

Advanced Features.....	2
Using The Transport Buttons.....	2
The Global Mode Menu.....	2
Saving The Global Settings To Memory.....	4
Upgrading The Operating System From MIDI.....	4
Synthesis Tutorial.....	5
Elements Of A Sound.....	5
The Oscillators And Mixer.....	6
The Filter.....	7
Envelopes And Amplifier.....	8
LFOs.....	10
Memories.....	10
Summary.....	10
The KS Synthesizer.....	11
Introduction.....	11
Selecting KS Synth Patches.....	11
Editing A Synth Patch (Sound).....	12
Saving A Synth Patch.....	12
Using Menus.....	13
The Oscillator / Mixer Section.....	13
The Filter Section.....	15
The LFOs Section.....	16
The Envelopes Section.....	17
The Arpeggiator Section.....	18
The Effects Section.....	19
The Oscillator Menu.....	19
The Mixer Menu.....	21
The Filter Menu.....	22
The LFO Menu.....	22
The Arpeggiator Menu.....	24
The Sync Menu.....	25
The Wheels Menu.....	26
The Aftertouch And Breath Menu.....	27
The Pan Menu.....	28
The KS Synth Mode Global Menu.....	29
Routing MIDI To And From The KS Synthesizer.....	29
The KS Synth General Settings.....	30
Saving The KS Synth General Settings.....	30
Appendix.....	31
Troubleshooting.....	31
Using The ReMOTE 25 Audio With Reason.....	31
Known Anomalies With Reason.....	31
The KS Synth Patch Preset Listings.....	32
MIDI Implementation Chart.....	34
Safety CE Notices And Approvals.....	35

Using The Transport Buttons



The transport buttons may be defined in the same manner as any of the other programmable buttons in **Template Edit Mode**. However, they are ideally suited to controlling sequencers or recording device. Therefore, they can alternatively be assigned to transmit MIDI MMC (MIDI Machine Control) commands.

Each one of the 40 Template memories can hold its own set of definitions for these five buttons.

The details of assigning MMC to these buttons and the range of MMC commands available is described in detail on pages 17 & 18.

Some sequencers (such as Cubase) Use other types of MIDI message for remote control purposes such as MIDI Note messages. The TRANSPORT buttons can of course be configured to transmit these instead of MMC in the normal way. Consult your sequencer documentation for full details of the MIDI messages used for remote control purposes.

The Global Mode Menu

The menu in **Global Mode** is used to alter settings which apply to globally across all Templates. Also found here are various utilities and information displays. When **Global Mode** is selected by pressing the GLOBAL button, page 1 of the Global menu is automatically selected. The available menu pages are :

Memory Protect (Menu Page 1)

Global Menu			
Page	Function	Top Line Display	Value
1	Memory Protect	Mem Protect	OFF...ON
2	Memory Dump	Dump	CURR...BANK 2
3	USB To MIDI Out	USB to MIDI Out	----...12
4	MIDI In To	MIDI In to	----...U12
5	Global MIDI Channel	Glob MIDI Chan	1...16
6	Pot / Slider Override	Pot/Slid Ovrde	OFF...PICKUP
7	Display Timeout	Display Timeout	0...PERMANENT
8	Calibrate Pitch Bend / Modulation	Cal Pitch/Mod	
9	Calibrate Aftertouch	Cal Aftertouch	
10	Battery Charge	Battery Charge	OFF...PSU/USB
11	Power Status	Pwr Status	
12	New Operating System From USB	New O/S from USB	
13	Retain Template Values	Retain Template	ON...OFF
14	Default Sample Rate	Def SampleRate	44.1K...48K

Sets the Memory Protect switch. This is a safety feature to prevent Templates or Global settings being accidentally over-written. Setting **Memory Protect** to **On** also prevents memories being over-written by incoming System Exclusive Template dumps.

Memory Dump (Menu Page 2)

Selects either the currently selected Template, all Template data or KS Synth Patch data to be saved in System Exclusive format. Use the DATA / VALUE encode to select the type of dump to be sent. This feature is useful for creating libraries of ReMOTE 25 Audio Templates / Synth Patches or as a safety backup.

