprets as a low, bass type sound and the highest is many thousands of times a second which the brain interprets as a high pitched sound.



Wave A



Wave B

If the number of peaks in the two waveforms (vibrations) are counted, it will be seen that there are exactly twice as many peaks in Wave B as there are in Wave A. (Wave B is actually an octave higher in pitch than Wave A). It is the number of vibrations in a given period that determines the pitch of a sound. This is the reason that pitch is sometimes referred to as frequency. It is the frequency of the waveform peaks which are counted during a given period of time. Frequency is expressed in Hertz (abbreviated to Hz). For example:

20Hz	20 Hz or 20 cycles per second
440Hz	440Hz or 440 cycles per second. This is also known as 'concert A' or 'A-440' and is the pitch an orchestra tunes to. It is also the common tuning reference for many other instruments.
1kHz	1,000Hz or 1,000 cycles per second
10kHz	10,000Hz or 10,000 cycles per second

Tone

Musical sounds consist of several different related pitches occurring simultaneously. The loudest is referred to as the 'Fundamental' pitch and corresponds to the perceived note of the sound. Pitches related to the fundamental are called harmonics (sometimes also referred to as 'overtones') and these are multiples of the fundamental (i.e. $\times 2$, $\times 3$, $\times 4$, $\times 5$, $\times 6$ etc.). The number of harmonics and their relative loudness to the fundamental determines the tone or 'Timbre' of the sound. Some waveforms contain both even and odd numbered harmonics (i.e. fundamental plus $\times 2$, $\times 3$, $\times 4$, $\times 5$... etc.), others contain only odd numbered harmonics (fundamental and $\times 3$, $\times 5$, $\times 6$, $\times 7$ etc.). Some contain lots of harmonics (even and/or odd) whilst others only have a few.

Consider two instruments such as a clarinet and a trumpet playing exactly the same note at exactly the same volume. Even though the pitch and volume are identical, they sound completely different. This is because the trumpet is rich in even and odd harmonics whereas the clarinet only contains odd numbered harmonics. Consider also a flute - another very different tone. This is because a flute typically has very few harmonics. When a sound has a lot of harmonics, the sound will be bright; when a sound has very few harmonics, it will be mellow in tone.

However, tone is rarely static on most instruments and varies during the course of the note. Generally, sounds start off quite bright and, because higher harmonics have less energy, they tend to die away first followed by lower frequency harmonics - the result is that the sound gradually gets softer in tone throughout the note. Other instruments start off with few harmonics but higher harmonics build up throughout the course of a note so that the sound gets gradually brighter. Tonal changes are often linked with level changes - i.e. the harder you hit, pluck, scrape or blow something, not only is it louder but it is usually brighter in tone.

Volume

Volume, which is referred to as the amplitude or loudness of the sound, is determined by how large the vibrations are. Think of a guitar string - pluck it softly so that it hardly vibrates and the sound will be low in level. Pluck it hard, however, so that it moves a lot and the sound will be louder.



In the diagram above, the waveform on the right is quieter than the one on the left.

However, volume is not a static element of a sound as it tends to change throughout a note's duration. Consider the sound of a piano and, say, an oboe - the piano is initially very loud but dies away over time. The oboe, on the other hand, has a soft start but sustains during the course of the note (though not always). Other instruments' amplitude varies in different ways as well - some sounds start slowly (bowed instruments, for example) whilst other sounds ring on for a long time after the note has sounded (a gong, for example). The way in which a sound varies over time is known as the 'envelope'.

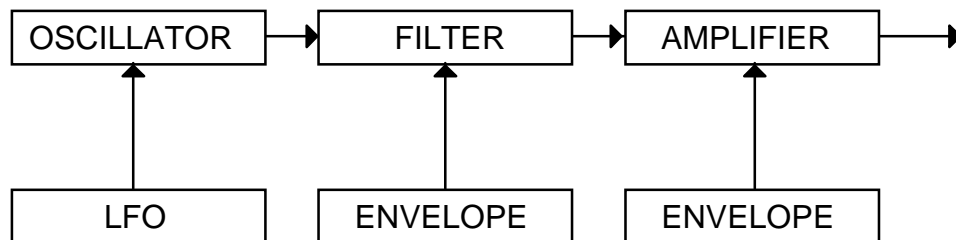
Putting it all together

Having shown that just three elements make up any sound, these elements now have to be related to a musical synthesizer. It is logical that each element of the sound is handled by different sections on a music synthesiser.

OSCILLATORS generate the basic waveforms which provide the pitch of the sound along with its raw harmonic content (tone). This passes into a section called the FILTER which is responsible for further altering the tone of the oscillator's basic waveform. It does this by removing (filtering) certain undesired harmonics. Lastly, the filtered signal is fed into an AMPLIFIER which determines the final volume of the sound. The simplest synthesizer would look something like this:



However, additional synthesizer sections; LFOs (low frequency oscillators) and ENVELOPES provide ways of altering the pitch, tone and volume of a sound by interacting with the oscillators, filter and amplifier. They introduce changes in the character of a sound that evolve throughout the duration of the sound. Because the LFOs and Envelopes' only purpose is to control (modulate) the other synthesizer sections, they are commonly known as 'modulators'. A more advanced synthesizer might look like this:



The oscillator generates the basic waveform but can be controlled (or modulated) from the LFO for effects such as vibrato, etc.. The oscillator's signal passes on to the filter where the basic waveform can be modified further and the filter's envelope can cause tonal changes to take place over time. Finally, the sound passes onto the amplifier where the sound's envelope can be shaped.

The V-Station's sound generating process is all based around these basic principles except that it has three oscillators which can be mixed and combined in any number of ways to provide a far greater palette of raw waveforms than a single oscillator could ever produce. The oscillators can also be detuned to create a denser sound (consider the sound of a single violin compared with a string ensemble where several violins are playing together but all slightly detuned from each other).

These three oscillators are then mixed together in a mixer and the output of this mixer passes to the filter. The filter can be controlled by its own envelope but also by a separate LFO. The signal then passes through a final amplifier that can be shaped with its own envelope. On the V-Station, however, the output of the amplifier also passes through multi-effects where you can add echo, reverb, chorus, etc., to add the final polish to the sound.

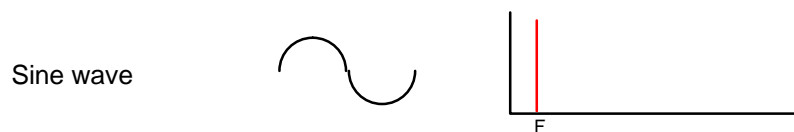
The various synthesizer sections will now be covered in more detail.

Oscillators

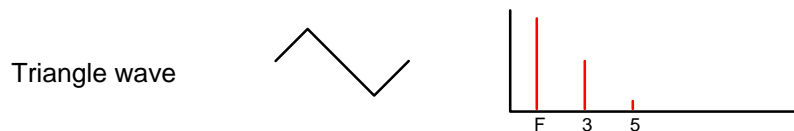
The oscillator is really the heartbeat of the synthesizer. It generates an electronic wave (this creates the vibrations). This waveform is produced at a controllable musical pitch, initially determined by the note played on a keyboard or other MIDI controller. The initial distinctive tone or timbre of the waveform is actually determined by the wave's shape.

Many years ago, pioneers of musical synthesis discovered that just a few distinctive waves contained most of the useful harmonics for musical synthesis. The names of these waves reflect their actual shape when viewed on an instrument known as an oscilloscope. They are:

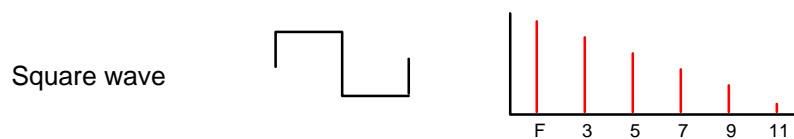
WAVEFORM WAVESHape HARMONIC STRUCTURE



The sine wave contains no harmonics, just the fundamental frequency and is the purest sound available.

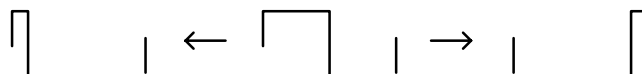


The triangle wave is another pure sound but it does contain a few odd-numbered harmonics.

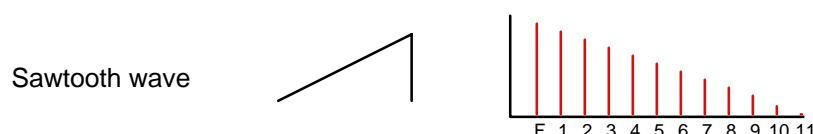


The square wave is a very bright but hollow sounding waveform, not unlike the tone of a clarinet. It consists of a wide range of odd numbered harmonics.

On many synths (the V-Station included), it is possible to vary the width of the square wave:



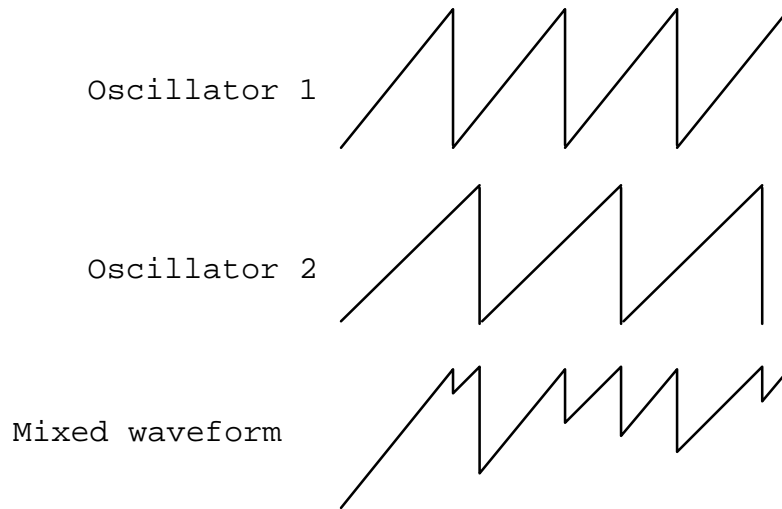
The so-called 'pulse' waves at either extreme have a very different harmonic content to the square wave and sound 'thinner' and more 'nasal'. However, because the pulse width is totally variable, the harmonic content of each variation in between the extremes also differs. If the pulse width is controlled by something like an LFO, a very vibrant and animated sound can be created - this is called Pulse Width Modulation.



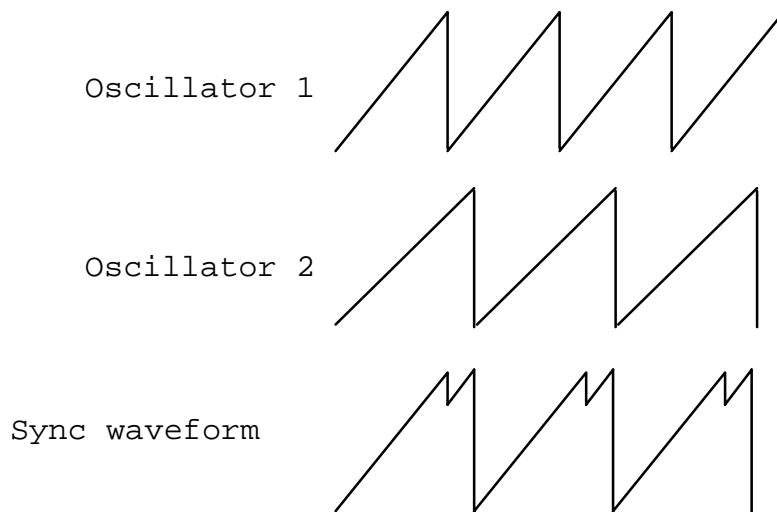
The sawtooth wave is probably the brightest sounding waveform of all and contains a wide range of odd and even numbered harmonics in equal proportion. It is good for a wide range of sounds including strings, brass and more.

Another technique possible with the oscillators is that known as OSCILLATOR SYNC. This synchronises the outputs of two oscillators to create new waveforms.

Normally, when two oscillators are free running, they interact and the resulting waveform is an 'animated', constantly evolving sound:



However, when two oscillators are synchronised, one oscillator's waveform is constantly being reset to the other:



The result is a new waveshape with different harmonic components and the interval between the two oscillators (and the waveforms selected for both oscillators) determines the harmonic content of the final waveform. Some very interesting new waveforms can be made in this way and, used subtly, many digital sounding waveforms can be created.

However, by sweeping the frequency of the synchronised oscillator, many distinctive 'sync sweep' effects can be created that can sound like thick flanging - great for aggressive leadlines and distinctive bass sounds.

One final type of waveform that is available on most synthesizers is Noise.

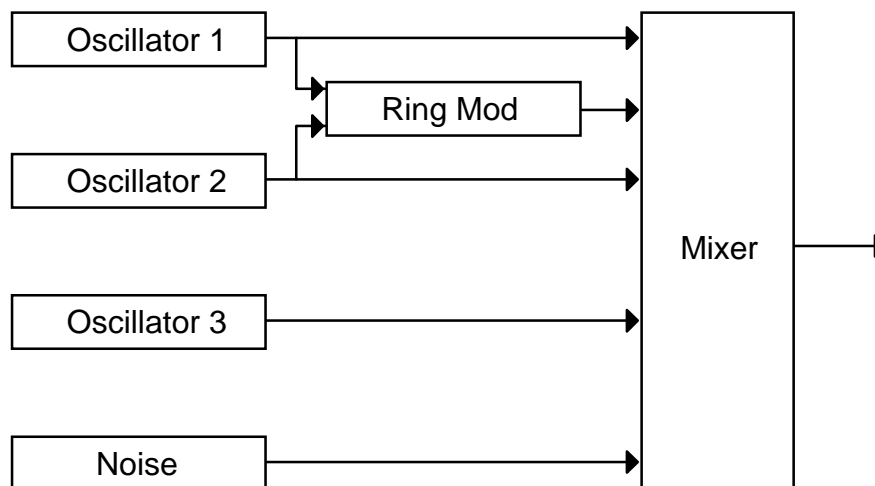
Noise is a special case since it contains all the frequencies of the sonic spectrum simultaneously and, unlike the oscillators, is unpitched. Much like when you mix all the colours of the light spectrum together, you get the colour white so, when you mix all the frequencies of the sonic spectrum together, you get a waveform known as white noise and this sounds like a hiss that can be used for the creation of un-pitched sounds and sound effects.

Mixer

To extend the range of sounds that may be reproduced, a typical analogue synthesizer often has more than one oscillator. By using more than one oscillator when creating a sound, it is possible to achieve very interesting harmonic mixes. It is also possible to slightly detune individual oscillators against each other which creates a very warm 'fat' sound. The V-Station has three independent oscillators which can be mixed.

For flexibility, a mixer section is usually included so that the level of each of the oscillators may be adjusted independently and mixed together to form a harmonically complex waveform.

However, as well as mixing together the individual oscillators, the V-Station's mixer also allows you to adjust the relative volume levels of a Noise Generator and a Ring Modulator:



The Noise Generator produces an unpitched sound suitable for drums sounds, sound effects, etc..

The Ring Modulator is a device that takes two inputs and produces sum and difference frequencies at the output. For example:

INPUT A: 500Hz
 INPUT B: 750Hz
 OUTPUT: 1.25kHz (1,250Hz - the sum) and 250Hz (the difference)

Typically, these sum and difference frequencies will be 'enharmonic' (i.e. not harmonically related to the frequencies presented at Inputs A and B) resulting in clangy, metallic, bell-like sounds.

The Ring Modulator also has a use as an octave divider. For example:

INPUT A: 440Hz (Concert A)
 INPUT B: 880Hz (An octave up)
 OUTPUT: 1.76kHz (1,760Hz - the sum a further octave up)

In this way, you can coax another octave out of the oscillators for a bigger sound.

The Ring Modulator on the V-Station always takes Oscillators 1 and 2 as its input sources as shown in the diagram above.

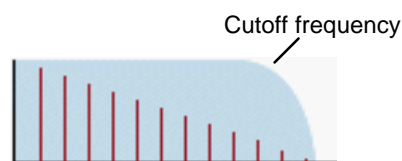
Filter

The V-Station is an *analogue subtractive* type of music synthesizer. Subtractive implies that part of the sound is subtracted or removed somewhere in the synthesis process.

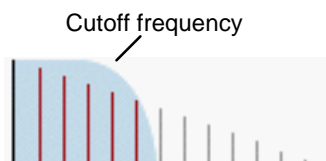
The oscillators provide the raw waveforms many of which have plenty of harmonic content and it is the filter that subtracts unwanted harmonics in a controllable manner.

The filter in the V-Station Powercore can be set to either a Low Pass type, a High Pass Type or a Band Pass Type.

For a Low Pass type, a cut-off point is chosen and any harmonics below that point are allowed to pass through unaffected and any above are filtered out. The setting of the FREQUENCY knob on the V-Station panel dictates the point above which harmonics are removed. This process of removing harmonics from the waveforms has the effect of changing the sounds character or timbre. When the FREQUENCY knob is set fully clockwise, the filter is set completely open and no harmonics are removed from the raw oscillator waveforms:

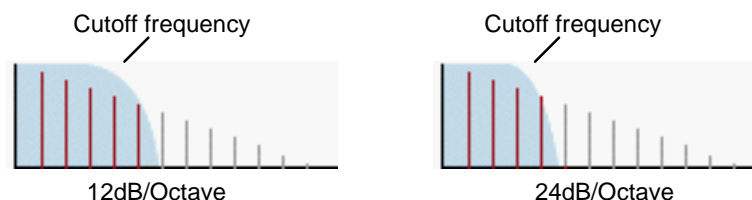


Here, all the harmonics pass through and the sound is very bright. However, as the control is moved counter-clockwise, the cutoff frequency is reduced and the higher harmonics are removed:



In this example, all those harmonics within the shaded area pass through unaffected whilst those above the cutoff frequency are removed and won't be heard. With the cutoff set like this (i.e. about halfway), the sound will have mellower tone. As the cutoff moves down, so more and more upper harmonics will be removed.

In practice, there is a gradual reduction in the volume of the harmonics above the cut-off point. How quickly these harmonics are reduced in volume above the cut-off frequency is determined by the filter's slope. This slope is measured in 'volume units per octave'. Since Volume is measured in decibels, this slope is quoted in the number of decibels per octave (dB/Octave). Typical values are 12dB or 24dB per Octave. The higher the number, the faster the harmonics are cut and the more pronounced the filtering effect.



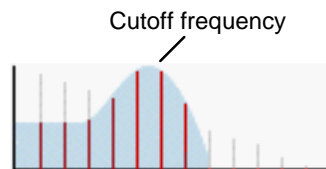
As you can see from the diagrams, the 12dB setting has a more gradual 'slope' than the 24dB setting which is steeper and even though the CUTOFF is the same in both examples, more upper harmonics are allowed to pass through with the 12dB setting than the 24dB setting. Some say that 12dB/Octave filters are 'fizzier' whilst the 24dB/Octave setting sounds 'punchier' and more like the original analogue synths. The V-Station offers both types of filter slopes to be selected.

The High Pass filter type has the opposite effect to the Low Pass filter. With the High Pass filter, harmonics below the Cutoff frequency are removed while harmonics above the Cutoff

frequency are allowed through. When the FREQUENCY knob is set fully anticlockwise the filter will be completely open and no frequencies will be removed from the raw oscillator waveforms

The Band Pass Filter type is a combination of both high and low pass filters. When the band pass filter is used only a narrow band of frequencies centered on the Cutoff frequency are allowed through. It is not possible to fully open this filter to let all frequencies pass through.

A further important feature of the filter is the RESONANCE control. Frequencies at the cut-off point are increased in volume by this control:

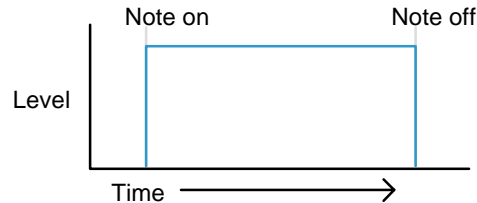


As you can see, those harmonics around the cutoff frequency are actually boosted in level whilst all those outside the shaded area are removed. This is useful for emphasising certain harmonics of the sound and with increased resonance settings, sweeping the cutoff frequency up and down causes the filter sound to change from the normal 'waa' sound to a more distinctive 'weeow' as the individual harmonics are picked out and emphasised.