Transmission of the Sysex dump is initiated by pressing the WRITE button while this menu page is displayed.

Sysex editor / librarian programs can be downloaded from the internet as shareware or freeware. Using such a program is recommended for building a library of templates and synthesiser programs. A System Exclusive dump can be replayed into the ReMOTE 25 Audio

from a sequencer at any time. A single Template dump or synth program will over-write the edit buffer of the currently selected Template or synth program. The changes will not be permanent unless the Template is then manually written to a memory following the procedure detailed on pages 20 & 21.

In contrast, 'All' Template Sysex dumps *always* directly write into the ReMOTE 25's memories. This can be prevented by setting **Memory Protect** to **On** (see above).

Note that synthesiser programs will only be received when the X-Station is in the synthesiser mode.

USB To MIDI Out (Menu Page 3)

Enables the ReMOTE 25 Audio to immediately re-transmit MIDI arriving from the USB port to either or both of the MIDI OUT ports. This feature is useful for some MIDI network configurations (see pages 8 & 9).

This setting applies across all Templates.

MIDI In To (Menu Page 4)

Enables the X-Station to immediately re-transmit MIDI arriving from the MIDI IN port to the USB port or either of the MIDI OUT ports. This feature is useful for some MIDI network configurations (see pages 8 & 9). Any multiple combination of ports is possible. A 'U' shown on the display indicates that MIDI data will be sent from the USB port, a '1' that the MIDI OUT (1) port will be used and a '2' indicates that the MIDI OUT (2) port will be used.

This setting applies across all Templates.

Global MIDI Channel (Menu Page 5)

In addition to selecting a new template using the DATA / VALUE knob, Templates or Synth Patches may also be selected by sending a Bank Select / Program Change command from another MIDI device to the X-Station. See page 34 for full details on this.

In **KS Synth Mode**, The ReMOTE 25 Audio uses the **Global MIDI Channel** setting as the MIDI receive / transmit channel.

Pot / Slider Override (Menu Page 6)

Allows the individual **Pot / Slider Control** settings for each knob or slider (set in the Template Edit menu - see page 17) to be overridden. Three options are available :

Off - Each knob or slider will behave according to its own settings as stored in the Template.

Jump - Each knob or slider will immediately transmit MIDI when moved.

This applies globally to all knobs and sliders in all Templates.

Pickup - Each knob and slider will only transmit MIDI once it has passed through the position represented by the control's data value as stored in the Template.

This applies globally to all knobs and sliders in all Templates.

Display Timeout (Menu Page 7)

When many controls are adjusted (such as the LEVEL control in the effects section) the display switches to show an updated value for period of time. The time period is set by this Timeout value option.

It has a default value of 64 which will give about 0.5 seconds of display time before the display switches back to the previous screen. The range of the control is 0 (no timeout) to permanent whereby the display does not switch back to a previous screen.

The Global Mode Menu

Pitch Bend / Mod Calibration (Menu Page 8)

Here the Modulation / Pitch Bend joystick can be calibrated.

Cal Pitch/Mod:
--- ---

The joystick is moved from the extreme left to the extreme right. The digits below the word 'Pitch' will show 0 to 255. The joystick is then moved from the extreme top to the extreme bottom. The digits below the word 'Mod' will show 0 to 128.

The joystick mechanism is now calibrated. The calibration is saved by saving the global settings. See page 4 for details. Normally, it should not become necessary to calibrate the joystick again.

Aftertouch Calibration (Menu Page 9)

Here the Aftertouch response of the keyboard can be calibrated.

Cal Aftertouch:
--- ---

The number on the right hand side is the sensitivity setting. This is adjusted manually by using the DATA / VALUE encoder.

Maximum pressure is applied to a keyboard note and the DATA / VALUE encoder rotated until the digits on the left register a value of 127. The right hand digits should show a value of approximately 100.

A few different keyboard notes should be tried to check that any key can achieve an Aftertouch maximum value of 127 without pressing excessively hard.

The keyboard Aftertouch response is now calibrated. The calibration is saved by saving the global settings. See page 4 for details. Normally, it should not become necessary to calibrate the joystick again.

Battery Charge (Menu Page 10)

This page is used to set the battery charging options. The available options are :

Off

No charging. Recommended when dry cells are used (eg. Alkaline, Duracell).

PSU Max Only

Maximum charge rate when external PSU is used. No charge when powered by USB.

PSU Max/USB Min

Maximum charge rate when external PSU is used. Light charge when powered by USB.

PSU Max/USB Med

Maximum charge rate when external PSU is used. Medium charge rate when powered by USB.

Power Status (Menu Page 11)

Pwr Status: PSU
Chg: OFF 10.1v

This menu page is used to display (as a status only) the powering status of the X-Station. The DATA / VALUE encoder has no function here.

On the top line of the display can be seen the power source. This will be **PSU** for the external PSU, **USB** for USB powering or **BAT** if the X-Station is being powered by dry cells.

On the bottom line are shown at the left the charging rate (**OFF**, **LOW**, **MID** or **HI**). To the right is shown the voltage level of any connected dry cells.

Operating System Upgrade from USB (Menu Page 12)

New O/S From USB
Press Write...

This menu page is used to upgrade to a newer Operating System (O/S) via the USB port that Novation may publish from time to time. The display will prompt to press the WRITE button. After pressing the WRITE button the display will show :

Waiting New O/S
Press Write...

The new O/S should now be sent from the host computer. Operating systems can be sent with the Novation OS installers that can be downloaded with the latest operating systems from www.novationmusic.com.

As the OS is received a percentage of receipt is displayed. When completed, a prompt is made to switch Off the ReMOTE 25 Audio and On again.

Retain Template Values (Menu Page 13)

Determines whether the 'current values' for each control in the current Template are remembered when a different Template is selected.

When set to **ON**, the 'current values' values are remembered. If the original Template is later selected again, it is these remembered values which will be regarded as 'current'.

Note : These remembered values are lost when the ReMOTE 25 Audio is powered off unless a Template is saved to memory.

When set to **OFF**, the values are not remembered and every time a new Template is selected, it will the values stored in the Template memory data which will be regarded as 'current'.

This setting should be used with the pot / slider override control (Menu page 6) set to Pickup.

Default Sample Rate (Menu Page 14)

Defines the internal audio sampling rate when the ReMOTE 25 Audio is not connected to a computer via USB.

When a USB cable is connected, the computer specifies the sampling rate and altering this setting has no effect.

Saving The Global Settings To Memory

Once any of the Global settings have been altered in **Global Mode**, they may be written to a special area of X-Station memory for instant recall the next time the X-Station is switched on.

The Global write procedure is invoked by pressing the WRITE button while in **Global Mode**. If the **Memory Protect** switch is set **On**, the following screen is displayed :

MEMORY PROTECTED

And the write procedure is halted. After about half a second, the ReMOTE 25 resumes in **Play Mode**. It will be necessary to set the **Memory Protect** switch to **Off** before the X-Station's memory can be over-written. This is described on page 2.

Otherwise, pressing the WRITE button will write all Global settings to memory. The display will show :

GLOBALS SAVED

And around half a second later, the X-Station will return to the previously displayed page in **Global Mode**.

Note : When the Global settings are written to memory, the number of the currently selected Template is also stored. The next time the X-Station is powered on, this Template will immediately be selected in **Play Mode**.

Upgrading The Operating System From MIDI

As well as being updateable from USB (see page 3), the operating system can be updated via the conventional MIDI in port. The latest version of the operating system which Novation may publish from time to time is available for download from the Novation web site :

<http://www.novationmusic.com>

To install the operating system via the conventional MIDI port, power up the X-Station while simultaneously holding down the PHANTOM, INPUT and STEREO buttons. Send the operating system file from the Novation OS update utility.

It is also possible for an X-Station to transmit the currently installed operating system (for example to directly update another connected X-Station by powering up the X-Station while simultaneously holding down the INPUT, STEREO and TEMPLATE COMMON BUTTONS buttons).

Elements Of A Sound

It is recommended that this chapter is read carefully if Analogue sound synthesis is an unfamiliar subject. Users familiar with this subject can skip this chapter and move on to the chapter - **The KS Synthesizer** on Page 11.