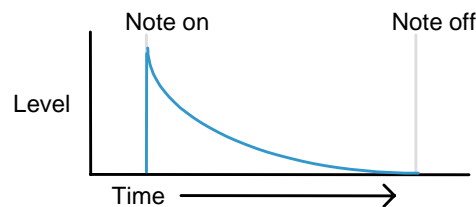
As the RESONANCE is increased, a whistling like quality will be introduced to the sound passing through the filter. When set to very high levels, RESONANCE actually causes the filter to self - oscillate whenever a signal is being passed through it. The resulting whistling tone being produced is actually a pure sine wave, the pitch of which depends on the setting of the FREQUENCY knob (the filter's cut-off point). This resonance-produced sine wave can actually be used for some sounds as an additional sound source if desired.

Amplifier and Mod envelopes

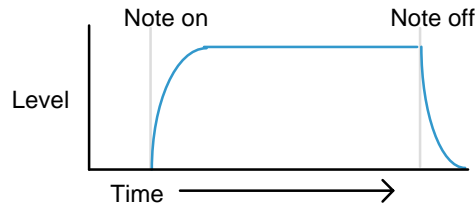
In earlier paragraphs, it was determined how the pitch and timbre of a sound is synthesised. This final part of the Synthesis Tutorial describes how the volume of sound is controlled. The volume throughout the duration of a sound created by a musical instrument often varies greatly according to the type of instrument.



An organ sound (above) quickly attains full volume when a key on the keyboard is pressed. It stays at full volume until the key is released, at which point the volume level falls instantly to zero.



A piano quickly attains full volume when a key is pressed and gradually falls back down to zero after several seconds, even if a key is held.



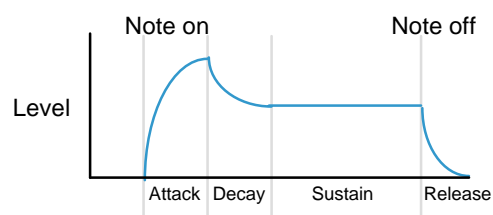
A string section emulation attains full volume gradually (i.e. it swells in gracefully with a slow attack) when a key is pressed. It remains at full volume while the key is held down, but once the key is released, the volume level gradually falls to zero.

On an analogue synthesizer, changes which occur throughout the duration of a note are controlled by a section known as an Envelope Generator.

Note that on the V-Station, there are no controls in a section on the MAIN panel which deal with the amplifier directly. The only way to hear and control an audio signal passing through the amplifier is to modulate it by using Amp Envelope controls.

The V-Station has two envelope generators - one controls overall amplitude, the other controls the filter (amongst other things).

Each envelope generator has four controls which are used to adjust the shape of the envelope.



When controlling volume, these controls adjust the following phases of the envelope as shown in the illustration.

Attack time	Adjusts the time it takes when a key is pressed for the envelope to climb from zero to full volume. It can be used to create a sound with a slow fade in.
Decay time	Adjusts the time it takes for the envelope to decay from full volume to the level set by the Sustain control while a key is held down.
Sustain level	Sets the level that the envelope remains at while the key is held down, after the decay time has expired.

<i>Note : It is important to realise that the SUSTAIN parameter is a level control, not one that sets time like the other envelope controls.</i>

Release time	Adjusts the time it takes when key is released from the sustain level to zero. It can be used to create sounds that slowly fade away in volume after you have taken your finger(s) off the keyboard.
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Low Frequency Oscillators (LFOs)

Like the Envelope Generators, the LFO section on a synthesizer is a 'modulator'. That is to say, instead of forming a part of the sound *generating* process, it is used instead to modify (modulate) other synthesizer sections. For example, altering the oscillator pitch or filter cutoff frequency.

Most musical instruments produce sounds that vary not just in volume but also in pitch and timbre. Sometimes this variation can be quite subtle, but still contributes greatly towards shaping the final sound.

Where an Envelope is used to control a one-off modulation event which occurs during the lifetime of a single note, LFOs modulate by using a cyclic repeating wave pattern. As discussed earlier, oscillators produce a constant waveform which can take the shape of a repeating sine wave, triangle wave etc. LFOs produce waveforms in a similar way, but at a frequency normally too low to produce an audible pitched vibration that the human ear can perceive.

The waveforms generated by the LFOs may be fed to other parts of the synthesizer to create the desired movements in the sound. A typical LFO will generate a variety of different control waveforms. These 'look' exactly the same as those we have seen with the audio oscillators except that, because their function is to modulate or control pitch, tone and amplitude, the effect they have is very different. The usual waveforms are:

WAVEFORM

WAVESHAP

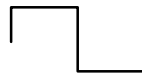
Triangle wave



The triangle wave will cause pitch to gradually rise and fall in accordance with its shape. The triangle wave is commonly used at a fairly fast speed (around 7Hz or a value of 75 on the V-Stations LFO SPEED control) to create vibrato effects.

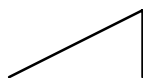
When applied to the filter cutoff frequency, it will cause the filter to gradually open (get brighter) and close (get softer). When the LFO speed is set quite fast, it can be used to emulate the 'tremolo' effect of instruments such as flute. With extreme settings, it can create distinctive 'bubbly' effects.

Square wave



The square wave will cause the oscillators to jump abruptly from one pitch to another. This can be useful for creating 'trills' and other musical effects. When applied to the filter, it will cause the cutoff frequency to jump from one value to another, alternating bright - soft - bright - soft and so on.

Sawtooth wave

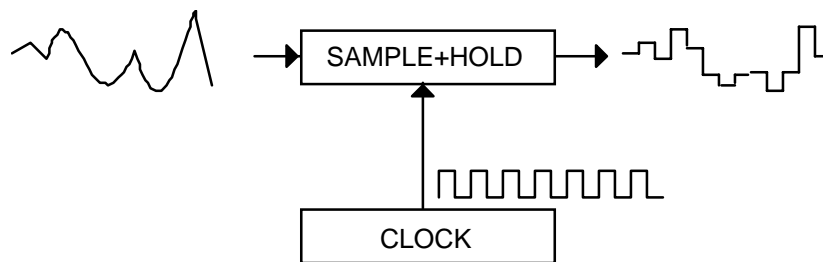


The sawtooth wave will cause pitch to rise gradually and then drop suddenly. When applied to the filter, the filter will open gradually then close suddenly. It is often possible to 'invert' this waveshape (i.e. turn it upside down) so that pitch falls gradually then rises abruptly and the filter closes gradually and opens abruptly. Generally speaking, the sawtooth wave (and its inverted variation) is used for special effects.

Another control waveform that is commonly available on synthesizers is the 'random' waveform.

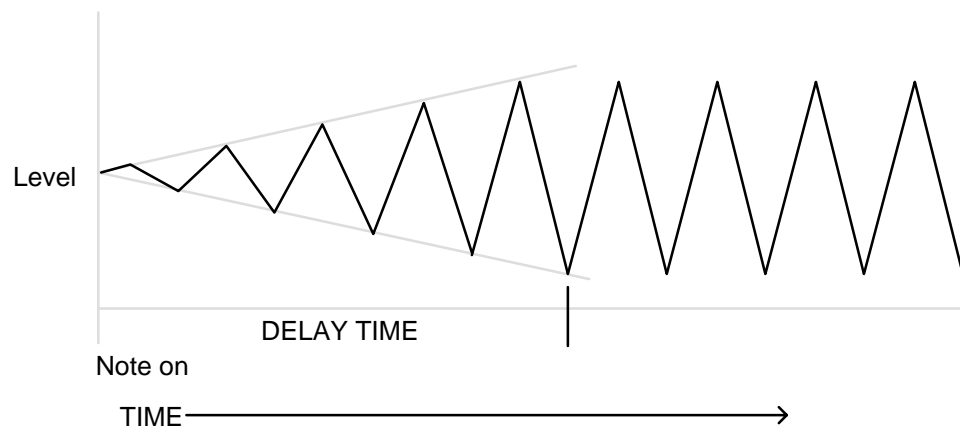


This is also sometimes known as 'sample and hold', often abbreviated to S/H. The reason for this is because in the really early days of sound synthesis when synthesizers were modular (and huge!), there was a device that could 'sample' a signal¹ and hold that sampled value for a period of time set by a clock signal. When the clock advanced a cycle, the next sampled value was read out. When the sample input was derived from a random noise generator and the clock source was a repeating LFO square wave, the output was a totally random, stepped control signal:



These days, whilst the method of producing random control waveforms is achieved differently, the resulting effect is exactly the same and when fed to the oscillators, this will cause random, repetitive jumps in pitch and when fed to a filter, will cause random, repetitive changes in tone.

Another common parameter found on LFOs is a DELAY control. This causes the control waveform to fade in gradually after a note-on is received:



How is this useful? Well, with most instruments, vibrato is not always on - it tends to be gradually introduced during the course of a note. Think of a violinist or an opera singer - they start at a certain pitch and then gradually add vibrato. The LFO DELAY parameter allows us to simulate this (although it must be said that vibrato effects are more naturally controlled with a performance controller such as the modulation wheel).

The V-Station has two independent LFOs available which may be used to modulate different synthesizer sections and each LFO can run at different speeds.

¹ The term 'sample' in this context is not to be confused with the more recent meaning of recording sounds digitally and playing them back from a music keyboard.

Memories

The first generation of synthesizers produced many years ago were large modular instruments where each part of the synthesizer was housed in separate units ('modules'). These modules could only be physically connected together by combinations of cables (known as patch leads or patch cords). A typical sound produced by this method would often involve connecting dozens of patch leads and every time a new sound was required, the leads would have to be physically disconnected and reconnected. The positions and connections of the controls would also have to be noted down on paper if there was to be any hope of creating that particular sound ever again!

However, it was discovered that nine times out of ten, a typical 'patch' (i.e. the collection of modules) followed the same signal path we have seen in this tutorial - i.e. oscillators into mixer into filter into output amplifier with each of these controlled by a few envelopes and LFOs. Thus, manufacturers started making 'hardwired' synthesizers where everything was connected together without the need for patch cords. This made them easier to use, less expensive and also portable. However, it was still not possible to store sounds and control settings had to be noted down in order to re-create any sound. In fact, some synthesists would take Polaroid photos of the panel(s) in an attempt to 'store' a sound's settings!

Around 1977, however, someone had the bright idea of digitizing the front panel controls (i.e. have their position monitored by simple digital circuitry) and use a simple processor to store their positions in battery backed-up memory. As a result, patch memories were born and became a standard feature on all synths and it was possible to recall sounds with a simple press of a button.

Originally, these programmable synths had only a limited number of memories (typically 40 or so) but as processors got better (and cheaper) and memory became cheaper and readily available, manufacturers were able to allow more and more sounds to be stored in memory. Today, a typical synth has locations for *hundreds* of sounds! The V-Station Powercore is no exception with the capacity to store 400 sounds.

Summary

An analogue synthesizer can be broken down into five main sound generating or sound modifying (modulating) blocks.

- 1 Oscillators that generate Waveforms at a certain pitches and a Noise Generator that generates a noise signal for unpitched sounds and special effects.
- 2 A Mixer that combines the outputs from the Oscillators and Noise Generator together.
- 3 A Filter that removes certain harmonics and which changes the tone or timbre of the sound.
- 4 An Amplifier that is controlled by an Envelope Generator that alters the volume of a sound over time when a note is played.
- 5 LFOs and Envelopes that can be used to modulate and control any of the above.
- 6 The combination of all the above can be stored in memories for later recall.

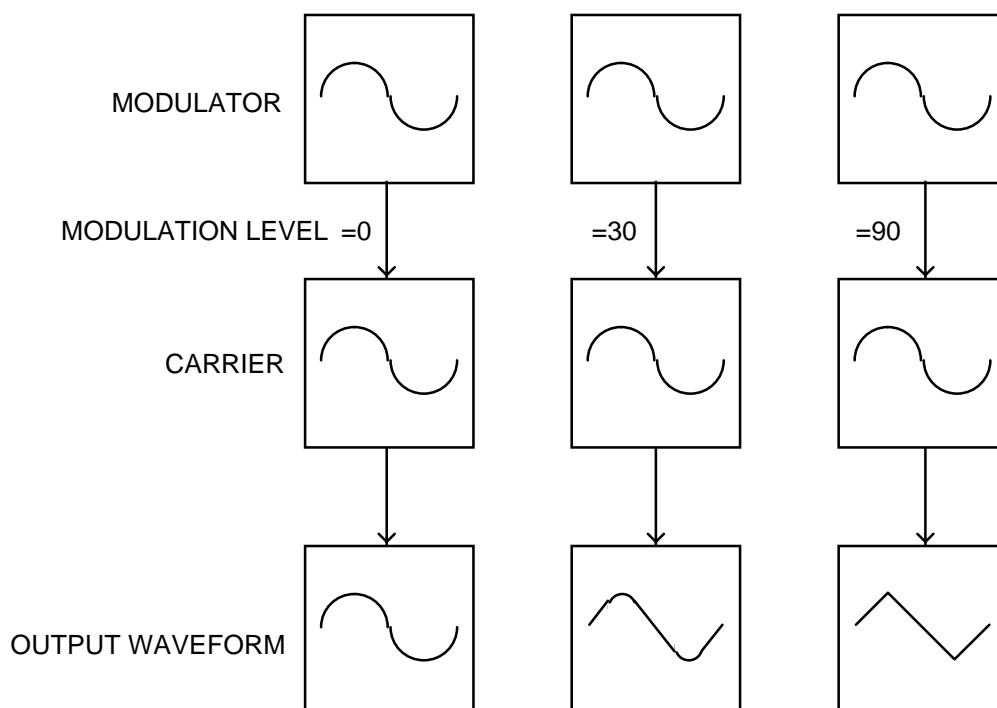
Much of the enjoyment to be had with a synthesizer is with experimenting with the factory preset sounds and creating new ones. There is no substitute for 'hands on' experience. Experiments with altering knobs and buttons will eventually lead to a fuller understanding of how the various controls interact and alter and help create new sounds.

FM synthesis

We have seen how we can create sounds by taking raw waveforms that are rich in harmonics, combining them and processing these through filters and amplifiers under the control of envelopes and LFOs, etc.. However, a form of synthesis was introduced in the 1980s that used a very different technique to create sounds and instead of taking complex waveforms and breaking them down with filters, you start with simple waveforms and build more complex ones. This technique was known as 'FM synthesis'

FM Synthesis is the technique of using one waveform to Frequency Modulate - FM - another to produce a more harmonically complex waveform. A 'modulator' is fed into a 'carrier' and as the output of the modulator is increased, the waveform of the carrier becomes more and more complex as harmonics are introduced.

The following diagram illustrates that the higher the modulation level between the modulating wave and the carrier wave, the more the output waveform changes.

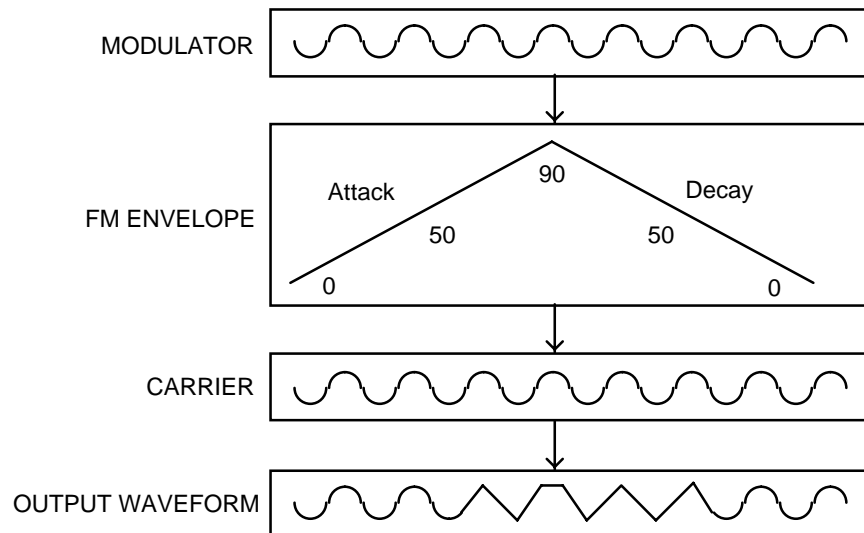


In the illustration, the oscillators are producing sine waves. Many different sounds are possible using this technique and they rely on the frequency and modulation level of the modulator into the carrier.

However, as we have seen, the tone of an instrument rarely stays static during a note. It can be deduced that if modulation level controls the output waveform, if we can control that level somehow, we can cause tonal changes to occur.

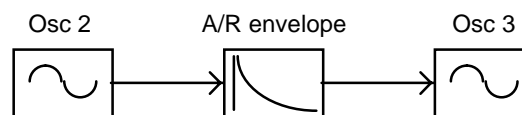
In FM synthesis, an envelope generator is inserted between the modulator and the carrier so that there is control over of how much of the frequency modulation is taking place with respect to time.

Adding this envelope constructs the basic FM building block as illustrated below:



It can be seen that as the attack rises (and the modulation level gradually increases), the output waveform becomes increasingly more complex (harmonics are added) and when the envelope is at its peak, the output waveform is approaching a square wave in shape. It then returns to a simple sine wave again as the envelope (and hence the modulation level) decays to zero.

The V-Station Powercore OSC 2 is able to frequency modulate OSC 3 via a dedicated FM envelope:



It is important that it is realised that the FM envelope is used only for FM purposes and is not one of the envelopes available on the V-Station's MAIN panel.

Although the FM synthesis capabilities on the V-Station are not as extensive as those found on other synthesizers that specialise in FM synthesis, it is nonetheless capable of producing some excellent electric pianos and tuned percussion sounds not normally available on subtractive analogue synthesizers. Plus, of course, you can run your FM sounds through the V-Station's filter for a range of sounds not normally possible on FM synths.

The easiest way to be totally familiar with FM is to try out some of the factory presets that employ FM. For example, Program 209 is a bell sound that relies on FM and Programs 135 and 145 are electric pianos - experiment by modifying the various FM settings.

Conclusion

Armed with the knowledge in this chapter, and an understanding of what is actually happening in the machine when tweaks to the knobs and buttons are made, the process of creating new and exciting sounds will become easy.

In the next chapter, we'll see how all this theory relates to the V-Station Powercore.

V-Station MAIN panel

The V-Station Powercore MAIN panel is laid out like a conventional analogue synthesizer:



The design is based on the V-Station Powercore hardware brother, the K-Station and if you have any experience with that synthesizer, the V-Station Powercore will be immediately familiar to you.

The MAIN panel houses all the main parameters associated with the creation and editing of a sound. The sections are logically laid out to be representative of the signal flow (i.e. oscillators into mixer into filter into amplifier). We will look at these in turn during this chapter.

Oscillators

The oscillators generate pitched waveforms (as described in the Synthesis Tutorial chapter).



Most of the controls that determine the pitch and waveform of the oscillators and how they react to modulation are in this area.

OCT LEDs

Sets the basic pitch of Oscillator 1, 2 or 3 in Octave jumps. To change the basic pitch of the selected oscillator to +1 octave for example, simply click on the red LED.

Note : The 0 position corresponds to the pitch of 440Hz when the note A above middle C is played (and SEMI and DETUNE are also set to 0 or zero).

SEMI knob

Raises or lowers the selected oscillators pitch in semitone increments up/down to a full octave. By setting the pitch of Oscillator 1 to zero and adjusting the pitch of Oscillator 2 and 3 by differing amounts results in some musically pleasing intervals. Settings of 5 (a perfect 4th), 7 (a perfect 5th), 3 (minor 3rd), 4 (major 3rd), 8 (minor 6th) and 9 (major 6th) offer the best results.

DETUNE knob

Sets the detune amount in cents for the selected Oscillator 1,2 or 3. If it is set fully clockwise, the oscillator's pitch will be 50 cents sharper than its basic pitch, fully anticlockwise and it will be 50 cents flat.

Slight detuning between each oscillator will enrich the sound by introducing a beating between the oscillators (in the same way a 12-string guitar sounds richer than a 6-string). Bass and lead sounds can be fattened up using a small amount of detune. Large amounts of detuning will lead to more extreme effects.