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 terms*, and all sounds *always* have them. They are :

- * Volume
- * Pitch
- * Tone

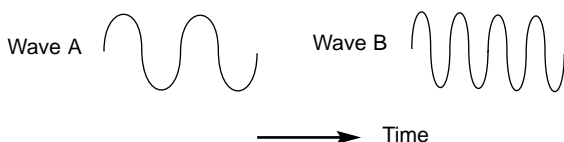
What makes one sound different to another is the proportion of these three qualities initially present in the sound and how these three terms *change* throughout the duration of the sound.

With a musical synthesizer, we deliberately set out to have precise control over these three terms and, in particular, how they can be changed throughout the duration of the sound. These terms are often given different names, Volume is referred to as Amplitude, Pitch as Frequency and Tone as Timbre.

Pitch

Taking the example of air vibrating the ear drum, the 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 bass type sound, and the highest is many thousands of times a second, which the brain interprets as an extreme treble type sound.

Wave B is twice the pitch of Wave A



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 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.

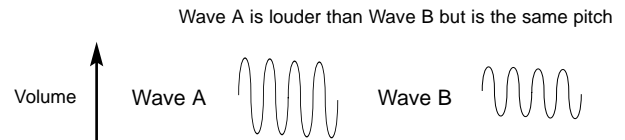
Tone

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. The relative loudness of these harmonics compared to the loudness of all the other harmonics (including the fundamental) determines the tone or 'Timbre' of the sound.

Consider two instruments such as a harpsichord and a piano playing the same note on the keyboard and at equal volume. Despite having the same volume and pitch, the instruments would still sound distinctly different. This is because the harmonics present in a piano sound are different to those found in a harpsichord sound.

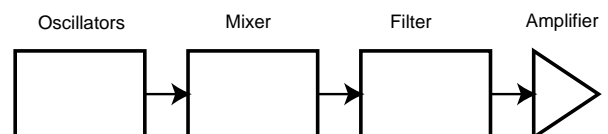
Volume

Volume, which is referred to as the amplitude or loudness of the sound is determined by how large the vibrations are. Very simply, listening to a piano from a metre away would sound louder than if it were fifty metres away.



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 a different section of the Synthesizer 'Synthesizes' (or creates) these different elements.

One section of the synthesizer, the **Oscillators** provide raw waveforms which provide the pitch of the sound along with its raw harmonic content (tone). These signals are then mixed together into a section called the **Mixer** and the mixed oscillator signal is then fed into a section named the **Filter** which is responsible for further altering the tone of the sound. It does this by removing (filtering) certain undesired harmonic frequencies. Lastly, the filtered signal is fed into a final section, the **Amplifier** which determines the final volume of the sound.



Audio path of the main Synthesizer blocks

Additional synthesizer sections; **LFOs** and **Envelopes** provide ways of altering the pitch, tone and volume of a sound by interacting with the **Oscillators**, **Filter** and **Amplifier**, providing changes in the character of the sound which can evolve over time. Because **LFOs** and **Envelopes** only purpose is to control (modulate) the other synthesizer sections, they are commonly known as 'modulators'.

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



The Oscillators And Mixer



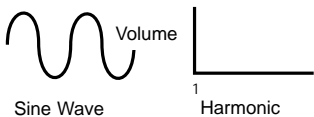
The Oscillator is really the heartbeat of the Synthesizer. It generates an electronic wave (which creates the vibrations). This *Waveform* is produced at a controllable musical pitch, initially determined by the note played on the keyboard or contained in a received MIDI note message. The initial distinctive 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 many of the most useful harmonics for musical synthesis. The names of these waves reflect their actual shape when viewed on an instrument known as an *Oscilloscope*, and are known as, Sine waves, Square waves, Sawtooth waves, Triangle waves and Noise Waves.

Each one has a specific fixed amount of musically related harmonics (except noise waves) which can be manipulated by further sections of the Synthesizer.

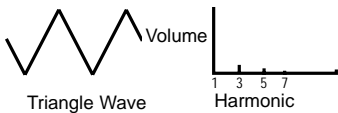
The diagrams below show how these waveforms look on an Oscilloscope and illustrate the relative levels of their harmonics. Remember, it is the relative levels of the various harmonics present in a waveform which determine the tone of the final sound.