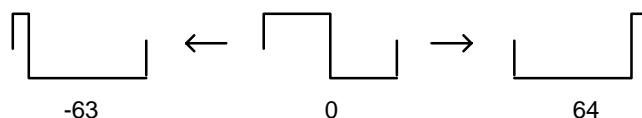
WAVE select LEDs

These select the chosen oscillator's waveform. To select the waveform, simply click on the red LEDs as appropriate.

PWM (Pulse Width Modulation) knob / PWM select LEDs

The function of the PWM knob is dependent on the selection made with the three LEDs to its immediate right. With the POS setting selected, the position of the PWM knob will manually control the pulse width of a square waveform (the selected waveform for the oscillator must be square wave for this to happen).

With the PWM knob in the central position and with the square wave selected, the wave is a perfect square wave and gives the characteristic 'hollow' quality not unlike a clarinet. As the knob is adjusted clockwise or anticlockwise, the pulse width becomes narrower producing what is known as a Pulse Wave.



A pulse wave has a different complement of harmonics and sounds thinner and more 'nasal' and more like an oboe.

With LFO 2 setting selected, the width of the Pulse Wave may be modulated by LFO 2. The intensity of this modulation is determined by the PWM knob. With the Pulse Width knob at central position there is no effect. Turning clockwise or anticlockwise introduces the effect. Continuous variation in the width of a pulse waveform (which is what is happening when LFO 2 is modulating it) changes the harmonic content. This is pleasing to the ear, especially at lower pitches where all the associated harmonics fall within the audio range. This creates the classic PWM sound, as described below.

When modulated by the MOD ENV setting, the effect is most apparent when using fairly long Mod Env Attack and Decay times.

However, the PWM control on the V-Station is not limited only to varying the width or 'symmetry' of the square wave - it can also be used with the other waveforms available for each of the V-Station's oscillators (see the next page for details).

Obtaining a classic Square/Pulse PWM sound

The PWM sound is one of the classic analogue synthesizer sounds. Select one of the factory initialisation sounds (300 - 499) All of these initial sounds use only Oscillator 1's sawtooth wave as the source waveform. Select the square waveform. Notice how the timbre changes from a bright sound to a more 'hollow' sound. Select POS using the select LEDs.

Rotate the PWM knob and notice how the sound changes to a very thin nasal sound when the knob is towards the clockwise or anticlockwise end stop positions. (Infact the sound will extinguish completely at maximum settings). Leave the knob at the 12 O'clock position.

Select LFO 2 using the select LEDs. Slowly rotate the PWM knob. Notice that there will now be some movement in the sound. Rotate LFO2's SPEED knob and notice how the speed of the movement will change. Experiment with the above controls until the desired sound is achieved.

Obtaining a Double Saw detuned sound.

A thick 'Double Saw' detuned sound using just a single oscillator may be created easily. If necessary this sound can be stacked using additional oscillators to produce a 'huge' sound. Select one of the factory initialisation sounds (300 - 499). All of these initial sounds use only Oscillator 1's sawtooth wave as the source waveform. Select POS using the select LEDs.

Rotate the PWM knob fully clockwise. As the control is rotated, a double sawtooth wave is generated. At this fully clockwise position the pitch will appear to double.

Select LFO 2 using the PWM select LEDs. Slowly rotate the PWM knob. Notice that there will be some movement in the sound. Select a triangle LFO wave for LFO2 and rotate LFO2's SPEED knob - notice how the speed of the movement will change. Select a sawtooth LFO wave for LFO2 and set the PWM amount for osc 1 to its maximum setting. Rotate LFO2's SPEED knob - notice how it sounds like there are now two waveforms and the speed of LFO2 will change the detune amount between these waves. Experiment with the above controls until the desired sound is achieved.

MOD ENV Knob

Controls the amount of pitch modulation to an oscillator from the Mod Envelope. In the centre position there is no effect on the oscillator's pitch; anticlockwise the effect is negative (i.e. the pitch drops and then rises) and clockwise positive (the pitch rises and then falls).

LFO 1 Knob

Controls the amount of pitch modulation to an oscillator from LFO 1. It controls how much above and below the basic pitch the oscillator regularly rises and falls. If the LFO is set to triangle wave and the LFO's speed knob is above the centre of its range, this will produce a vibrato effect. Other effects like a siren or sea gull cry are possible with more extreme settings.

Some additional oscillator parameters can be found on the EXTRA page. These are described on Pages 58 – 70.

Mixer

The V-Station's mixer makes it possible to combine the outputs of Oscillators 1, 2 and 3, the Noise source and the Ring modulator.



The ability to mix together any (or all) of these sound sources makes it easy to create complex timbres.

OSC 1, OSC 2 & OSC 3 Knobs

Controls the volumes of the three oscillators. Fully anticlockwise results in no signal. In this position and with all the other Mixer levels turned down, there will be no audio output. Fully clockwise results in full volume for this oscillator.

NOISE

Controls volume of the White Noise Generator. White Noise is useful for creating sound effects such as wind, explosions and many other unpitched sounds.

RING 1+2

Controls the volume of the Ring Modulator. As we saw in the Synthesis Tutorial, the ring modulator takes the outputs of Oscillators 1 and 2 and produces enharmonic overtones and frequencies. As such ring modulation is useful for creating harder metallic tones.

SOLO buttons

Alongside each knob is a LED that can be clicked on to solo the associated sound source. This can be useful when setting up a sound as it allows you to isolate the sound sources so that you can concentrate solely on that element of the overall sound. When a source is solo'd, the button flashes.

Filter

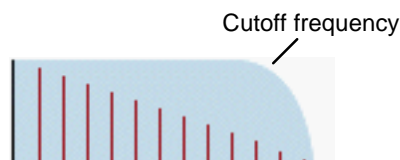
Filter

The V-Station Powercore filter is a 'Multimode' filter. This means that there are several different filter types available for use. The V-Station Powercore filter can be set to either a Low Pass, High Pass or Band Pass type. A Low pass filter removes frequencies above the Cutoff frequency. A High Pass filter removes frequencies below the cutoff frequency and passes frequencies above the cutoff frequency. A Band Pass filter only allows a narrow band of frequencies centered at the cutoff frequency to pass. All other frequencies are removed.

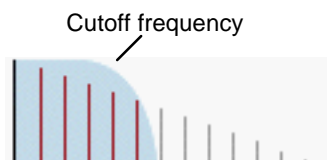


FREQ Knob

This controls the basic cutoff frequency of the filter. For the Low Pass filter when this is set fully clockwise, the filter is wide open allowing all frequencies (harmonics) produced by the oscillators to pass through.



As the knob is turned anticlockwise, the filter closes, cutting out harmonics, starting with the highest, then increasingly lower ones until only the fundamental (or nothing at all is allowed to sound - fully anticlockwise).



Note : If there is silence when the VOLUME knob is turned up, it is most likely that the filter is fully closed. Turn the FREQ knob clockwise to open the filter.

If the High Pass filter type is selected, the opposite would be true - as the FREQ knob is turned *clockwise*, the filter closes, cutting out harmonics, starting with the *lowest*, then increasingly *higher* ones until nothing at all is allowed to sound - fully anticlockwise).

A different effect is produced if the Band Pass filter type is selected as it is not possible to fully open this type of filter. A narrow band of frequencies centered around the cutoff frequency are allowed to pass through, all other frequencies are removed. As the FREQ knob is turned *clockwise*, the cutoff frequency increases and so the narrow range of frequencies allowed to pass will also increase.

RES Knob

This knob controls the resonance of the filter. The control will boost frequencies at the cutoff frequency. On some synthesizers, this control is known as Emphasis since it will emphasise certain frequencies. At the zero position (i.e. fully counter-clockwise) there is no effect. Turning clockwise slowly introduces the emphasis.

Set fully clockwise, the filter will begin to self - oscillate, producing a new pitched element (similar to feedback on an electric guitar).

Note : At least a small signal must be fed into the filter in order for the resonance to take effect. It is not possible for the filter to self - oscillate if no signal at all is fed into it.

If the V-Station produces a high pitched whistling sound, it is probably due to this knob having been adjusted too far clockwise. If this self-oscillating effect is not desired, keep the resonance control away from the extreme clockwise setting. Increasing the resonance is very good for bringing out modulation (movement or change) in the filter cutoff frequency, such as in Acid bass lines and other very edgy sounds.

Q NORM Knob

Controls the Resonance Normalise. At zero, when resonance is applied, the main audio signal will remain at normal levels. Adjusting clockwise will reduce the signal level in relation to the resonance level.

This feature enables the filter to emulate many of the classic filters such as the Moog type, Oberheim type and Roland TB303* type.

O-DRIVE Knob

Controls how much the filter is overdriven. When used in large amounts it will have the effect of making the sound richer and slightly distorted.

MOD ENV Knob

Controls the amount of change to the filter cutoff (set by the FREQUENCY knob) by the Modulation Envelope.

In its central position there is no change to the filter cutoff frequency.

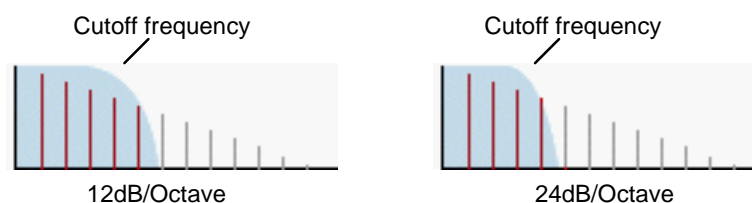
Adjusting the knob clockwise from centre will introduce an increasing amount of positive modulation - the cutoff will rise through the MOD ENV's attack and will fall through the MOD ENV's subsequent decay and release stages.

Adjusting the knob anticlockwise from centre will introduce an increasing amount of negative modulation and the MOD ENV effect will appear to be 'upside down' (i.e. the attack stage of the MOD ENV will force the cutoff frequency down and the decay / release stage will cause the cutoff to rise or 'open')

SLOPE LEDs

Controls how drastically the frequencies above, below or around the cutoff point are removed from the sound depending on the type of filter selected.

For the low pass filter when the 12dB position is selected, the cutoff slope is gentle so higher harmonics are not attenuated (reduced in volume) as sharply as they are when the 24dB position is selected.



KEYTRACK Knob

Controls the amount of change to the filter cutoff (set by the FREQUENCY knob) by the pitch of the note played. Set fully anticlockwise, there is no change to the filter cutoff frequency as pitch increases. With clockwise movement there will be an increasing amount of modulation and the filter cutoff frequency will increase as higher notes are played on the keyboard. This control is used to define how the timbre of a sound changes over the keyboard.

At the fully clockwise position, the filter tracks the pitch changes in a 1 to 1 ratio. This means that with RESONANCE set to a high level, the pitch of the filter's self - oscillation will increase in semitone steps as notes are played on the keyboard. This effect is akin to adding an extra (Sine Wave) oscillator to the sound when notes are played on the keyboard.

LFO2 Knob

Controls the amount of change to the filter cutoff (set by the FREQUENCY knob) by LFO 2. In its central position there is no change to the filter cutoff frequency.

Adjusting the knob clockwise from centre will introduce an increasing amount of positive modulation - i.e. the filter will open and close at a rate set by LFO2's SPEED control.

Adjusting the knob anticlockwise from centre will introduce an increasing amount of negative modulation - i.e. the filter will close and open at a rate set by LFO2's SPEED control.

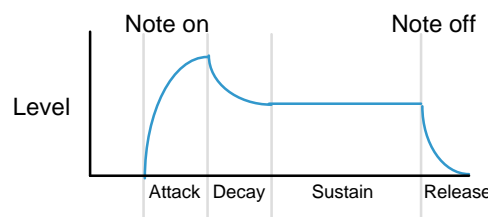
Amplifier and Mod envelopes

The V-Station's envelopes are used to shape a sound throughout its duration. The AMP ENV determines the volume of the sound with respect to its duration.

The MOD ENV may be used to control other sound elements of the synthesizer throughout the duration of the sound. It can control oscillator pulse width, filter frequency and oscillator pitch.



Using the controls associated with the two envelopes, you can 'shape' the sound:



ATTACK Knob / Slider

Sets how quickly the envelope rises to its maximum level when a note is struck. Fully anticlockwise and this rise time or slope is very fast increasing exponentially to twenty seconds when fully clockwise. To shorten attack times, turn this control towards zero and to lengthen attack times, turn this control towards maximum.

Note : When the attack time is set to zero, the instantaneous rise time of the Envelope may produce audible 'clicks'. This is not a faulty condition and may be useful for the creation of certain sounds (for example, 'key clicks' on organ simulations). If this is undesirable, increase the Attack time until the clicks are inaudible.

DECAY Knob / Slider

Sets how quickly the envelope falls to a sustain level after the maximum level has been reached. Set to zero, this time is very fast increasing exponentially to twenty seconds when set to maximum. To shorten decay times, move this control towards zero and to lengthen decay times move this control towards maximum.

SUSTAIN Knob / Slider

Sets the level at which the envelope remains following the Decay phase, only while a key is being held on a controller keyboard (or there is a MIDI Note On command present). When set to zero, the envelope will decay to zero without being interrupted. As the control is moved towards maximum, the sustain level increases until, when at maximum, the sustain level is at its maximum level.

Note: When SUSTAIN level is set to maximum, the DECAY control has no effect - with sustain at full, there's nothing to decay down too!

RELEASE Knob / Slider

Sets how quickly the envelope falls from the sustain level to zero once the note has been released. When set to zero, this time is very fast (instantaneous to the ear) increasing exponentially to twenty seconds when set to maximum. To shorten release times, move this control towards zero and to lengthen release times, move this control towards maximum.

Additional settings associated with the Envelopes can be found on the EXTRA page. These are described on Pages 58 – 70.

Low Frequency Oscillators (LFOs)

There are two LFOs - Low Frequency Oscillators - available on the V-Station. These produce regular electronic variations which are too low to be heard but can be used to modify or control various elements of the sound such as pitch (vibrato), oscillator pulse width or filter cutoff frequency.



SPEED Knob

Controls the speed of the low frequency oscillations. An LED directly above the knob indicates the speed. Faster speeds are set by turning the knob clockwise. These are suitable for vibrato and tremolo effects. Slower speeds are more appropriate for Pulse Width changes, slow filter sweeps or special effects.

DELAY Knob

Controls how long after the note is struck the selected LFO begins to take effect. Fully anticlockwise and the selected LFO effect will begin immediately. Turning clockwise will cause the LFO effect to fade in. The time of the fade in is dependent on the knob position. This is used for delayed vibrato and other effects.

WAVE LEDs

Selects the waveform shape.

- The triangle waveform gives the smoothest continuous change in level to the LFO. When routed to pitch, it introduces vibrato or a siren effect dependent of its speed setting. When routed to filter cutoff, a 'wow wow' effect results.
- The sawtooth waveform generates a rising level which then jumps back up to zero level. Routed to the filter cutoff, it produces a rhythmic pulse effect. Routing it to pitch produces siren type sounds. Routing to pulse width for any of the oscillators at maximum PWM amount setting will generate a double waveform with a detune dependant on the LFO speed (see page 29).
- The square waveform changes level instantly from minimum to maximum. This waveform is useful for musical trills and computer game effects.
- Sample & Hold. At a regular interval (governed by the SPEED knob), the level of the LFO jumps to a new random level and stays there until the next jump. This creates a rhythmic effect particularly if routed to the filter cutoff. Routing this to pitch gives a less musical result, but is useful for computer or machinery sound effects.

Additional settings associated with the LFOs can be found on the EXTRA page. These are described on Pages 58 – 70.

Master section

Although unlabelled as such, this section houses certain 'master' controls that affect the V-Station



PROGRAM and Randomiser LED buttons

These two buttons determine the controls that are displayed in the rest of this screen. When the Program LED is lit the compare, write and confirm buttons and the volume pot are shown.

PROGRAM up/down buttons

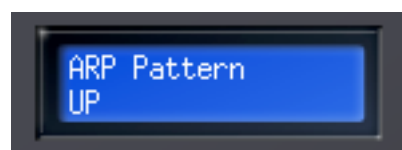
Use these to select programs in the V-Station. You can click on them individually to go through the sounds one-by-one but if you click *and hold* these buttons, the program selection will increment / decrement in units of 10 to make program selection quicker and easier.

VOLUME Knob

This control adjusts the overall output volume on the main master audio outputs. This control can be useful for preventing distortion on your sequencer's mixer.

LCD

This 'virtual' LCD allows you to see program numbers and names. However, when you move the cursor over any knobs and switches, after a short delay, the parameter name and its value is shown on the LCD:

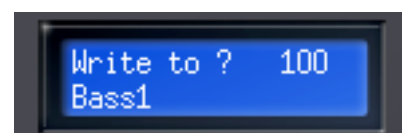


COMPARE button

Clicking *and holding* this button when editing a sound allows you to compare the original with your edited version.

WRITE button

Allows you to write any sounds you edit or create to the V-Station's memory. Clicking on this will put a prompt in the LCD:



If you want to over-write the existing sound, simply click on CONFIRM - the sound will be written to the current location.

Note : The destination memory is always initially set to the currently selected program's number.

If you want to save the sound in a different location (thereby retaining the original sound in its original location), using the PROGRAM up/down buttons, select the destination memory and click on CONFIRM.

To cancel the WRITE operation, simply click on WRITE again.

Notes about editing programs

When you select a sound, you can start editing it immediately simply by tweaking the controls and no special 'edit' mode is required. However, please note that if you do edit a sound, should you then select another, by default, the edits you made to the previous sound will be lost. However, it is possible to overcome this: In the GLOBAL page, there is a preference - AUTO WRITE - which, when enabled, will automatically write programs to memory if another program is selected. By default, this is off.

With AUTO-WRITE enabled, selecting another sound will automatically write your edited version before the next sound is selected.

CONFIRM button

As described above, the CONFIRM button is used to confirm the act of writing a program to memory.

VOICE METER

Below the Master section is a voice meter that shows how many voices are being used. The V-Station Powercore is capable of 8-voice polyphony.

MIDI indicator LED

This flashes whenever a MIDI note is received. If this LED does not flash when a note is played, there is a problem with MIDI reception.

Randomiser Section

Although unlabelled as such, this section houses certain 'master' controls that affect the V-Station



PROGRAM and Randomiser LED buttons

These two buttons determine the controls that are displayed in the rest of this screen. When the Randomiser LED is lit, the controls concerned with random patch generation are shown.

AMOUNT

The amount control selects the strength of the randomization as applied according to the setting of the synth and fx LEDs and the RND-Factor pot.

Synth / FX LEDs

These LEDs select if the randomize feature applies to the synthesizer section only, the effects section only or to both the effects and synthesizer simultaneously. A lit LED means that this section will be effected by the randomize facility.

RND-Factor

To make the randomize facility as useful as possible this control determines which of the synthesiser and effects parameters are included in the randomize process. At low settings very few parameters are included – eg just filter cutoff frequency and oscillator levels at moderate settings, more parameters are included such as envelope controls. At extreme settings, almost all V-Station power core settings can be altered with the randomizer. Most musically useful random patches will be generated with a low RND-Factor setting, wild special effects sounds are easily generated with high levels of RND-Factor.

Randomise button

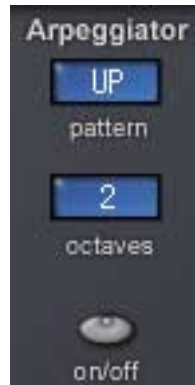
The randomize button is used to generate a random patch once the other settings have been set appropriately.

Undo button

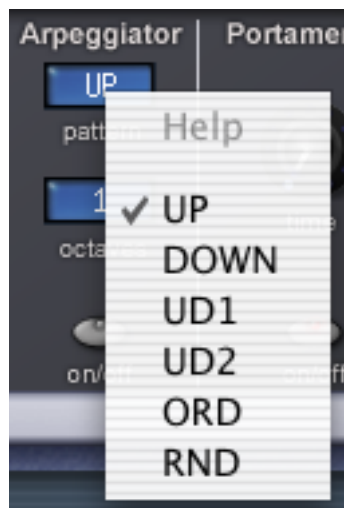
As the name of this control implies, the undo button will undo a random generation. Is this unlimited undo?

Arpeggiator

The V-Station includes an Arpeggiator which breaks down chords into single notes and plays them one at a time. For example, if a 'C' triad chord is held, the notes C, E and G will play one by one in sequence. This section of the MAIN panel allows you to select the arpeggiator's pattern and range.



PATTERN menu



This determines the Arpeggio pattern played by the Arpeggiator. There are six types of pattern available :

UP	The arpeggio starts at the lowest note played and sweeps up through the notes until it reaches the highest note. It then starts at the bottom again and repeats the sequence.
DOWN	The arpeggio starts at the highest note played and sweeps down through the notes until it reaches the lowest note. It then starts at the top again and repeats the sequence.
UD1	Up / Down : The arpeggio starts at the lowest note played and sweeps up through the notes until it reaches the highest note. It then sweeps back down. This is useful when playing three notes in songs with a 3/4 time signature.
UD2	Up/Down - end repeat: The arpeggio starts at the lowest note played, plays it twice, and sweeps up through the notes until it reaches the highest note. It then plays the top note again and sweeps back down.
ORD	Order Played: The arpeggio plays the notes in the order they were played on the keyboard. Once at the end of the notes played it repeats the sequence.
RND	Random: Notes played will be arpeggiated in a random order.

RANGE menu

Sets how many octaves the Arpeggio pattern will sweep through. The sweep range is selectable from 1 to 4 octaves.

ON / OFF Button

This activates / deactivates the Arpeggiator. While the Arpeggiator is activated, the LED in the button will be lit.

There are other parameters related to the arpeggiator on the EXTRA page. These are described on Pages 58 – 70.

Portamento

Portamento (sometimes known as GLIDE) is an effect where notes will slide smoothly from one pitch to the next.



Normally, when you play, notes just 'play' - they change pitch instantly as you would expect. However, with portamento applied, the notes will slide from one to another at a rate determined by the portamento TIME control. This can be useful for simulating certain instruments such as fretless bass, trombone, etc., but is also a rich source of synth sounds and effects not least of which, of course, is an emulation of the famous Theremin.

Increasing the portamento TIME control clockwise will slow the time taken for the pitch of the first note to reach that of the second note played. With this control set to zero, when the keyboard is played, the pitches of notes change instantly from one pitch to another. Turning the knob clockwise introduces the portamento effect.

The ON / OFF switch allows you to enable / disable the effect.

Other PORTAMENTO functions are available in the EXTRA page. See Pages 58 – 70 for more details.

Effects section

At the bottom right of the V-Station's panel is a section where you can program the V-Station Powercore effects.



The V-Station Powercore has six effects - delay (echo), reverb, chorus (which can also produce flanging and phasing effects), distortion, EQ and panning - which can be used simultaneously. To edit the effects, simply click on the LEDs. As the different effects are selected, the controls to the right of the LEDs change to reflect the controls available for the currently selected effect type. One control, however, that is consistent to all six effects is the LEVEL control - this sets the level of the signal going to the selected effect - the higher the level, the more of the effect you will hear.

Another parameter that is consistent between all six effects is the ON/OFF switch - this is used to disable all six effects in one convenient action. If you want to remove one effect from the chain, set its LEVEL control to zero (i.e. fully counter-clockwise).

Delay

The first effect in the list is DELAY. The delay effects parameters are:

TIME Knob

Controls the amount of time it takes for the delayed signal to be heard after the original signal.

FEEDBACK Knob

Controls how much of the delayed signal is fed back into the delay input. No feedback produces a slapback echo effect - just one delayed sound with no repeats. Small amounts of feedback produce repeated sounds resulting in a multiple echo effect. Large amounts of feedback can produce infinite echoes.

WIDTH Knob

This sets the Stereo spread between the long and short Delay times. With a width setting of zero, both delays appear in the middle of the stereo field (Mono). At maximum width setting, the longer delay will appear on one output and the shorter on the other, producing a dramatic stereo effect.

RATIO Menu

The V-Station's delay effect is actually a stereo delay and it is possible to set different delay times on the left and right audio outputs. The RATIO menu allows you to select the ratio of the longest delay time and the shorter delay time into timings that are musically useful. The following ratios are available:

Delay Ratio Left / Right
1/1
4/3
3/4
3/2
2/3
2/1
1/2
3/1
1/3
4/1
1/4
1/OFF
OFF/1

A simple, equal 1 to 1 ratio is the first entry in the table. This setting sends a delay of equal time to the left and right output channels. The number in the left column of the table indicates the ratio of the delay time that will be in the left channel versus the number in the right column.

For example, if a delay of twice the time is required in the left channel compared to the right, select the 2/1 option. The final 1/OFF and OFF/1 options will result in no delay being heard in the channel indicated by the 'OFF'.

Note: Selecting a 1/1 ratio will produce a mono effect regardless of the stereo WIDTH setting since the timing of the echos are equal.

SYNC RATE Menu

Enables the time of the Delay repeats to be synchronised to the tempo of a song. The following table gives the range of synchronisation values available.

Menu Item	MIDI Clocks	Synchronised to
OFF	-	Manual Rate
32nd T	2	32nd Triplet
32nd	3	32nd
16th T	4	16th Triplet
16th	6	16th
8th T	8	8th Triplet
16th D	9	16th Dotted
8th	12	8th
4th T	16	4th Triplet
8th D	18	8th Dotted
4th	24	4th
2nd T	32	2nd Triplet
4th D	36	4th Dotted
2nd	48	2nd
1bar T	64	1 Bar Triplet
2nd D	72	2nd Dotted
1 bar	96	1 Bar
2bar T	128	2 Bar Triplet
1bar D	144	1.5 Bars
2 bars	192	2 Bars

When a sync interval is selected, the delay time is controlled by the sequencer's tempo when MIDI clock source is set to EXT (the default). If the MIDI clock source is set to INT, the Arpeggiator's TEMPO knob controls the delay time.

Note : When Sync Rate is set to OFF, the timing of the delay repeats will be controlled by the setting of the delay effect's Time control. Any incoming MIDI clock messages or Arpeggiator TEMPO settings will be ignored .

Reverb

The Reverb Effect is an electronic simulation of a room or building that is acoustically reflective.

When a sound is made in a room or large building, there are sound reflections from all directions. Unlike echo where you hear each reflection individually, the reflections in a reverberant space 'smudge' together to create the reverb sound we are familiar with. When a reverb effect is applied, it is these 'smudged' reflections of the sound that are being added.



LEVEL Knob

Sets the amount of signal going to the reverb. As the control is turned clockwise, so you will hear more reverb.

DECAY Knob

This sets the time it takes for the Reverb to die away after the original sound has decayed. Very acoustically reflective rooms (like those with metal or glass surfaces) tend to have long decay times and non-reflective rooms have short ones.

TYPE Menu

Different types of rooms and halls have different acoustics and, therefore, different reverb characteristics. The V-Station's reverb processor features six different reverb types. These range from a small room to a large hall:



Experiment with different types of reverb, noting how different 'rooms' affect the acoustic properties of the sound.

Chorus

This effect was originally designed to simulate the sound of many people singing together (hence the name 'chorus'). Instrumentally, consider the sound of a 12 string guitar compared to a 6 string guitar. The very slight detuning of the individual strings actually gives a richer quality to the sound.



Chorus is an effect produced by mixing a continuously delayed version of the audio signal back with the original. The timing of the delayed version is very small and is controlled by the chorus's own internal LFO (not to be confused with the two LFOs available on the V-Station's MAIN panel). The characteristic swirling chorus effect is the result.

The V-Station Powercore chorus is a stereo unit which adds width as well as depth to the sound.

The V-Station Powercore chorus is also capable of behaving as a phaser. The way a phaser works is in fact entirely different to the chorus. A portion of the audio signal is split off and phase shifted at certain frequencies. It is then mixed back with the original signal to generate the characteristic swishing effect. The controls are:

LEVEL Knob

Sets the amount of signal going to the chorus. As the control is turned clockwise, so you will hear more chorus.

CHORUS / PHASER LEDs

Determines whether the V-Station's chorus behaves as a standard chorus or as a phaser.

RATE Knob

Controls the rate or speed of the chorus effect. At very slow speeds (and with DEPTH and FEEDBACK set fairly high), the chorus can also be used as a flanger.

Note : The dedicated chorus LFO should not be confused with the two LFOs available on the V-Station Powercore MAIN panel.

FEEDBACK Knob

Controls how much of the delayed signal is fed back to the input of the chorus generator. The chorus effect benefits from low levels of feedback. When acting as a flanger or a phaser, the effect often requires higher levels of feedback.

MOD DEP Knob

The chorus has its own LFO which is continuously changing the delay time. Mod Depth sets how much of the fixed delay time is being modulated. Large amounts of modulation will produce a more noticeable effect. Moderate amounts are recommended.

Note : The dedicated chorus LFO should not be confused with the two LFOs available on the V-Station Powercore MAIN panel.

CENTRE Knob

The stereo chorus can actually be thought of as two continuously variable delays. The delay variations are being controlled by the chorus dedicated LFO. The LFO is constantly moving the two delay amounts from minimum to maximum. When one delay is at max, the other is at min (hence the stereo effect).

The Centre control moves the middle point between the Min and Max values. Experiment with this control for the desired effect.

INIT POS Menu

As well as being able to synchronise to MIDI clock (tempo), the chorus LFO may have its initial position set after a specific MIDI event is received (see the Global Sync Mode function on Page 75).



The initial positions available are shown in the screen shot above. For example, if the chorus initial position sync is set to RIGHT, after an appropriate MIDI event, the chorus effect will start from the right and move to the left. If set to CENTRE, the chorus will start from the centre, move to the left and then across to the right and back to centre and so on. If set to OFF, the movement will be 'free-running' for every note.

SYNC RATE Menu

Similar to Delay Sync, the chorus unit's internal LFO may be synchronised to internal or external MIDI clock tempo. The available Sync resolutions are the same as those we saw in the delay section but with the addition of longer LFO sweeps:

Menu Item	MIDI Clocks	Synchronised to	Menu Item	MIDI Clocks	Synchronised to
OFF	-	Manual Rate	1bar D	144	1.5 Bars
32nd T	2	32nd Triplet	2 bars	192	2 Bars
32nd	3	32nd	4bar T	256	4 Bar Triplet
16th T	4	16th Triplet	3 bars	288	3 Bars
16th	6	16th	5bar T	320	5 Bar Triplet
8th T	8	8th Triplet	4 bars	384	4 Bars
16th D	9	16th Dotted	3bar D	432	4.5 Bars
8th	12	8th	7bar T	448	7 Bar Triplet
4th T	16	4th Triplet	5 bars	480	5 Bars
8th D	18	8th Dotted	8bar T	512	8 Bar Triplet
4th	24	4th	6 bars	576	6 Bars
2nd T	32	2nd Triplet	7 bars	672	7 Bars
4th D	36	4th Dotted	5bar D	720	7.5 Bars
2nd	48	2nd	8 bars	768	8 Bars
1bar T	64	1 Bar Triplet	9 bars	864	9 Bars
2nd D	72	2nd Dotted	7bar D	1008	10.5 Bars
1 bar	96	1 Bar	12bars	1152	12 Bars
2bar T	128	2 Bar Triplet			

When a sync interval is selected, the rate of the chorus effect's LFO is controlled by the sequencer's tempo when MIDI clock source is set to EXT (the default). If the MIDI clock source is set to INT, the Arpeggiator's TEMPO knob controls the chorus unit's LFO rate.

Note : When Sync Rate is set to OFF, the rate of the chorus LFO will be controlled by the setting of the chorus effect's Rate control. Any incoming MIDI clock messages or Arpeggiator TEMPO settings will be ignored by the chorus effect.

Distortion

Distortion is an effect commonly used by guitar players. However, it is now increasingly used in the production of modern dance music. The V-Station Powercore distortion effect gives the sound a hard edged, distorted and dirty kind of quality.



LEVEL Knob

Sets the amount of signal going to the distortion. As the control is turned clockwise, so you will hear more distortion.

COMP Knob

If distortion is added to a sound, it will tend to get louder. In order to reduce the level of the sound back to a level which is consistent with other programs, use this function which compensates for the perceived added loudness of a sound when distortion is added.

EQ (Equalisation)

Contained in the Effects section is an EQ filter which can boost or cut high (treble) or low (bass) frequencies in a similar manner to the 'tone' controls often found on domestic hi-fi units.



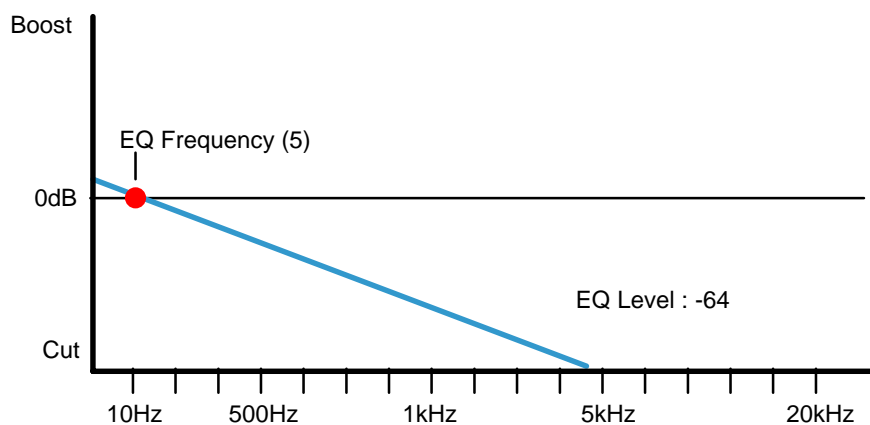
As well as being able to boost low or high frequencies, the final output EQ filter may be used to create automatic sweeps of EQ and filtering. EQ processing may be synchronised to tempo and locked to musical timings from 32nd triplets through to several bars.

LEVEL Knob

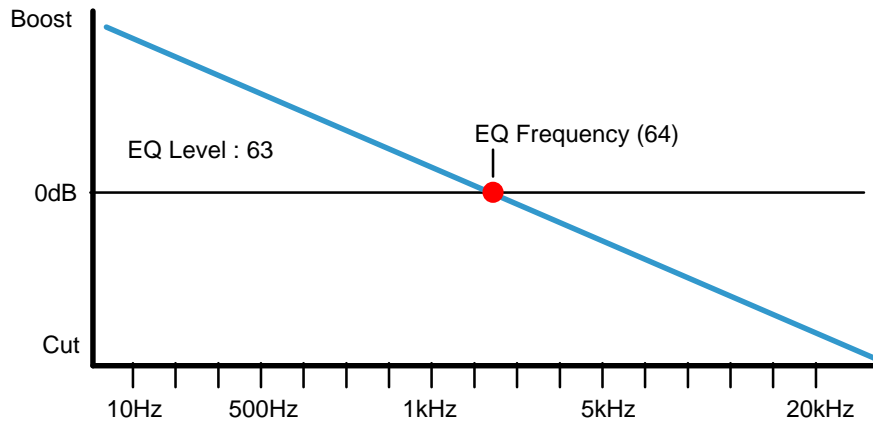
The LEVEL control has a different purpose with the EQ effect in that instead of setting the send level to the effect, it actually sets the amount of cut / boost around the centre frequency.

FREQUENCY Knob

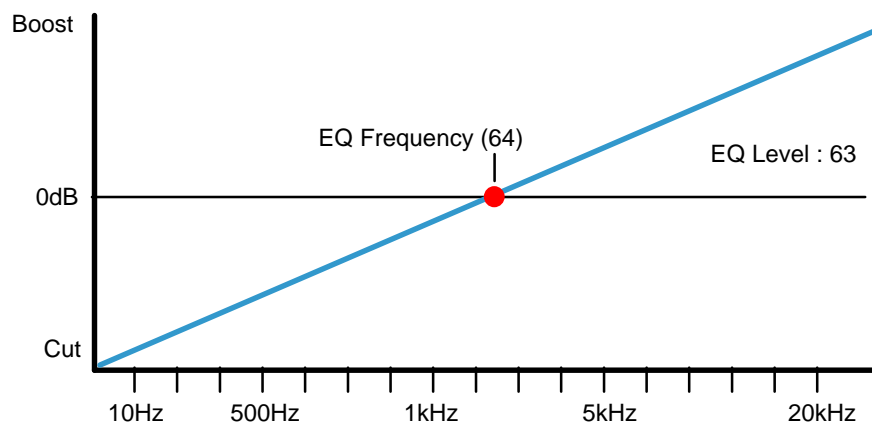
The EQ frequency control determines where in the sound spectrum the boost or cut occurs. The Frequency point may be moved anywhere from very low frequencies (0 = less than 10Hz) to very high frequencies (127 = above 20,000Hz).



Here, *FREQ* is set to 0 (i.e. around 10Hz) and *LEVEL* is set to -64 (cut). As a result, all the high frequency content has been removed.



Here, the *FREQ* control is set halfway (64) and *LEVEL* is set to -64. The result is extreme bass boost (ideal for reinforcing bass sounds).



Here, the *FREQ* is set halfway (64) but level is set to +64. The result is that high frequency components are boosted and low frequency components are attenuated

MOD DEP Knob

The real power of the EQ filter is the ability to move the EQ Frequency with the dedicated LFO. This control (MOD DEP or 'modulation depth') dictates how intense the movements are from the LFO. Any amount of depth will result in dynamic EQ frequency movement at a rate determined by the EQ MOD RATE control. The effect is not unlike that of a mild filter sweep and can be used creatively to augment the V-Station Powercore filter section.

Note : The dedicated EQ LFO should not be confused with the two LFOs available on the V-Station Powecore MAIN panel.

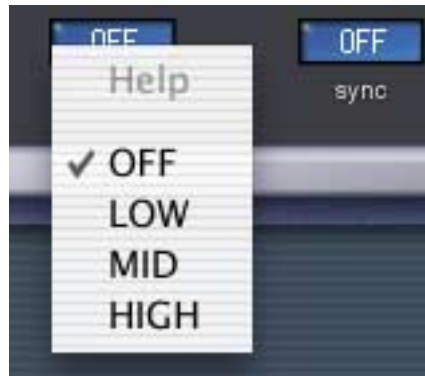
MOD RATE Knob

Determines the rate (speed) of the dedicated EQ LFO. This LFO is able to modulate the EQ frequency (see Mod Depth above).

Note : The dedicated EQ LFO should not be confused with the two LFOs available on the V-Station Powercore MAIN panel.

INIT POS Menu

As well as being able to synchronise to MIDI clock (tempo), the dedicated LFO used to modulate the depth of the EQ may have its initial position set after a specific MIDI event is received.



To change the EQ Initial position, click on this parameter and drag down and release to select one of the initial positions shown below. For example, if the desired position is to start moving upwards then set this function to LOW. After an appropriate MIDI event, the LFO wave will start to climb from this low position. Set to MID and it climbs from the centre of the EQ curve.

Note : The dedicated EQ LFO should not be confused with the two LFOs available on the V-Station Powercore MAIN panel.

SYNC RATE Menu

The rate (speed) of the dedicated EQ LFO may be locked to the tempo of the host sequencer to allow synchronised EQ filtering effects. The following table describes the musical timings available:

Menu Item	MIDI Clocks	Synchronised to	Menu Item	MIDI Clocks	Synchronised to
OFF	-	Manual Rate	1bar D	144	1.5 Bars
32nd T	2	32nd Triplet	2 bars	192	2 Bars
32nd	3	32nd	4bar T	256	4 Bar Triplet
16th T	4	16th Triplet	3 bars	288	3 Bars
16th	6	16th	5bar T	320	5 Bar Triplet
8th T	8	8th Triplet	4 bars	384	4 Bars
16th D	9	16th Dotted	3bar D	432	4.5 Bars
8th	12	8th	7bar T	448	7 Bar Triplet
4th T	16	4th Triplet	5 bars	480	5 Bars
8th D	18	8th Dotted	8bar T	512	8 Bar Triplet
4th	24	4th	6 bars	576	6 Bars
2nd T	32	2nd Triplet	7 bars	672	7 Bars
4th D	36	4th Dotted	5bar D	720	7.5 Bars
2nd	48	2nd	8 bars	768	8 Bars
1bar T	64	1 Bar Triplet	9 bars	864	9 Bars
2nd D	72	2nd Dotted	7bar D	1008	10.5 Bars
1 bar	96	1 Bar	12bars	1152	12 Bars
2bar T	128	2 Bar Triplet			

When a sync interval is selected, the rate of the EQ's LFO is controlled by the sequencer's tempo when MIDI clock source is set to EXT (the default). If the MIDI clock source is set to INT, the Arpeggiator's TEMPO knob controls the EQ's LFO rate.