Sine Waves



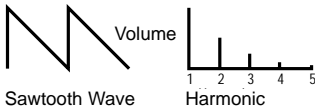
These have just a single frequency. This waveform produces the purest sound because it only has this single pitch (frequency).

Triangle Waves



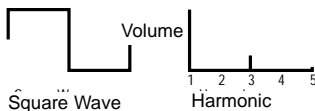
These contain only odd harmonics. The volume of each is the square of its position in the harmonic series. For example, the 5th harmonic has a volume of 1/25th of the fundamental.

Sawtooth Waves



These have a rich proportion of harmonics, containing all the harmonics of the fundamental frequency. The volume of each harmonic is proportional to its position in the harmonic series.

Square Waves

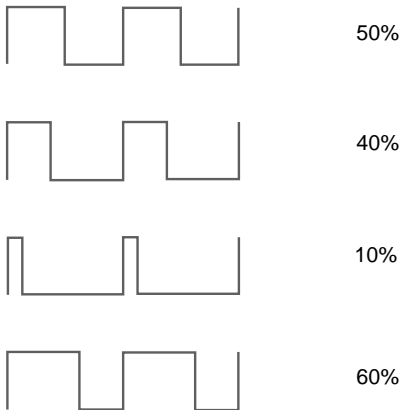


These only have only the odd harmonics present. These are at the same volume as the odd harmonics in a sawtooth wave.

It will be noticed that the square waveform spends an equal amount of time in its 'high' state and its 'low' state. The way in which this defined is known as the 'duty cycle'. A square wave always has a duty cycle of 50% which means it is 'high' for 50% of the waveform cycle and 'low' for the remaining 50% of the waveform cycle.

With the KS Synth, it is possible to adjust the duty cycle of the basic square waveform to produce a waveform which is more 'rectangular' in shape. These are often known as Pulse waveforms. As the waveform becomes more and more rectangular, more even harmonics are introduced and the waveform changes its character, becoming more 'nasal' sounding.

The width of the pulse waveform (often known as 'Pulse Width') can be altered dynamically by a modulator which results in the harmonic content of the waveform constantly changing. This can result in the waveform having a very 'fat' quality when the pulse width is altered at a moderate speed.

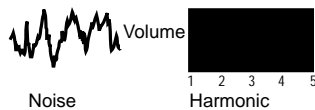


Various duty cycles of rectangular (pulse) waves

When listening to a pulse wave, it does not make any difference to the perceived sound whether the duty cycle is 40% or 60% since the waveform has just been inverted and the harmonic content between the two is exactly the same.

The Filter

Noise Waves



These have no fundamental frequency (and therefore no pitched element). All frequencies are at the same volume. Because they have no perceivable pitch, noise waves are often useful for creating sound effects and percussion type sounds.

Digital Waveforms

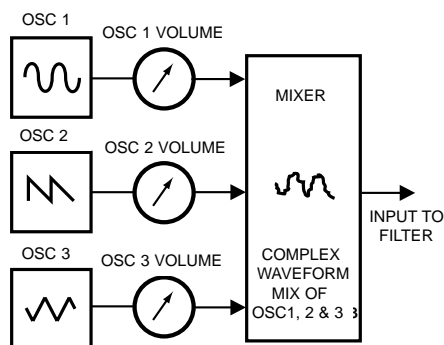
In addition to the traditional types of Oscillator waveforms detailed above, the KS Synth also offers carefully selected digitally sampled pre-set waveforms containing useful harmonic elements normally difficult to produce using traditional Oscillator waveforms.

The 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. There are three independent Oscillators and a separate Noise Oscillator.



Some synths such as the Novation KS 5 often have a separate Mixer section available on the front panel. On the X-Station's KS Synth implementation, a single LEVEL knob within the OSC / MIXER section is used to adjust the levels of the Oscillators and Noise generator. These may be independently adjusted and mixed together to form a new, more harmonically complex waveform.



Use the Oscillator SELECT button to select the signal controlled by the LEVEL knob. A column of LEDs above the button indicate which signal is currently selected.