Note : When Sync Rate is set to OFF, the rate of the EQ's LFO will be controlled by the setting of the panning effect's Rate control. Any incoming MIDI clock messages or Arpeggiator TEMPO settings will be ignored by the EQ's LFO .

Panning

The Panning function in the V-Station performs the same function as the PAN knob on a mixing console. It can be used to position a sound anywhere from left to right in the stereo field.



POS Knob

Uniquely, the PANNING effect does not have a LEVEL control. Instead, it has a POS (an abbreviation for 'position') control to place the sound in the left / right output.

MOD RATE Knob

Controls the panning LFO's speed. If the Mod Depth (see below) is set to a non zero value, the panning LFO will move the sound from the Left to the Right at a speed determined by this Rate setting

Note : The panning LFO should not be confused with the two LFOs available on the V-Station Powercore MAIN panel.

MOD DEP Knob

The panning effect has its own dedicated LFO (not to be confused with the two LFOs available on the V-Station's MAIN panel) which can be used to automatically pan a sound backwards and forwards across the stereo field. This control (an abbreviation of 'modulation depth') controls the depth of this automatic panning effect.

When Mod Depth is set to zero, no automatic panning will be applied and the position of a sound in the stereo field will be static, being solely determined by the POS(ition) control.

INIT POS Menu

As well as being able to be synchronised to a MIDI clock (tempo), the panning LFO may have its initial position set after a specific MIDI event is received.



The initial positions are shown in the screen shot above. For example, if the panning initial position sync is set to RIGHT (Right), after an appropriate MIDI event has been received, the sound will begin in the right output audio channel and then move towards the left. If set to CENTRE, the panning will start at the centre, move to the left then back to the right and then to the centre, etc.. If set to OFF, the panning will be ‘free-running’ for every note.

Note : The panning LFO should not be confused with the two LFOs available on the V-Statio Powercore MAIN panel.

SYNC RATE Menu

A very pleasing audio effect may be heard when the panning effect is synchronised to the tempo of a musical piece. The following table describes the musical timings available:

Menu Item	MIDI Clocks	Synchronised to	Menu Item	MIDI Clocks	Synchronised to
OFF	-	Manual Rate	1bar D	144	1.5 Bars
32nd T	2	32nd Triplet	2 bars	192	2 Bars
32nd	3	32nd	4bar T	256	4 Bar Triplet
16th T	4	16th Triplet	3 bars	288	3 Bars
16th	6	16th	5bar T	320	5 Bar Triplet
8th T	8	8th Triplet	4 bars	384	4 Bars
16th D	9	16th Dotted	3bar D	432	4.5 Bars
8th	12	8th	7bar T	448	7 Bar Triplet
4th T	16	4th Triplet	5 bars	480	5 Bars
8th D	18	8th Dotted	8bar T	512	8 Bar Triplet
4th	24	4th	6 bars	576	6 Bars
2nd T	32	2nd Triplet	7 bars	672	7 Bars
4th D	36	4th Dotted	5bar D	720	7.5 Bars
2nd	48	2nd	8 bars	768	8 Bars
1bar T	64	1 Bar Triplet	9 bars	864	9 Bars
2nd D	72	2nd Dotted	7bar D	1008	10.5 Bars
1 bar	96	1 Bar	12bars	1152	12 Bars
2bar T	128	2 Bar Triplet			

When a sync interval is selected, the rate of the panning LFO is controlled by the sequencer’s tempo when MIDI clock source is set to EXT (the default). If the MIDI clock source is set to INT, the Arpeggiator’s TEMPO knob controls the delay time.

When controlling the panning rate from a sequencer, it is important to ensure that the sequencer is transmitting MIDI Clock messages. Consult the sequencer manual for details.

Note : When Sync Rate is set to OFF, the rate of the panning LFO will be controlled by the setting of the panning effect's Rate control. Any incoming MIDI clock messages or Arpeggiator TEMPO settings will be ignored .

Conclusion

That concludes our examination of the MAIN panel. Armed with the knowledge you have (hopefully!) gained here and the Synthesis Tutorial, you should now be able to make meaningful edits to any of the preset sounds on offer (or even create your own sounds from scratch)

In the next section, we'll look at some of the lesser-used (but no less important) functions of the V-Station Powercore.

EXTRA panel



The EXTRA page is where you'll find the little 'extras' that add a lot to the basic functionality but are only used occasionally and don't warrant cluttering up the MAIN panel.

As on the MAIN panel, the sections are divided up logically. We will look at these in this chapter.

Oscillators



The Oscillator Extra controls are:

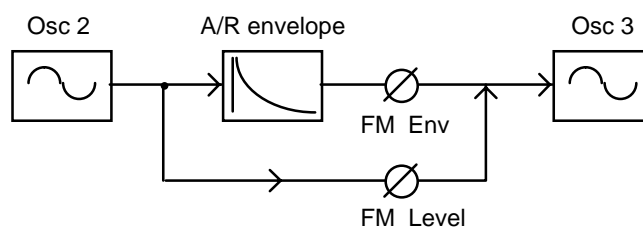
FM LEVEL Knob

The V-Station allows simple FM synthesis to be performed. The FM Level controls the amount that Oscillator 3 is directly Frequency Modulated by Oscillator 2. As the FM Level is increased, so the output of Oscillator 3 becomes more 'metallic' (for a description of FM synthesis, see pages 23 and 24)

FM ENV Knob

As well as being able to frequency modulate Oscillator 3 with Oscillator 2, it is possible to 'shape' the output level of Oscillator 2 with a simple attack / release envelope. As this envelope opens and closes, so more modulation is received by Oscillator 3 and, as we saw in the Synthesis Tutorial, this allows us to dynamically control the harmonic content (and hence the tone) of the output. The FM Level control allows you to set how much the FM Envelope affects the FM process.

The following diagram may help you understand how the two controls interact:



FM LEVEL sets the 'fixed' amount of FM; FM ENV sets the amount of 'dynamic' FM.

UNI DETUNE Knob

Unison Detune is used in conjunction with Uni Voices control. When using more than one voice per note, the Unison detune amount sets how much each voice is detuned relative to the others. Adjust the amount until the desired effect is heard.

VCO DRIFT Knob

Controls the amount of tuning drift for the oscillators. Setting a modest value, 10 for example will cause each oscillator to slowly drift fractionally out of tune. Classic analogue synthesizers were known to gradually go out of tune as the internal circuits heated up. This 'instability' actually helped to give them their own unique character!

PRE-GLIDE Knob

A Pre-glide is applied to the pitch of the oscillators starting at a pitch determined by the Pre-glide amount in semitones. Gliding up from a pitch occurs when the display indicates between -12 to -1, and gliding down from a pitch occurs when the display indicates between 1 to 12. At a setting of 0, no pre-glide is applied.

The time it takes to complete the Glide is determined by the PORTAMENTO knob on the MAIN panel. The Pre-glide is triggered with every note received.

VOICE MODE select LEDs

These options determine how the program will play - i.e. polyphonically or monophonically.

When set to MONO or MONO AG, the Program plays monophonically (i.e. only one note can be sounded at any one time). If a chord is played on the keyboard, it will be noticed that as each individual note is released, the note sounding will revert back to the nearest played note.

The MONO AG setting enables 'Auto glide' (portamento) to be triggered whenever a note is played on the keyboard before the previously held down note has been released (legato playing). Using 'Auto glide' in this way can greatly add expressiveness to a Program. It is especially effective when applied to lead type sounds.

The monophonic settings are often useful when replicating sounds in the 'real world' which would normally be played monophonically, for example a bass guitar.

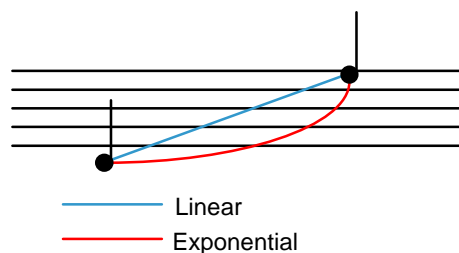
As their name implies, the POLY 1 and POLY 2 settings allow polyphonic operation.

POLY1 allows successive playing of the same note(s) to be 'stacked' together, gradually producing a louder sound texture as the note(s) are repeatedly played.

With POLY2, if the same note(s) are played repeatedly, they will use the same synthesizer voices as used previously, thus avoiding the 'stacked note' effect.

PORTA MODE select LEDs

Determines the type of curve applied when PORTAMENTO is used. Two types of curve are available, Exponential and Linear. Linear Portamento sweeps through note intervals at a constant rate. When Exponential Portamento is used, the glide effect gradually speeds up as it reaches the new note:



OSC 1+2 SYNC Button

This button synchronises Oscillator 1 to Oscillator 2. When the oscillators are synced, Oscillator 1 is the 'master' oscillator to which Oscillator 2 synchronises. Depending on the interval between the two oscillators, you can create new waveforms with oscillator sync enabled and if you sweep Oscillator 2 independently of Oscillator 1 with, say, the LFO or Mod Env or the pitch bend or mod wheel, you can create tearing lead lines and basses.

START PHASE Knob

When synthesising percussive or plucked type sounds, there is a lot of detailed waveform information at the beginning of the sound. It is often useful to have the oscillator wave start in exactly the same place every time a key is pressed.

The start phase option allows the precise starting point of the oscillator wave to be determined. At a setting of 0, the wave will start at zero degrees. Each increment on the control shifts the start point of the wave approximately 24 degrees. The wave will start at a random phase when set to OFF.

UNI VOICES Knob

Unison allows more than one voice to be used for each note played on the keyboard. This effect is useful when a very thick sound is required. The V-Station allows up to eight voices to sound layered one on top of another when just a single note is played.

To listen to the effect, play a series of notes whilst gradually increasing this control and listen to the sound. It will become thicker sounding. Increasing the number of notes to a maximum of 8 will result in very dense sounding textures.

Note: As more voices are assigned to Unison, the available polyphony will reduce accordingly. For example, using 8 voices in Unison mode will result in just one note of polyphony being available!

Arpeggiator



The arpeggiator's extra controls are:

TEMPO Knob

By default, the arpeggiator is set to sync to the sequencer's tempo so that when the arpeggiator is enabled, it automatically syncs to the song you are working on. However, it is possible to override this default so that the arpeggiator is 'free-running' independently of the sequencer's tempo. When the arpeggiator is set to free-run, the TEMPO knob controls the arpeggiator's speed. Under normal circumstances, this control has no effect - only when you have specifically disabled external MIDI clock sync does this control have any effect.

GATE TIME Knob

Sets the gate time or duration of the notes being played by the Arpeggiator. Small values of gate time produce a Staccato effect. Large values produce a Legato effect. Anticlockwise and the gate time is very short, clockwise and the gate time is long.

KEYSYNC button

When activated, the arpeggio pattern will re-start whenever a new note is played on the keyboard.

LATCH button

When activated, remembers notes played on the keyboard, even after the notes have been released.

Once all notes on the keyboard have been released, the next chord to be played on the keyboard will clear the existing latch memory and only the newly played chord will be arpeggiated.

Note: It is possible to control the Arpeggiator Latch On/Off from an external Computer/Sequencer/Keyboard. Transmit MID CC 64 (Sustain) with a value of 127 to turn the Arpeggiator latch ON and transmit controller number 64 with a value of 0 to turn the latch OFF.

SYNC RATE

This drop down menu allows the Arpeggiator to be synchronised with an external sequencer. A range of synchronisation values are available :

Menu Item	MIDI Clocks	Synchronised to
OFF	-	Manual Rate
32nd T	2	32nd Triplet
32nd	3	32nd
16th T	4	16th Triplet
16th	6	16th
8th T	8	8th Triplet
16th D	9	16th Dotted
8th	12	8th
4th T	16	4th Triplet
8th D	18	8th Dotted
4th	24	4th
2nd T	32	2nd Triplet
4th D	36	4th Dotted
2nd	48	2nd
1bar T	64	1 Bar Triplet
2nd D	72	2nd Dotted
1 bar	96	1 Bar

When a sync interval is selected, the rate of the arpeggiator is controlled by the sequencer's tempo when MIDI clock source is set to EXT (the default). If the MIDI clock source is set to INT, the arpeggiator's TEMPO knob controls the arpeggiator speed.

Envelopes



PROG LEVEL Knob

The value of this function adjusts the program output level. This is used to maintain a consistent volume level, avoiding distortion throughout all sound programs. Delicate sounds (such as those which use just one oscillator and closed filter settings) can be increased in volume using this control. Conversely, sounds that use all oscillators and high polyphony (6 to 8 notes played at once), can be reduced in volume to avoid distortion. Using a mixing desk as a comparison, this control can be thought of as the gain or trim control for the channel.

If a sound appears to be distorting unintentionally, especially when complex chords are being played, reduce the value of this setting.

FM ATTACK Knob

When FM synthesis is being used, this value determines the FM Envelope's Attack time.

Note : The FM Envelope is used only for FM synthesis and should not be confused with the Amp or Mod Envelopes available on the V-Station's MAIN panel.

FM DECAY Knob

When FM synthesis is being used (see Pages 23 and 24), this value determines the FM Envelope's Decay time.

Note : The FM Envelope is used only for FM synthesis and should not be confused with the Amp or Mod Envelopes available on the V-Station's MAIN panel.

VEL > FM

Controls the amount velocity will affect the output level of the FM envelope. At a setting of zero, there will be no effect - it won't matter how hard or soft you play the keyboard, there will be no difference in the sound. At values between 1 and +63, the harder you hit the keyboard, the brighter the sound will become. At values between -1 and -64, the harder you hit the keyboard, the softer the sound will become.

Note : For this control to have any effect at all, the FM LEVEL knob (discussed on Page 56) has to be set to a value other than zero. If FM LEVEL is set to zero, the VEL > FM control has no effect.

VEL > AMP

Controls the amount velocity will affect the overall output level of the selected sound. At a setting of zero, there will be no effect - it won't matter how hard or soft you play the keyboard, there will be no difference in the sound. At values between 1 and +63, the harder you hit the keyboard, the louder the sound will become. At values between -1 and -64, the harder you hit the keyboard, the quieter the sound will become.

VEL > MOD

Controls the amount velocity will affect the overall output level of the MOD ENV. At a setting of zero, there will be no effect - it won't matter how hard or soft you play the keyboard, there will be no difference in the sound.

The effect other settings will have on the sound depends very much on where the MOD ENV is routed.

If the MOD ENV is controlling the filter's cutoff frequency, at values between 1 and +63, the harder you hit the keyboard, the brighter the sound will become. At values between -1 and -64, the harder you hit the keyboard, the softer the sound will become.

Note: With positive values set for this control, if the filter cutoff frequency is set quite high, you may not notice much difference in the sound even when extreme velocity is used. In this case, you should reduce the filter's cutoff frequency slightly until the desired result is achieved.

If the MOD ENV is controlling oscillator pitch, at values between 1 and +63, the harder you hit the keyboard, the pitch sweep will be greater (higher). At values between -1 and -64, the harder you hit the keyboard, the pitch sweep will be less.

If the MOD ENV is controlling pulse width at values between 1 and +63, the harder you hit the keyboard, the more the pulse width will be affected. At values between -1 and -64, the harder you hit the keyboard, the less the pulse width will be affected.

ENV TRIGGER

These functions only apply to a sound which has been set up to behave in a monophonic manner (see Voice Mode on Page 60).

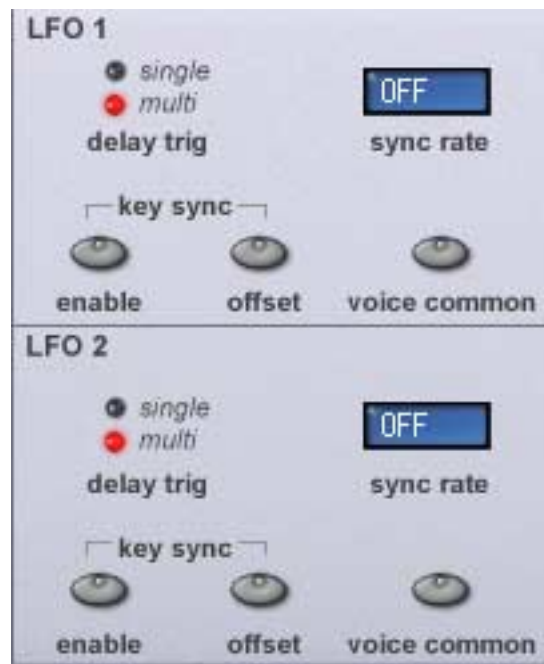
When the Voice Mode is set to any of the Mono options, different envelope triggering options are available for legato playing styles (notes overlapping).

When the first note of a musical phrase is played, it might be desirable to have both the Amp and Mod envelopes trigger. For the remaining legato notes, just the Mod envelope re-triggering would create the effect of the phrase becoming quieter and quieter.

When these are set to SINGLE, the appropriate envelope will only be triggered when the first keyboard note is played. Any subsequent legato style key presses (i.e. playing another note whilst holding down the first note pressed) will not re-trigger the attack/decay stages of envelope. Single triggering is useful when emulating certain solo instruments such as woodwind - it is also good for emulating older analogue synths such as the MiniMoog that had single triggering.

When set to MULTI, the appropriate envelope's attack/release will always re-trigger on each key press, regardless of the playing style used. Multi triggering is useful where you want every note to have a pronounced attack/decay - it is also good for emulating older analogue synths such as the ARP range that had multiple triggering.

Low Frequency Oscillators (LFOs)



DELAY TRIG select LEDs

When the Voice mode is set to any of the Mono options (see Page 60), different LFO delay settings are available for legato playing styles (notes overlapping).

When the first note of a musical phrase is played, it might be desirable to have an initial delay on the LFO. (If the LFO is routed to pitch modulation, a vibrato effect would be introduced after the delay time). For the remaining legato notes, a non interrupted vibrato might be required. Setting this to SINGLE achieves this.

Setting this to MULTI sets the LFO delay to apply to every note played.

KEY SYNC ENABLE button

Each LFO waveform may be restarted every time a key is pressed. For example, if a siren type sound effect was required, an LFO using a sawtooth wave would be set to positively modulate pitch. Each time a new key is pressed, the pitch would climb from the same point (because the LFO waveform would be restarted) rather than being at an undetermined pitch position.

Note : If the VOICE COMMON function (detailed on the next page) is set to ON for the LFO, altering this value will have no effect. How keysync is applied to the LFO is determined by the changing the Global Sync Mode settings found on the GLOBAL page.

KEYSYNC OFFSET button

This setting provides an alternative point in the LFO's waveform cycle where the waveform will be restarted from when LFO Keysync is set to ON. To hear the difference, set a slow LFO to modulate oscillator pitch modulation and experiment with different LFO waveforms and LFO Keysync Phase Offset settings.

VOICE COMMON

Each of the eight voices have two LFO's - sixteen in total. The eight LFOs designated LFO 1 (one per voice) may be 'phase' locked together and similarly the eight LFO's designated LFO 2 may be locked.

To illustrate this, assume the LFO waveform is a triangle wave and at a specific moment in time all eight are at the beginning of a the rising portion of the wave. At a later point in time all

will be at the beginning of the falling portion of the wave. If this waveform is applied to pitch, when a number of notes are played simultaneously, the pitch of all the notes will rise and fall at precisely the same time.

If the LFO is not locked, then each wave will be at a random position relative to the others. In this pitch modulation example, the pitch of all the notes will be changing 'out of synchronisation' with others.

Imagine a string section of eight violin players. Here are eight people, each playing their instruments individually - they will play in time but their bowing and vibrato is going to be unsynchronised, with each player going at ever so slightly different rates and also, as one player's vibrato may be rising, another's is falling. It is this that gives an orchestral string section its lush, rich sound. With the LFO locked and the LFO being used to create a vibrato, all eight of the string players would have the bow in exactly the same position, would be performing their vibrato at *exactly* the same rate and phase, etc.. This obviously does not occur in a real string section and if it did, the sound would be very rigid and mechanical - in fact, it may as well be played by robots! In reality, each player's bow would be in a slightly different position and each player's vibrato would be slightly different which gives the strings a 'chorus' type sound. To simulate the string section (and to create lush pads, etc.), the LFOs should not be locked.

Setting this to ON will 'lock' the LFO.

SYNC RATE menu

Both LFOs may be synchronised to MIDI Clock. As an example, a very pleasing audio effect may be achieved when an LFO is modulating the filter cutoff frequency and is in perfect sync with your sequencer's tempo - the sequencer opens and closes in time with the music.

To synchronise an LFO, alter this value until the desired musical timing is displayed. See the synchronisation table below for details on how these settings relate to the MIDI Clock:

Menu Item	MIDI Clocks	Synchronised to	Menu Item	MIDI Clocks	Synchronised to
OFF	-	Manual Rate	1bar D	144	1.5 Bars
32nd T	2	32nd Triplet	2 bars	192	2 Bars
32nd	3	32nd	4bar T	256	4 Bar Triplet
16th T	4	16th Triplet	3 bars	288	3 Bars
16th	6	16th	5bar T	320	5 Bar Triplet
8th T	8	8th Triplet	4 bars	384	4 Bars
16th D	9	16th Dotted	3bar D	432	4.5 Bars
8th	12	8th	7bar T	448	7 Bar Triplet
4th T	16	4th Triplet	5 bars	480	5 Bars
8th D	18	8th Dotted	8bar T	512	8 Bar Triplet
4th	24	4th	6 bars	576	6 Bars
2nd T	32	2nd Triplet	7 bars	672	7 Bars
4th D	36	4th Dotted	5bar D	720	7.5 Bars
2nd	48	2nd	8 bars	768	8 Bars
1bar T	64	1 Bar Triplet	9 bars	864	9 Bars
2nd D	72	2nd Dotted	7bar D	1008	10.5 Bars
1 bar	96	1 Bar	12bars	1152	12 Bars
2bar T	128	2 Bar Triplet			

Be aware that if an LFO is synchronised to the MIDI Clock, the MAIN panel's LFO SPEED knob will have no effect on the LFO speed. The actual speed of the LFO will be determined instead by the tempo of the MIDI Clock signals being transmitted by a sequencer. Many sequencers do not transmit MIDI Clock messages at all when they are stopped.

Setting this function to OFF allows the LFO to run at its own speed, which can be controlled by setting the LFO SPEED knob, found on the MAIN panel.

CONTROLS panel



The CONTROLS panel allows you to set how the various performance controllers such as pitch bend, mod wheel, aftertouch and breath will control certain V-Station parameters. Typically, these will be set so that the modwheel will control vibrato, the pitch bend wheel will control pitch and so forth. However, the flexibility of this page means that you can use the modwheel or pitch bend to control the filter and/or effects balance... whatever. If you have aftertouch on your keyboard, this too can be routed to a variety of different sources. And if you are using a wind controller such as the Akai EWI, there are parameters to route breath control to the V-Station's key parameters.

These controls are described over the next few pages.

Mod wheel



This section of the panel provides all the controls required to route the mod wheel to various destinations. They are:

FX

Using these four controls, you can use the modulation wheel to gradually introduce each of the effects during a performance.

- DELAY** Sets how much the modulation wheel will introduce the delay effect.
- REVERB** Sets how much the modulation wheel will introduce the reverb effect.
- CHORUS** Sets how much the modulation wheel will introduce the chorus effect.
- DISTORTION** Sets how much the modulation wheel will introduce the distortion effect.

All the above controls are 'bi-polar' - that is, they can have a positive and a negative setting. With values of 0 to +63, pushing the mod wheel forward will add more of the chosen effect. With values of 0 to -64, the effect will be on by default and pushing the mod wheel forward will cause the chosen effect to fade out.

OSC 123

PITCH It may be desirable to drastically change the pitch of all the oscillators using the modulation wheel. This setting is used to shift the absolute pitch of the all the oscillators up or down in response to the modulation wheel position. Values 1 to 63 will result in a higher pitch from 1 to 63 semitones when the wheel is pushed forward. Values -1 to -64 will result in a lower pitch when the wheel is pushed forward.

PITCH MOD Allows you to use the modulation wheel to control the amount of pitch modulation from LFO1, introducing a vibrato effect. As the mod wheel is pushed forwards, LFO 1 modulation (i.e. vibrato) will be applied. For best results, ensure that LFO 1 is using a Triangle waveform and its SPEED is set to a value of around 75. This will give a smooth, traditional vibrato effect.

FILTER

FREQ Sets the amount that the modulation wheel will control the filter's cutoff frequency. With values of 0 to +63, pushing the mod wheel forward will cause the cutoff frequency to rise (i.e. it will 'open' the filter). With values of 0 to -64, pushing the mod wheel forward will cause the filter to close.

FREQ MOD Allows you to use the modulation wheel to control the amount of filter cutoff frequency modulation from LFO2. In this, you can use the mod wheel to introduce filter sweeps.

AMP

AMP GAIN By routing the Modulation wheel to the amplifier, the overall volume of the sound may be controlled. Positive values of 1 to 63 increase the output volume of the Amp Envelope as the Modulation Wheel is pushed forwards. Negative values from -1 to -64 decrease the output volume of the Amp Envelope as the Modulation Wheel is pushed forwards. At a setting of 0, the wheel will have no effect.

Pitch bend

These three controls allow you to set the pitch bend range for each oscillator individually. The value shown when the controls are adjusted shows the number of semitones the pitch bend wheel will affect the oscillators' pitch.

Under normal circumstances, each oscillator should be set to the same value. However, by having independent control of each oscillator individually, you have an enormous amount of flexibility to set different pitch bend ranges for special performance effects. In fact, one application where this is useful is in the case of using Oscillator Sync. By setting pitch bend on Oscillator 1 to zero and a wide pitch bend range to Oscillator 2, you can use the pitch bend wheel to create the tearing sync sweep effect.

Breath control



With these controls, you can set how the V-Station will respond to breath control.

OSC 123

PITCH It may be desirable to drastically change the pitch of all the oscillators using breath control. This setting is used to shift the absolute pitch of all the oscillators up or down in response to breath control. Values 1 to 63 will result in a higher pitch from 1 to 63 semitones when you blow harder on the controller. Values -1 to -64 will result in a lower pitch when you blow harder on the controller.

PITCH MOD Allows you to use breath control to control the amount of pitch modulation from LFO1, introducing a vibrato effect. As you blow harder, LFO 1 modulation (i.e. vibrato) will be applied. For best results, ensure that LFO 1 is using a Triangle waveform and its SPEED is set to a value of around 75. This will give a smooth, traditional vibrato effect.

FILTER

FREQ Sets the amount that breath control will control the filter's cutoff frequency. With values of 0 to +63, blowing harder will cause the cutoff frequency to rise (i.e. it will 'open' the filter). With values of 0 to -64, blowing harder will cause the filter to close.

FREQ MOD Allows you to use breath control to control the amount of filter cutoff frequency modulation from LFO2. In this way, you can use breath control to introduce filter sweeps.

AMP

AMP GAIN By routing breath control to the amplifier, the overall volume of the sound may be controlled. Positive values of 1 to 63 increase the output volume of the Amp Envelope as you blow harder. Negative values from -1 to -64 decrease the output volume of the Amp Envelope as you blow harder. At a setting of 0, breath control will have no effect.

Aftertouch



With these controls, you can set how the V-Station will respond to aftertouch.

OSC 123

PITCH It may be desirable to drastically change the pitch of all the oscillators using aftertouch. This setting is used to shift the absolute pitch of the all the oscillators up or down in response to aftertouch. Values 1 to 63 will result in a higher pitch from 1 to 63 semitones when you press harder on your keyboard. Values -1 to -64 will result in a lower pitch when you press down on your keyboard.

PITCH MOD Allows you to use aftertouch to control the amount of pitch modulation from LFO1, introducing a vibrato effect. As you press down on your keyboard, LFO 1 modulation (i.e. vibrato) will be applied. For best results, ensure that LFO 1 is using a Triangle waveform and its SPEED is set to a value of around 75. This will give a smooth, traditional vibrato effect.

FILTER

FREQ Sets the amount that aftertouch will control the filter's cutoff frequency. With values of 0 to +63, pressing harder on your keyboard will cause the cutoff frequency to rise (i.e. it will 'open' the filter). With values of 0 to -64, pressing harder on your keyboard will cause the filter to close.

FREQ MOD Allows you to use aftertouch to control the amount of filter cutoff frequency modulation from LFO2. In this way, you can use aftertouch to introduce filter sweeps.

AMP

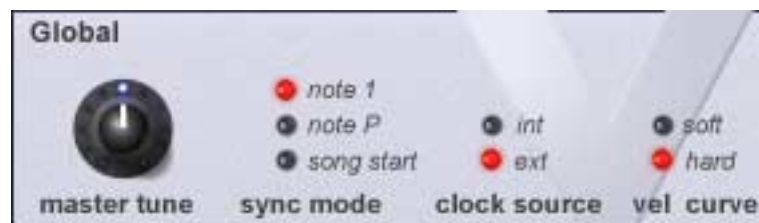
AMP GAIN By routing aftertouch to the amplifier, the overall volume of the sound may be controlled. Positive values of 1 to 63 increase the output volume of the Amp Envelope as you press harder on your keyboard. Negative values from -1 to -64 decrease the output volume of the Amp Envelope as you press down on your keyboard. At a setting of 0, aftertouch will have no effect.

GLOBAL panel



This page allows you to set parameters that relate to the overall performance of the V-Station.

Global

**MASTER TUNE Knob**

This allows you to tune the V-Station to other instruments.

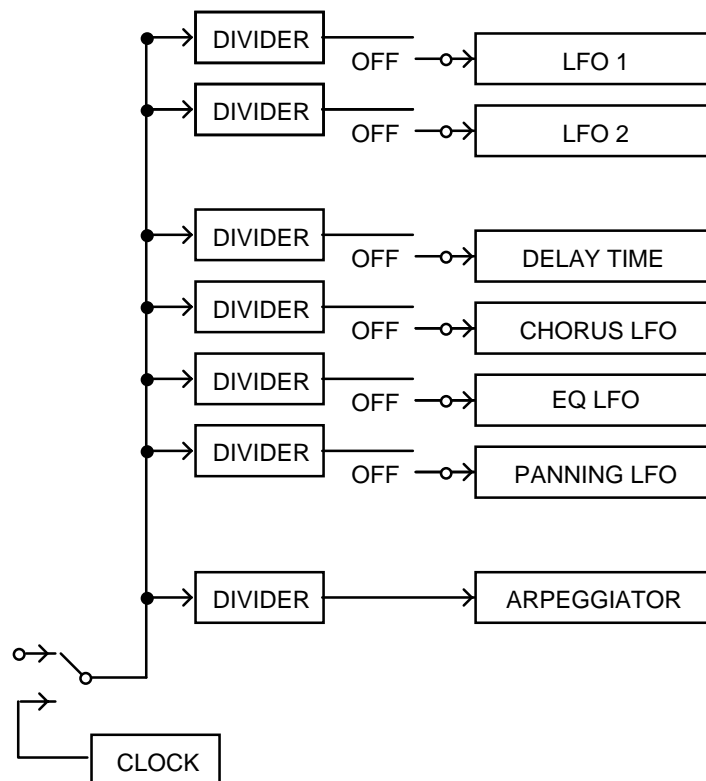
SYNC MODE select LEDs

If MIDI Clock Source is set to EXT (external clock), a clock synchronisation type may be selected using this function. This allows the first note played after all notes have been released or the first note played after a MIDI Program Change or MIDI Song Start Message to synchronise the Panning, EQ filter, Chorus LFO's and voice LFO's. This allows them to have their start position locked in time with the musical piece for stunning effects.

CLOCK SOURCE select LEDs

The V-Station requires a master timing clock in order to determine the tempo (rate) of the arpeggiator and to provide a time base for synchronisation to other musical timings. This clock may be derived from your host sequencer or can be derived from the V-Station's own internal clock. By default, the V-Station is set to automatically sync to your host sequencer's tempo.

When set to EXT, the V-Station will sync to the sequencer's tempo. However, that's not to say every syncable device in the V-Station will run in time with your sequencer - they will have to be individually set to sync to incoming MIDI clock. The only exception to this is the arpeggiator which, by default, will sync to your sequencer. Perhaps the following diagram will make things clearer:



The above is the default setting for the V-Station. External sync is selected and, by default, the arpeggiator is synchronised to the sequencer's tempo. However, the other syncable devices are, by default, set to free-run at rates determined by their own speed or time controls. If you want any of the syncable devices to synchronise to the sequencer's tempo, they should be specifically set with the device's SYNC RATE parameter.

Note : Most sequencers do not transmit MIDI Clock while they are stopped. Synchronisation of the V-Station to MIDI Clock will only be possible while the sequencer is actually recording or playing.

When set to INT, the V-Station's own internal clock is used for synchronisation purposes. The tempo of the internal clock is controlled by the TEMPO knob found in the Arpeggiator section.

VEL CURVE select LEDs

The response to MIDI velocity information may be set using this function.

A setting of SOFT indicates that smaller changes in velocity (a lighter playing style) will create a large change in response to velocity, be it volume or any other modulation destination that velocity is routed to.

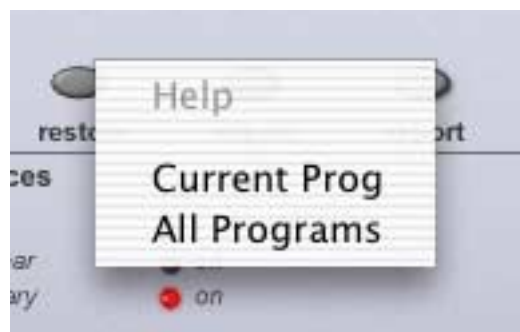
A setting of HARD indicates that higher changes in velocity - a much harder playing style, will create large changes in response to velocity.

Memory

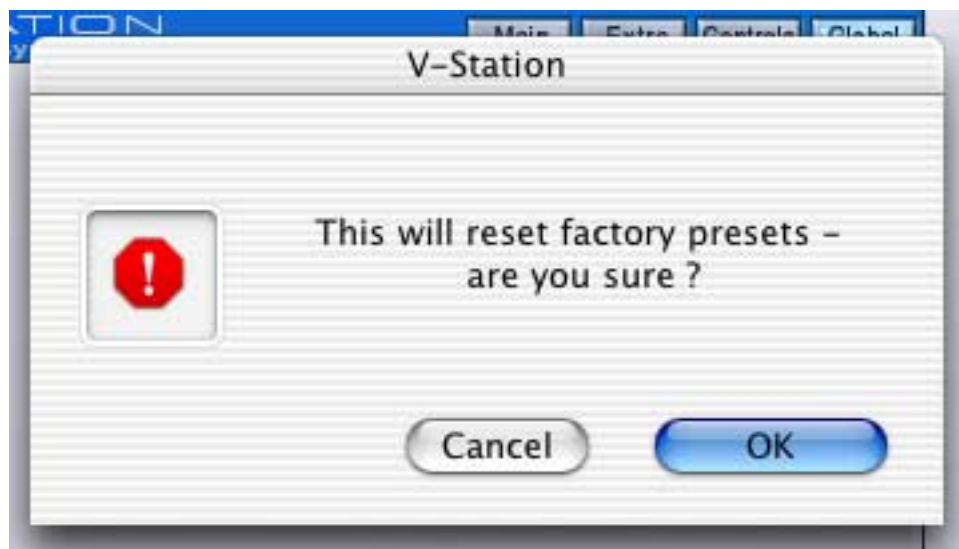


Restoring the factory presets

The RESTORE button allows you to restore the factory sounds originally supplied with the V-Station. To restore the factory sounds, simply click on RESTORE - you will receive a prompt asking if you want to restore just the currently selected program or all programs:



Select as appropriate. You will then be asked if you are sure you want to proceed.:



Click on the appropriate response.

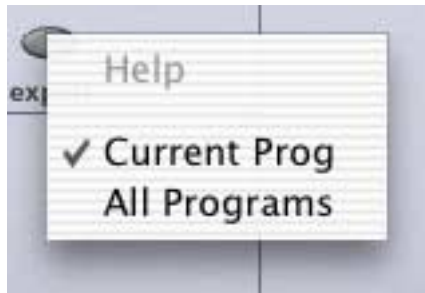
Note : The RESTORE process will completely replace the sounds you have in your V-Station and there is no 'undo' function - please proceed with caution if you have created and stored any of your own sounds as they will be lost if you proceed with the RESTORE function.

Import / Export

The V-Station allows you to import sounds from a K-Station and export a MIDI file that can be used to dump your V-Station sounds into a K-Station. The EXPORT function also allows you to back up your V-Station's internal sounds and/or build up your own personal library of V-Station sounds.

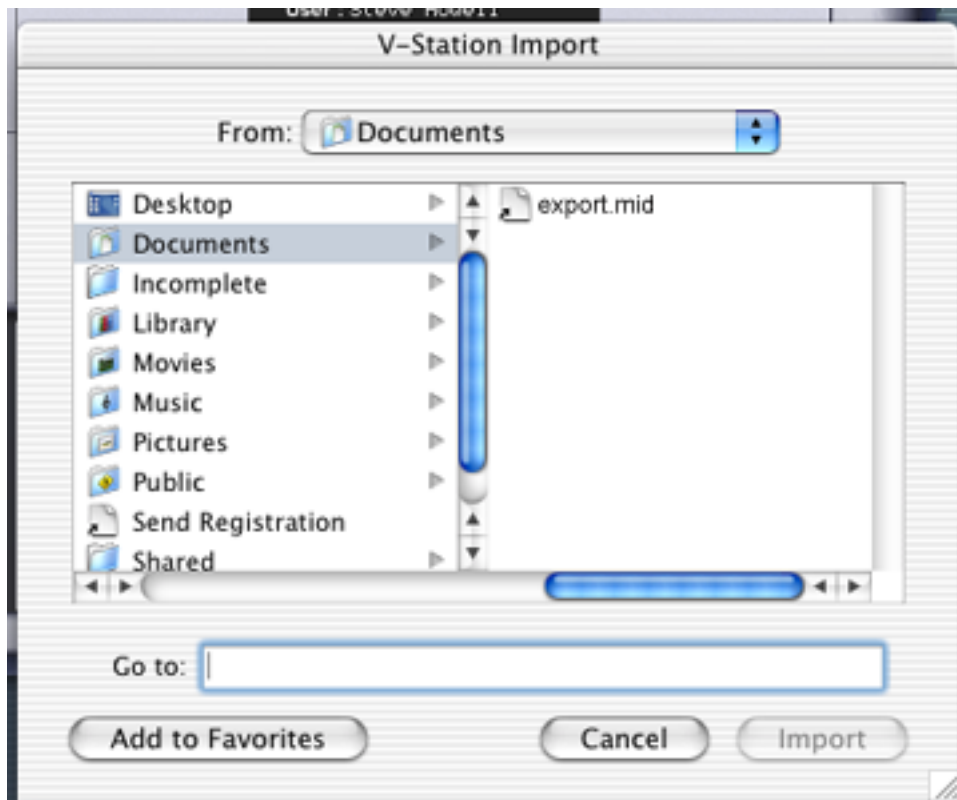
We'll discuss EXPORT first and we'll look at how to get that export into the V-Station and into a K-Station.

To export, click on EXPORT. You will receive this prompt:



You can export the currently selected sound or all programs. Select as appropriate. You will then receive a typical 'navigation' window where you must give the file a name as appropriate and you should save this to a location of your choosing. You should have something like 'export.mid' or whatever saved on your hard drive.

To import, click on IMPORT. This will pop-up a typical navigation window:



Select the file you want to import and click on IMPORT. After a short while, the V-Station's LCD will inform you that the import completed.

Note : The IMPORT process will completely replace the sounds you have in your V-Station and there is no 'undo' function - please proceed with caution if you have created and stored any of your own sounds as they will be lost if you proceed with the IMPORT function.

Transferring sounds from a V-Station to a K-Station

To transfer sounds from you V-Station to a K-Station, go through the export process described above so that you have a MIDI file that contains your sounds. Now, open your sequencer and create a new project (song, arrangement or whatever it is your sequencer refers to them as). Now either import the MIDI file you created (i.e. the 'export.mid' or whatever it is you called it) into the empty song (or, if your sequencer allows, drag and drop it onto a track). Now, assuming that you have a MIDI OUT connected from your Mac/PC to the K-Station's MIDI IN (and assuming the K-Station is switched on!!), press PLAY on your sequencer - the SysEx data will be sent to the K-Station and the sounds from your V-Station will be transferred.