The Filter

The X-Station's KS Synth is an *Analogue subtractive* type of music synthesizer. *Subtractive* implies that part of the sound is subtracted somewhere in the synthesis process.

The Oscillators provide the raw waveforms with plenty of harmonic content and it is the *Filter* that subtracts unwanted harmonics in a controllable manner.



Three types of Filter are available. The type of Filter most commonly found on synthesizers is the Low Pass type. With a Low Pass Filter, a cut-off point is chosen and any frequencies below that point are passed. Any frequencies above are filtered out. The setting of the FREQUENCY knob on the front panel dictates the point below which frequencies are removed. This process of removing harmonics from the waveforms has the effect of changing the sound's character or timbre. When the FREQUENCY knob is set fully clockwise, the filter is set completely open and no frequencies are removed from the raw Oscillator waveforms.

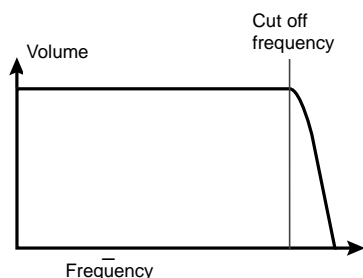
In practice, there is a gradual reduction in the volume of the harmonics above the cut-off point. How quickly these harmonics are reduced in volume above the cut-off frequency is determined by the Filter's slope. This slope is measured in 'volume units per octave'. Since Volume is measured in decibels, this slope is quoted in number of decibels per octave (dB). 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.

The button on the section marked SLOPE allows either the 12dB or 24dB type filter slope to be selected.

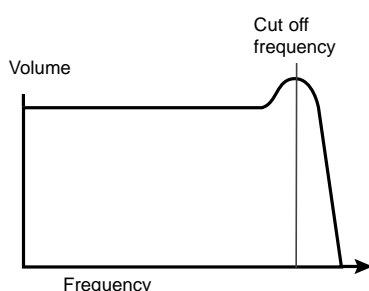
A further important feature of the Filter is the RESONANCE control. Frequencies at the cut-off point may be increased in volume by this control. This is useful for emphasizing certain harmonics of the sound.

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.

The diagram below shows the response of a typical low pass filter. Frequencies above the cut off point are reduced in volume.

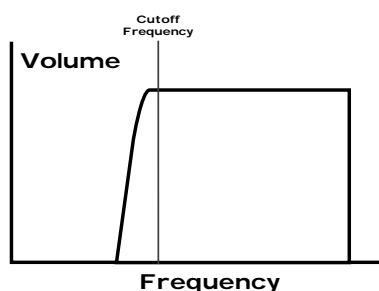


When resonance is added, frequencies at the cut off point are boosted in volume.

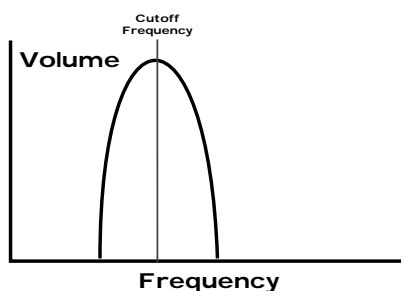


In addition to the traditional Low Pass Filter type, there is also a High Pass and Band Pass Filter. The type of Filter used is selected by using the front panel Filter TYPE button.

The High Pass Filter is similar to the Low Pass Filter except that frequencies *below* the cutoff frequency point are removed. Frequencies *above* that point are passed. When the FREQUENCY knob is set fully anti-clockwise, the filter is set completely open and no frequencies are removed from the raw Oscillator waveforms.

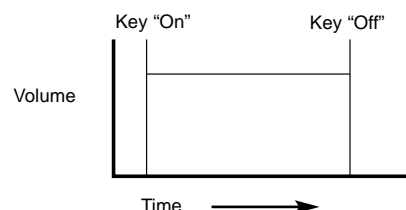


When the Band Pass Filter is used, only a narrow band of frequencies centered on the cutoff frequency point are removed. It is not possible to fully open this type of Filter, allowing all frequencies to pass through.