Note : The K-Station doesn't have to be in any special mode or condition to receive a SysEx dump of sounds - as soon as you put your sequencer into PLAY, assuming the file is valid and the correct MIDI connections are made, the data will be transferred to the K-Station.

Transferring sounds from a K-Station to a V-Station.

To initiate a Sysex dump, press MENUS and UTILITIES on the K-Station's front panel - you should see the 'DUMP' utility (if not, use the UP/DOWN keys to select it. Now select the desired option using the DATA knob - you have several options: CURRENT SOUND, PROGRAM BANKS 1, 2, 3 or 4 or ALL PROGRAM BANKS which can be selected using the DATA knob. Select a track on your sequencer and start the sequencer recording. Now press the K-Station's WRITE button to start transmission of Sysex data. If the CURR SOUND option is selected as the transmission type, then the LCD will flash DONE as confirmation that the transmission has taken place. If PROG BANK1 through ALL P BANKS is selected as the transmission type, the display will indicate progress of transmission by indicating DUMPING PROG XXX (where XXX is the Program number). When you see the 'DONE' message on the LCD, you can stop recording on your sequencer.

Note : The V-Station cannot accept a GLOBAL DUMP from the K-Station. If you attempt to try this, the V-Station will show "Invalid File" in its LCD.

Note : Some sequencers (such as Cubase) sometimes have Sysex messages filtered out as a default setting. If the sequencer appears not to have recorded the sysex dump into a track, check that the sequencer is not set to filter out Sysex messages. Consult the sequencer's manual for details.

The selected track you just recorded onto should now have a region shown that contains the K-Station's SysEx data (you can check this by opening the sequencer's 'event list' window if it has one). You should now save as or export as a MIDI file with a name of your choosing at a location of your choosing.

Please consult your sequencer's documentation for details on saving or exporting MIDI files.

Note : The MIDI file MUST have the extension .mid at the end of the file for it to be used by the V-Station's IMPORT function.

Now insert the V-Station into a track (or open the V-Station if it's already inserted) and select the GLOBAL page. Click on IMPORT and follow the procedure described on the previous page.

Importing raw SysEx files from the K-Station to the V-Station

The V-Station will also import SysEx files (*.syx) and it is possible (with the appropriate application) to import raw sysex data from the K-Station into your computer. In this way, you can receive K-Station SysEx dumps directly into your computer, save the result as '*.syx' and import that directly to the V-Station without having to create a MIDI file.

Applications that allow this are:

PC MIDIOX (<http://www.midiox.com>)³

OSX SYSEX LIBRARIAN (<http://www.snoize.com/SysExLibrarian>)²

Typically, with the application open, you initiate a SysEx dump from the K-Station. The application will receive the data and will then allow you to save it as a SysEx file which can be imported into the V-Station. You should consult the application's documentation for exact details.

<i>Note : The SysEx file MUST have the extension .syx at the end of the file for it to be used by the V-Station's IMPORT function.</i>
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² MIDIOX and SYSEX LIBRARIAN are both 3rd-party applications. They are neither endorsed or supported by Novation but are mentioned here as examples of SysEx applications. Any issues or problems you may have with either application must be resolved between you and the application's vendors.

Novation cannot and will not be held responsible for any dispute that may arise between yourself and any 3rd-party software vendors.

Preferences



In this section, you can set certain preferences. These are:

POT CONTROL select LEDs

You can choose between two different types of controlling the knobs on the V-Station's panels. With LINEAR selected, moving the mouse up or down will cause the knob to rotate. When ROTARY is selected, you should move the mouse in a circle to rotate the knob.

SUST > ARP LATCH select LEDs

Normally, When the arpeggiator is used on the V-Station, the sustain pedal doesn't work as sustain but turns the arpeggiator LATCH function on and off instead. The SUST > ARP function controls whether this feature works or not.

If SUST > ARP is ON, the doesn't work as a sustain pedal but will latch the arpeggiator for hands-free operation.

If SUST > ARP is switched OFF, sustain works like a normal sustain pedal and has no effect on the arpeggiator latch - this should be switched on/off manually using the LATCH button the EXTRA page.

The remainder of the panel shows details of your V-Station - serial number.

AUTO WRITE select LEDs

This option allows you to select whether loading external sounds into the V-Station will just be stored in memory or actually written to the V-Station's memory permanently.

When using your host sequencer's LOAD PRESET function (or BANK or SETTING or whatever the terminology is that is used by your sequencer), depending on the host, these will only be loaded into the V-Station's 'local' memory - to store them permanently, they need to be written to the V-Station's memory. This can be done manually, of course, but this preference allows you to set the V-Station so that whenever a preset/setting/whatever is loaded, it will automatically be written to the V-Station's memory.

You should consult your sequencer's documentation for details about loading presets/banks.

Another use for this is for automatically writing sounds to memory when you have edited a sound. Normally (i.e. AUTO WRITE : OFF), when you edit a sound, should you then select a different sound, unless you have specifically written the edited version to the V-Station's memory, your edits will be lost. With this preference enabled, should you select another sound when editing, the edited version will automatically be written before the new sound is selected.

This sounds ideal - when you select a new sound, any edits you might have made to the previous sound won't be lost forever. Except.....

You might have edited a sound but made a right hash of it and it sounds worse than the original you started off with. So you select another sound - with AUTO-WRITE enabled, your abortive edit will be written to memory thus overwriting the original sound!

So whilst it's very useful to be able to auto-save your edits, you can cause problems for yourself if you're not careful.

NUMPAD PROGRAM SELECT LEDs

This preference allows you to enable program selection using your computer keyboard's numeric keypad. With this enabled, programs can be selected by typing in a three digit number (100 - 400).

Note : Some sequencers use the numeric keypad for play, stop, locating and other functions. Some sequencers allow you to re-assign these so that you can use the keypad for other purposes. Others, however, do not. If your sequencer doesn't allow you to re-assign the numeric keypad, you won't be able to select programs numerically from your keypad. You should switch NUMPAD PROGRAM SELECT off.

NO LATENCY select LEDs

DSP based cards such as the TC Powercore introduce a slight delay before returning a signal back to a host application. This delay is very noticeable when playing the V-Station in real time. The Global page of the V-Station contains a very useful control called 'no latency' to work around this.

When the no latency control is set to on the V-Station can be played in real time. The no latency mode will put a significant load on the host CPU. However no latency mode is ideal for recording or playing the V-Station. The no latency mode can be selected to reduce the CPU load when playing back a recording made with the V-Station.

Using the V-Station with a K-Station

If you have a K-Station, you can use this to control your V-Station directly and very convenient this is too as it gives you all the flexibility of a software synth plug-in but with the tactile operation only a hardware control surface can provide.

Assuming the K-Station is connected to your Mac/PC, insert an instance of the V-Station into a track. Now, on the K-Station, start fiddling with the front panel controls - you will see the software equivalent knobs moving in real-time as you adjust them on the K-Station. Similarly, as you press the K-Station's switches, so the equivalent switches will be 'pressed' on the V-Station's panel.

Furthermore, if you have several instances of the V-Station running, as you switch between them, so the K-Station will control the 'active' instance.

What's more, these control movements can be automated so that they play back every time you run the sequencer. Which leads us neatly onto....

Automating control movements on the V-Station

One powerful aspect of synthesizer plug-ins is that control movements can be automated. Typically, as your sequencer is recording, as you move the controls, so their movements are remembered along with the music. When you subsequently rewind and play that sequence, the control movements will be played back. The V-Station is capable of automating the various panels' controls.

Furthermore, if (as described above) you are using a K-Station to control your V-Station, as you tweak the K-Station's front panel knobs so the V-Station's controls will move and these movements will be recorded into the sequence.

You should consult your sequencer's documentation for details on automation. Different sequencers approach automation in a variety of different ways offering different methods of entering control movements in real-time, different methods of 'overdubbing' control movements and different ways of editing such movements.

Notes for Logic users

There are some issues unique to Emagic's 'Logic' sequencer.

- Logic uses MIDI controllers 7 and 10 for channel level and pan respectively. As a result, it is not possible to use these controllers to set the level and pan position of the V-Station itself. If you are using a MIDI controller to issue these control values to control the V-Station's level and pan, you will find that instead of affecting the V-Station's level and pan controls, you will be setting the selected channel's level and pan.
- It is not possible to use your Mac keyboard's numeric keypad to select sounds directly as these keys are used by Logic for a variety of functions within Logic such as transport, window selection, etc.. At the time of writing, it is not possible to re-assign these functions to other keys to allow the keypad to be used for program selection on the V-Station.
- It is not possible to save/load individual programs using Logic's SAVE/LOAD SETTINGS. Logic saves all the V-Station's programs when SAVE SETTINGS is used. Thus, LOAD SETTINGS will load all programs back into the V-Station.
- When the V-Station is inserted into a track, if the V-Station's window is open and a track other than the one that the V-Station is inserted into is selected, the V-Station's panel will appear to be inactive (i.e. the LFOs' LEDs won't flash and the voice meter and MIDI RECEIVE LED won't show anything) even if the V-Station is playing. This is normal with Logic.

MIDI controller list

Some controllers adhere to the normal midi-specified use (eg modwheel, volume) but most are used arbitrarily and no claim is made of compatibility with other Novation products or other manufacturer's products. This is a common practice among manufacturers.

Whilst an attempt has been made to avoid misuse of "standard" controllers which could cause problems, Novation takes no responsibility for compatibility issues.

Unless noted, controllers are transmitted and received. Unless specifically noted, values have the range 0-127.

*** denotes a signed value where 64 represents zero.
 Unless noted, this is -64..0..+63 stored as 0..64..127
 another example is -12..0..+12 stored as 52..64..76

— denotes controller not used

Some controllers use the available 7 data value bits to control more than one parameter. These are noted as "packed parameters" and details are given.

The term "pulse width" is properly applied when squarewave is selected. For other waveforms, read "pulse width" as "double waveform phase offset". Double waveform phase offset is zero when the signed pulse width position parameter is 64 (meaning 0).

MIDI-SPECIFIED USE V-STATION USE

0	bank msb	IGNORED
1	modwheel msb	MODWHEEL (receive only)
2	breath msb	BREATH CONTROL (receive only)
3	undefined msb	ARP PATTERN (0..5 = up, down, ud1, ud2, order, random)
4	foot controller msb	—
5	portamento time msb	PORTAMENTO TIME
6	data entry msb	USED FOR NRPN DATA VALUES
7	volume msb	VOLUME
8	balance msb	PREGLIDE SEMITONES *** -12..+12 (0=preglide disabled)
9	undefined msb	ARPEGGIATOR RATE (64..191 bpm)
10	pan msb	PAN POSITION ***
11	expression msb	—
12	effect control 1 msb	NON-SYNC PAN RATE
13	effect control 2 msb	SYNC PAN RATE 0..34 (non-sync, 32Triplet..12bars)
14	undefined msb	—
15	undefined msb	—
16	gen. controller 1 msb	MODWHEEL DISTORTION ***
17	gen. controller 2 msb	DISTORTION COMPENSATION
18	gen. controller 3 msb	MODWHEEL DELAY SEND
19	gen. controller 4 msb	NON-SYNC DELAY TIME
20	undefined msb	SYNC DELAY TIME 0..19 (non-sync, 32Triplet..2bars)
21	undefined msb	DELAY FEEDBACK
22	undefined msb	DELAY STEREO WIDTH
23	undefined msb	DELAY RATIO
24	undefined msb	MODWHEEL REVERB SEND ***
25	undefined msb	REVERB DECAY
26	undefined msb	MODWHEEL CHORUS SEND ***
27	undefined msb	NON-SYNC CHORUS RATE
28	undefined msb	SYNC CHORUS RATE 0..34 (non-sync, 32Triplet..12bars)
29	undefined msb	CHORUS FEEDBACK ***
30	undefined msb	CHORUS MOD DEPTH

#	MIDI-SPECIFIED USE	V-STATION USE
31	undefined msb	CHORUS MOD CENTRE POINT
32	bank lsb	BANK SELECT 1..4
33	modwheel lsb	EQ LEVEL *** (0, 1..63, 64, 65, 126, 127 = LP, LPshelf, flat, HPshelf, HP)
34	breath lsb	EQ FREQUENCY
35	undefined lsb	NON-SYNC EQ MOD RATE
36	foot controller lsb	SYNC EQ MOD RATE 0..34 (non-sync, 32Triplet..12bars)
37	portamento time lsb	EQ MOD DEPTH
38	data entry lsb	—
39	volume lsb	—
40	balance lsb	OSC1 SEMITONE *** -12..+12
41	undefined lsb	OSC1 CENT *** -50..+50
42	pan lsb	OSC1 BENDWHEEL PITCH AMOUNT ***
43	expression lsb	OSC1 LFO1 PITCH AMOUNT ***
44	effect control 1 lsb	OSC1 MOD.ENV PITCH AMOUNT ***
45	effect control 2 lsb	OSC1 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
46	undefined lsb	OSC1 LFO2 PULSE WIDTH MOD ***
47	undefined lsb	OSC1 MOD.ENV PULSE WIDTH MOD ***
48	gen. controller 1 lsb	OSC2 SEMITONE *** -12..+12
49	gen. controller 2 lsb	OSC2 CENT *** -50..+50
50	gen. controller 3 lsb	OSC2 BENDWHEEL PITCH AMOUNT ***
51	gen. controller 4 lsb	OSC2 LFO1 PITCH AMOUNT ***
52	undefined lsb	OSC2 MOD.ENV PITCH AMOUNT ***
53	undefined lsb	OSC2 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
54	undefined lsb	OSC2 LFO2 PULSE WIDTH MOD ***
55	undefined lsb	OSC2 MOD.ENV PULSE WIDTH MOD ***
56	undefined lsb	OSC3 SEMITONE *** -12..+12
57	undefined lsb	OSC3 CENT *** -50..+50
58	undefined lsb	OSC3 BENDWHEEL PITCH AMOUNT ***
59	undefined lsb	OSC3 LFO1 PITCH AMOUNT ***
60	undefined lsb	OSC3 MOD.ENV PITCH AMOUNT ***
61	undefined lsb	OSC3 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
62	undefined lsb	OSC3 LFO2 PULSE WIDTH MOD ***
63	undefined lsb	OSC3 MOD.ENV PULSE WIDTH MOD ***
64	sustain pedal	SUSTAIN / MOMENTARY ARP LATCH ON
65	portamento on/off	ENVELOPE MODES / OSC WAVEFORM KEYSYNC (see packed parameter 1)
66	sostenuto pedal	—
67	soft pedal	UNISON / VOICE TYPE / FILTER TYPE (see packed parameter 2)
68	legato footswitch	UNISON DETUNE
69	hold 2	INDIVIDUAL OSCILLATOR RANDOM DETUNE
70	sound controller 1	OSC 1,2,3 WAVEFORM / PORTAMENTO MODE (see packed parameter 3)
71	sound controller 2	OSC 1,2,3 OCTAVE / OSC 1>2 SYNC (see packed parameter 4)
72	sound controller 3	OSC1 LEVEL (to filter)
73	sound controller 4	OSC2 LEVEL (to filter)
74	sound controller 5	OSC3 LEVEL (to filter)
75	sound controller 6	NOISE LEVEL (to filter)
76	sound controller 7	OSC 1*2 RINGMOD LEVEL (to filter)
77	sound controller 8	—
78	sound controller 9	LFO 1,2 WAVEFORM / DELAY MULTI MODE (see packed parameter 5)

#	MIDI-SPECIFIED USE	V-STATION USE
79	sound controller 10	LFO 1,2 KEYSYNC / LOCK / PHASE CONTROL (see packed parameter 6)
80	gen. controller 5 lsb	NON-SYNC LFO1 SPEED
81	gen. controller 6 lsb	SYNC LFO1 SPEED (0=NON-SYNC)
82	gen. controller 7 lsb	LFO1 DELAY (GRADUAL ONSET TIME)
83	gen. controller 8 lsb	NON-SYNC LFO2 SPEED
84	portamento control	SYNC LFO2 SPEED (0=NON-SYNC)
85	undefined	LFO2 DELAY (GRADUAL ONSET TIME)
86	undefined	— (may be used in future software releases)
87	undefined	ARPEGGIATOR SYNC SETTING 0..15 (32Triplet..1 bar)
88	undefined	ARPEGGIATOR GATE TIME (100+ GIVES TIED NOTE IN MONO MODE)
89	undefined	ARPEGGIATOR CONTROL (see packed parameter 7)
90	undefined	
91	effects 1 depth	REVERB SEND LEVEL
92	effects 2 depth	DELAY SEND LEVEL
93	effects 3 depth	CHORUS SEND LEVEL
94	effects 4 depth	PAN MOD DEPTH
95	effects 5 depth	—
96	data increment	—
97	data decrement	—
98	nrpn lsb	NRPN NUMBER
99	nrpn msb	IGNORED
100	rpn lsb	—
101	rpn msb	—
102	undefined	FILTER FREQUENCY LFO2 MOD DEPTH ***
103	undefined	FILTER Q NORMALISE (127=zero filter drive at max resonance)
104	undefined	FILTER OVERDRIVE
105	undefined	FILTER FREQUENCY
106	undefined	FILTER RESONANCE
107	undefined	FILTER FREQUENCY MOD.ENV DEPTH ***
108	undefined	AMP ENVELOPE ATTACK
109	undefined	AMP ENVELOPE DECAY
110	undefined	AMP ENVELOPE SUSTAIN
111	undefined	AMP ENVELOPE RELEASE
112	undefined	AMP ENVELOPE VELOCITY DEPTH ***
113	undefined	— (may be used in future software releases)
114	undefined	MOD. ENVELOPE ATTACK
115	undefined	MOD. ENVELOPE DECAY
116	undefined	MOD. ENVELOPE SUSTAIN
117	undefined	MOD. ENVELOPE RELEASE
118	undefined	MOD. ENVELOPE VELOCITY DEPTH ***
119	undefined	VOICE LEVEL TO OUTPUT & EFFECTS
120	all sounds off	ALL NOTES OFF WITH FAST RELEASE (receive only)
121	reset controllers	RESET CONTROLLERS (receive only)
122	local on/off	LOCAL ON/OFF
123	all notes off	ALL NOTES OFF (receive only)
124	omni off	ALL NOTES OFF (receive only)
125	omni on	ALL NOTES OFF (receive only)
126	mono mode setup	ALL NOTES OFF (receive only)
127	poly mode on	ALL NOTES OFF (receive only)

Refer to the lists of MIDI Controllers and NRPNs on Pages 42 - 44.

- 1 ENVELOPES SINGLE-MULTI / OSC WAVEFORM KEYSYNC
 - bit 0 amp env trigger 0=single 1=multi
 - bit 1 mod env trigger 0=single 1=multi
 - bit 2 fm env trigger 0=single 1=multi
 - bits 3-6 4-bit wave keysync phase
0=free-running 1..15 = 0..336 degrees in 24 degree steps

 - 2 UNISON / POLY MODE / FILTER TYPE
 - bits 0-2 3-bit unison count
0=off 1..7=2..8 voices
 - bits 3-4 2-bit voice polyphony mode
0=mono 1=mono autoglide 2=poly 3=poly with "same note voice stealing"
 - bit 5 filter type 0=12dB 1=24dB per octave

 - 3 OSC 1/2/3 WAVEFORM / PORTAMENTO MODE
 - bits 0-1 2-bit osc1 waveform sine, tri, saw, square (pulse)
 - bits 2-3 2-bit osc2 waveform sine, tri, saw, square (pulse)
 - bits 4-5 2-bit osc3 waveform sine, tri, saw, square (pulse)
 - bit 6 portamento mode 0=exponential 1=linear

 - 4 OSC 1,2,3 OCTAVE / OSC 1>2 SYNC
 - bits 0-1 2-bit oc1 octave -1,0,1,2
 - bits 2-3 2-bit oc2 octave -1,0,1,2
 - bits 4-5 2-bit oc3 octave -1,0,1,2
 - bit 6 oc1>2 sync 1=on

 - 5 LFO 1,2 WAVEFORM / DELAY MULTI MODE
 - bit 0 lfo1 delay multi 1=on
 - bit 1 lfo2 delay multi 1=on
 - bits 2-3 2-bit lfo1 waveform tri, saw, square, s/h
 - bits 4-5 2-bit lfo2 waveform tri, saw, square, s/h

 - 6 LFO 1,2 KEYSYNC / LOCK / PHASE CONTROL
 - bit 0 lfo1 keysync phase shift
 - bit 1 lfo1 keysync 1=on
 - bit 2 lfo1 lock 0=independent per voice 1=all voices same phase
 - bit 3 lfo2 keysync phase shift
 - bit 4 lfo2 keysync 1=on
 - bit 5 lfo2 lock 0=independent per voice 1=all voices same phase
- Note that when lock is on, keysync becomes global sync (i.e. note when all notes off, first note after prog change, song start message)
- 7 ARPEGGIATOR CONTROL
 - bits 0-1 2-bit number of octaves 1,2,3,4
 - bit 2 arpeggiator off/on 1=on
 - bit 3 arpeggiator keysync control 1=on
 - bit 4 arpeggiator latch control 1=on

 - 8 EFFECTS TYPE CONTROL
 - bits 0-2 3-bit reverb type Ec Sr Sh Lr Lh gh (values 6,7 not used)
 - bit 3 chorus/phaser control 0=chorus 1=phaser

 - 9 EFFECTS GLOBAL SYNC CONTROL
 - bits 0-1 2-bit chorus global sync off,left,centre,right
 - bits 2-3 2-bit pan global sync off,left,centre,right
 - bits 4-5 2-bit eq frequency global sync off,low,mid,high

-
- 10 EFFECTS, VOCODER & EXTERNAL AUDIO CONTROL
bit 3 vocoder sibilance type 0=hi-pass 1=noise
bit 5 external audio trigger control 1=enabled
bit 6 external audio to fx control 1=enabled
- 11 EFFECTS SELECT/ KEYBOARD OCTAVE
bits 0-2 0= Delay 1=reverb 2=chorus 3=distortion 4=EQ 5=panning 6=vocoder
bit 3,4,5,6 Signed value 0 = Nominal Octave where middle C is 261Hz
-4 = Lowest Octave +5 = Highest octave
- 12 OSC SELECT, NOISE/RING SELECT, PWM SOURCE SELECT, LFO SELECT
bits 0-1 Osc Select 0=1 1=2 2=3
bits 2-3 0= Noise 1=Ring1,2 2=External Input
bits 4-5 0= PW Position 1=LFO2 Mod 2=Mod Env Modbits 4-5
bit 6 LFO Select 0= LFO1 1=LFO2

The V-Station uses a few NRPNs as detailed below. Since less than 128 of them are used, only one NRPN msb (bank) is needed. Therefore only the NRPN lsb is transmitted/received and the NRPN msb is ignored and is not transmitted.

For future compatibility, assume that the NRPN msb is 0.

NRPN lsb V-STATION USE

0	FM FIXED LEVEL
1	FM ENVELOPE DEPTH ***
2	FM ENVELOPE VELOCITY DEPTH ***
3	FM ENVELOPE ATTACK
4	FM ENVELOPE DECAY
5	OSCs 1,2,3 MODWHEEL DIRECT PITCH DEPTH ***
6	OSCs 1,2,3 AFTERTOUCH DIRECT PITCH DEPTH ***
7	OSCs 1,2,3 BREATH DIRECT PITCH DEPTH ***
8	OSCs 1,2,3 MODWHEEL LFO1 PITCH DEPTH ***
9	OSCs 1,2,3 AFTERTOUCH LFO1 PITCH DEPTH ***
10	OSCs 1,2,3 BREATH LFO1 PITCH DEPTH ***
11	FILTER KEYBOARD TRACKING (0=NONE, 127=PRECISE PITCH TRACK)
12	FILTER MODWHEEL DIRECT FREQUENCY DEPTH ***
13	FILTER AFTERTOUCH DIRECT FREQUENCY DEPTH ***
14	FILTER BREATH DIRECT FREQUENCY DEPTH ***
15	FILTER MODWHEEL LFO2 FREQUENCY DEPTH ***
16	FILTER AFTERTOUCH LFO2 FREQUENCY DEPTH ***
17	FILTER BREATH LFO2 FREQUENCY DEPTH ***
18	AMPLITUDE MODWHEEL DIRECT DEPTH ***
19	AMPLITUDE AFTERTOUCH DIRECT DEPTH ***
20	AMPLITUDE BREATH DIRECT DEPTH ***
21	EFFECTS TYPE CONTROL (see packed parameter 8)
22	EFFECTS GLOBAL SYNC CONTROL (see packed parameter 9)
23	
24	RESERVED
25	EFFECTS SELECT/ KEYBOARD OCTAVE (see packed parameter 11)
26	OSC SELECT, NOISE/RING SELECT, PWM SOURCE SELECT, LFO SELECT (see packed parameter 12)
27-31	— (may be used in future software releases)

NRPNs FOR GLOBAL DATA (not part of programs)

32	MIDI RECEIVE CHANNEL 0..15
33	MIDI TRANSMIT CHANNEL 0..15
34-37	— (may be used in future software releases)
38	MIDI CLOCK SOURCE (0=internal 1=external)
39	— (may be used in future software releases)
40	MASTER TUNE CENTS ***
41	VELOCITY CURVE (0=soft 1=hard)
42	EXTERNAL INPUT RANGE (0=line 1=mic)
43	EXTERNAL INPUT TRIM (-10..+20 dB)
44	EXTERNAL INPUT TRIGGER SENSITIVITY (0 is most sensitive)
45	GLOBAL SYNC TYPE (0,1,2 = note when all notes off, first note after prog change, midi song start)
46	PARAMETER MOMENTARY DISPLAY TIME (off.200..1200mS)
47	MENU INITIAL PAGE MODE (0=first 1=last used)
48	KEYBOARD TRANSMIT CHANNEL
49	
50 -127	— (may be used in future software releases)

SYSEX REQUEST MESSAGES (receive only)

PROGRAM DUMP REQUEST

F0h	SYSEX START	
00h	NOVATION ID 1	
20h	NOVATION ID 2	
29h	NOVATION ID 3	
01h	DEVICE TYPE	
41h	K-STATION	
SyCh	SYSEX CHANNEL	7Fh or current receive channel
41h	MESSAGE TYPE	Program dump request
C	CONTROL BYTE	Reply will copy this value for C
Vv	SOFTWARE VERSION	Don't care
Vi	VERSION INCREMENT	Don't care
B	PROGRAM BANK	1-4 : don't care if C=0
P	PROGRAM NUMBER	0-99

F7h END OF EXCLUSIVE

PROGRAM PAIR DUMP REQUEST

F0h	SYSEX START	
00h	NOVATION ID 1	
20h	NOVATION ID 2	
29h	NOVATION ID 3	
01h	DEVICE TYPE	
41h	K-STATION	
SyCh	SYSEX CHANNEL	7Fh or current receive channel
42h	MESSAGE TYPE	Program pair dump request
C	CONTROL BYTE	Reply will copy this value for C
Vv	SOFTWARE VERSION	Don't care
Vi	VERSION INCREMENT	Don't care
B	PROGRAM BANK	1-4 : Don't care if C=0
P	PROGRAM NUMBER	0,2,4....98

F7h END OF EXCLUSIVE

GLOBAL DATA DUMP REQUEST

F0h	SYSEX START	
00h	NOVATION ID 1	
20h	NOVATION ID 2	
29h	NOVATION ID 3	
01h	DEVICE TYPE	
41h	K-STATION	
SyCh	SYSEX CHANNEL	7Fh or current receive channel
43h	MESSAGE TYPE	Global data dump request
00h	CONTROL BYTE	Don't care
Vv	SOFTWARE VERSION	Don't care
Vi	VERSION INCREMENT	Don't care
00h	(PROGRAM BANK)	Don't care
00h	(PROGRAM NUMBER)	Don't care

F7h END OF EXCLUSIVE

GLOBAL DATA BLOCK (256 bytes)

Byte	Parameter
0	POWER-UP PROGRAM BANK 1..4
1	POWER-UP PROGRAM NUMBER 0..99
2	MEMORY PROTECT (0=protected 1=not protected)
3	MIDI LOCAL CONTROL (0=off 127=on)
4	MIDI RECEIVE CHANNEL 0..15
5	MIDI TRANSMIT CHANNEL 0..15
6-9	--- (may be used in future software releases)
10	MIDI CLOCK SOURCE (0=internal 1=external)
11	--- (may be used in future software releases)
12	MASTER TUNE CENTS ***
13	VELOCITY CURVE (0=soft 1=hard)
14	EXTERNAL INPUT RANGE (0=line 1=mic)
15	EXTERNAL INPUT TRIM (-10..+20 dB)
16	EXTERNAL INPUT TRIGGER SENSITIVITY (0 is most sensitive)
17	GLOBAL SYNC TYPE (0,1,2 = note when all notes off, first note after prog change, midi song start)
18	PARAMETER MOMENTARY DISPLAY TIME (off.200..1200mS)
19	MENU INITIAL PAGE MODE (0=first 1=last used)
20	KEYBOARD/WHEELS MIDI TRANSMIT CHANNEL 0..15
21	PROGRAM MODE PARAMETER DISPLAY MODE (0=timed 1=permanent)
22	KEYBOARD OCTAVE SHIFT ALL-NOTES-OFF CONTROL (0=off 1=kill notes & send midi all-notes-off)
23-255	--- (may be used in future software releases) Zeros are transmitted. Use zeros for future compatibility

DATA BLOCKS USED IN SYSEX MESSAGES

See Midi Controller Map for further details of parameters and meaning of ***.

PROGRAM DATA BLOCK (128 bytes)

Byte	Parameter
0	UNISON / VOICE TYPE / FILTER TYPE (see packed parameter 2)
1	UNISON DETUNE
2	INDIVIDUAL OSCILLATOR RANDOM DETUNE
3	PORTAMENTO TIME
4	PREGLIDE SEMITONES *** -12..+12 (0=preglide disabled)
5	OSC 1,2,3 WAVEFORM / PORTAMENTO MODE (see packed parameter 3)
6	OSC 1,2,3 OCTAVE / OSC 1>2 SYNC (see packed parameter 4)
7	OSC1 SEMITONE *** -12..+12
8	OSC1 CENT *** -50..+50
9	OSC1 BENDWHEEL PITCH AMOUNT ***
10	OSC1 LFO1 PITCH AMOUNT ***
11	OSC1 MOD.ENV PITCH AMOUNT ***
12	OSC1 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
13	OSC1 LFO2 PULSE WIDTH MOD ***
14	OSC1 MOD.ENV PULSE WIDTH MOD ***
15	OSC2 SEMITONE *** -12..+12
16	OSC2 CENT *** -50..+50
17	OSC2 BENDWHEEL PITCH AMOUNT ***
18	OSC2 LFO1 PITCH AMOUNT ***
19	OSC2 MOD.ENV PITCH AMOUNT ***
20	OSC2 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
21	OSC2 LFO2 PULSE WIDTH MOD ***
22	OSC2 MOD.ENV PULSE WIDTH MOD ***

23	OSC3 SEMITONE *** -12..+12
24	OSC3 CENT *** -50..+50
25	OSC3 BENDWHEEL PITCH AMOUNT ***
26	OSC3 LFO1 PITCH AMOUNT ***
27	OSC3 MOD.ENV PITCH AMOUNT ***
28	OSC3 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
29	OSC3 LFO2 PULSE WIDTH MOD ***
30	OSC3 MOD.ENV PULSE WIDTH MOD ***
31	OSCs 1,2,3 MODWHEEL DIRECT PITCH DEPTH ***
32	OSCs 1,2,3 AFTERTOUC DIRECT PITCH DEPTH ***
33	OSCs 1,2,3 BREATH DIRECT PITCH DEPTH ***
34	OSCs 1,2,3 MODWHEEL LFO1 PITCH DEPTH ***
35	OSCs 1,2,3 AFTERTOUC LFO1 PITCH DEPTH ***
36	OSCs 1,2,3 BREATH LFO1 PITCH DEPTH ***
37	OSC1 LEVEL (to filter)
38	OSC2 LEVEL (to filter)
39	OSC3 LEVEL (to filter)
40	NOISE LEVEL (to filter)
41	OSC 1*2 RINGMOD LEVEL (to filter)
42	EXTERNAL INPUT (to filter)
43	FILTER OVERDRIVE
44	FILTER RESONANCE
45	FILTER Q NORMALISE (127=zero filter drive at max resonance)
46	FILTER FREQUENCY
47	FILTER KEYBOARD TRACKING (0=NONE, 127=PRECISE PITCH TRACK)
48	FILTER MODWHEEL DIRECT FREQUENCY DEPTH ***
49	FILTER AFTERTOUC DIRECT FREQUENCY DEPTH ***
50	FILTER BREATH DIRECT FREQUENCY DEPTH ***
51	FILTER FREQUENCY LFO2 MOD DEPTH ***
52	FILTER FREQUENCY MOD.ENV DEPTH ***
53	FILTER MODWHEEL LFO2 FREQUENCY DEPTH ***
54	FILTER AFTERTOUC LFO2 FREQUENCY DEPTH ***
55	FILTER BREATH LFO2 FREQUENCY DEPTH ***
56	FM FIXED LEVEL
57	FM ENVELOPE DEPTH ***
58	FM ENVELOPE VELOCITY DEPTH ***
59	FM ENVELOPE ATTACK
60	FM ENVELOPE DECAY
61	AMPLITUDE ENVELOPE VELOCITY DEPTH ***
62	AMPLITUDE ENVELOPE ATTACK
63	AMPLITUDE ENVELOPE DECAY
64	AMPLITUDE ENVELOPE SUSTAIN
65	AMPLITUDE ENVELOPE RELEASE

Byte	Parameter
66	MOD. ENVELOPE VELOCITY DEPTH ***
67	MOD. ENVELOPE ATTACK
68	MOD. ENVELOPE DECAY
69	MOD. ENVELOPE SUSTAIN
70	MOD. ENVELOPE RELEASE
71	--- (may be used in future software releases)
72	NON-SYNC LFO1 SPEED
73	SYNC LFO1 SPEED (0=NON-SYNC)
74	LFO1 DELAY (GRADUAL ONSET TIME)
75	NON-SYNC LFO2 SPEED
76	SYNC LFO2 SPEED (0=NON-SYNC)
77	LFO2 DELAY (GRADUAL ONSET TIME)
78	LFO 1,2 WAVEFORM / DELAY MULTI MODE (see packed parameter 5)
79	LFO 1,2 KEYSYNC / LOCK / PHASE CONTROL (see packed parameter 6)
80	ENVELOPE MODES / OSC WAVEFORM KEYSYNC (see packed parameter 1)
81	AMPLITUDE MODWHEEL DIRECT DEPTH ***
82	AMPLITUDE AFTERTOUCH DIRECT DEPTH ***
83	AMPLITUDE BREATH DIRECT DEPTH ***
84	ARPEGGIATOR/GENERAL SYNC RATE (64..191 bpm)
85	ARPEGGIATOR SYNC SETTING 0..15 (32Triplet..1 bar)
86	ARPEGGIATOR GATE TIME (100+ GIVES TIED NOTE IN MONO MODE)
87	ARP PATTERN (0..5 = up, down, ud1, ud2, order, random)
88	ARPEGGIATOR CONTROL (see packed parameter 7)
89	VOCODER BALANCE (0=off 64=full vocoder 127=modulator only)
90	VOCODER STEREO WIDTH
91	VOCODER SIBILANCE LEVEL
92	EQ LEVEL *** (0, 1..63, 64, 65..126, 127 = LP, LP shelf, flat, HP shelf, HP)
93	EQ FREQUENCY
94	NON-SYNC EQ MOD RATE
95	SYNC EQ MOD RATE 0..34 (non-sync, 32Triplet..12bars)
96	EQ MOD DEPTH
97	DISTORTION LEVEL
98	MODWHEEL DISTORTION ***
99	DISTORTION COMPENSATION
100	DELAY SEND LEVEL
101	MODWHEEL DELAY SEND
102	NON-SYNC DELAY TIME
103	SYNC DELAY TIME 0..19 (non-sync, 32Triplet..2bars)
104	DELAY FEEDBACK
105	DELAY STEREO WIDTH
106	DELAY RATIO
107	REVERB SEND LEVEL
108	MODWHEEL REVERB SEND ***
109	REVERB DECAY

Byte	Parameter
110	CHORUS SEND LEVEL
111	MODWHEEL CHORUS SEND ***
112	NON-SYNC CHORUS RATE
113	SYNC CHORUS RATE 0..34 (non-sync, 32Triplet..12bars)
114	CHORUS FEEDBACK ***
115	CHORUS MOD DEPTH
116	CHORUS MOD CENTRE POINT
117	PAN POSITION ***
118	NON-SYNC PAN RATE
119	SYNC PAN RATE 0..34 (non-sync, 32Triplet..12bars)
120	PAN MOD DEPTH
121	EFFECTS TYPE CONTROL (see packed parameter 8)
122	EFFECTS GLOBAL SYNC CONTROL (see packed parameter 9)
123	EFFECTS, VOCODER & EXTERNAL AUDIO CONTROL (see packed parameter 10)
124	--- (may be used in future software releases)
125	VOICE LEVEL TO OUTPUT & EFFECTS
126	EFFECT TYPE SELECTOR/KEYBOARD OCTAVE (see packed parameter 11)
127	OSC, SOURCE, PW, LFO SELECTORS (see packed parameter 12)

GLOBAL DATA BLOCK (256 bytes)

Byte	Parameter
0	POWER-UP PROGRAM BANK 1..4
1	POWER-UP PROGRAM NUMBER 0..99
2	MEMORY PROTECT (0=protected 1=not protected)
3	MIDI LOCAL CONTROL (0=off 127=on)
4	MIDI RECEIVE CHANNEL 0..15
5	MIDI TRANSMIT CHANNEL 0..15
6-9	--- (may be used in future software releases)
10	MIDI CLOCK SOURCE (0=internal 1=external)
11	--- (may be used in future software releases)
12	MASTER TUNE CENTS ***
13	VELOCITY CURVE (0=soft 1=hard)
14	EXTERNAL INPUT RANGE (0=line 1=mic)
15	EXTERNAL INPUT TRIM (-10..+20 dB)
16	EXTERNAL INPUT TRIGGER SENSITIVITY (0 is most sensitive)
17	GLOBAL SYNC TYPE (0,1,2 = note when all notes off, first note after prog change, midi song start)
18	PARAMETER MOMENTARY DISPLAY TIME (off.200..1200mS)
19	MENU INITIAL PAGE MODE (0=first 1=last used)
20	KEYBOARD/WHEELS MIDI TRANSMIT CHANNEL 0..15
21	PROGRAM MODE PARAMETER DISPLAY MODE (0=timed 1=permanent)
22	KEYBOARD OCTAVE SHIFT ALL-NOTES-OFF CONTROL (0=off 1=kill notes & send midi all-notes-off)

23-255...may be used in future software releases)
Zeros are transmitted. Use zeros for future compatibility

Note : Some parameters listed above are not appropriate to the V-Station (for example, Vocoder and External Input parameters). They will be accepted by the V-Station but will just be ignored.

Model : Novation V-Station Powercore
Version : 1.0

Function	Recognised	Remarks
Basic Channel Default Changed	1 to 16 1 to 16	Memorised
Mode Default Altered Messages	Mode 3 to Mode 4 X	Memorised in Program Data
Note Number TRUE Voice	0-127	
Velocity Note On Note Off	O v = 1- 127 X	
Aftertouch Channel Key	O X	
Pitch Bend	O	8 bit data
Control Change	1-3, 5-10, 12-37, 40-65, 67-85, 87-89 91-95,98,100 102-112, 114-127	See Controller & NRPN tables for details
Program Change TRUE	0-99	
System Exclusive	O	Program and Global data dumps
System Real-Time	O	Start Cong, Clock
Aux Messages Local On All Notes Off Active Sens Reset Control All Sound Off	X O X O O	

Mode 1 : OMNI ON, POLY
Mode 2 : OMNI OFF, POLY

Mode 3 : OMNI ON, MONO
Mode 4 : OMNI OFF, MONO

O : Yes
X : No