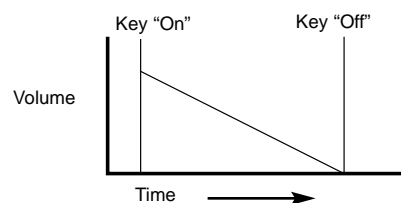


Envelopes And Amplifier

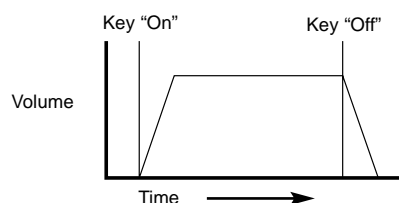
In earlier paragraphs, it was determined how the pitch and timbre of a sound are synthesized. This final part of the Synthesis Tutorial describes how the volume of sound is controlled. The volume throughout the duration of a sound created by a musical instrument often varies greatly according to the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



An Organ sound 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.

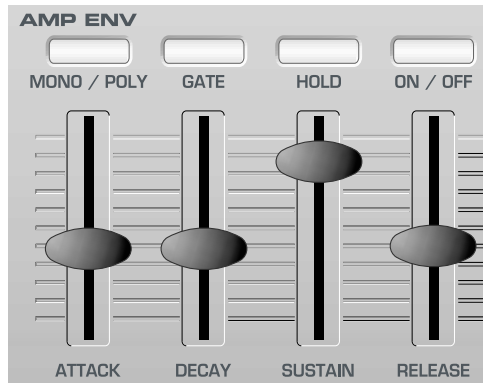


A String Section emulation attains full volume gradually when a key is pressed. It remains at full volume while the key is held down, but once the key is released, the volume level gradually falls to zero.

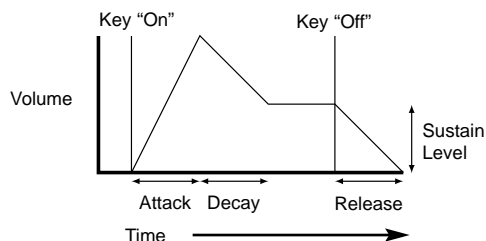
Envelopes And Amplifier

On an Analogue synthesizer, changes which occur throughout the duration of a note are controlled by a section known as an Envelope Generator. The KS Synth has two main Envelope Generators. The circuit of one of these is always connected to an *Amplifier*, which controls the Volume of the sound when a note is played.

Note that there are no controls in a section on the front 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.



Each envelope generator has four slider 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

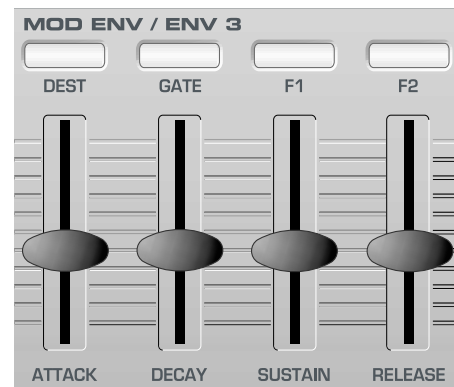
This is unlike the other Envelope controls in that it sets a level rather than a period of time. It sets the volume level that the envelope remains at while the key is held down, after the Decay time has expired.

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.

A typical synthesizer will have one or more envelopes. One envelope is always applied to the amplifier to shape the volume of each note played. Additional envelopes can be used to dynamically alter other sections of the synthesizer during the lifetime of each note.

The KS Synth has a second main Envelope Generator called the Mod Envelope which may be applied in various interesting ways. For example, it may typically be used to modify the filter cut off frequency or change an oscillators pitch during the lifetime of a note.

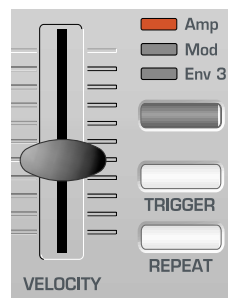


A third Envelope Generator called Envelope 3 is also used by the KS Synth for specialised purposes (such as FM control). Unlike the other two main Envelope Generators, this Envelope only has Attack and Decay phases.



When Envelope 3 is selected by using the Envelope SELECT button, the same front panel section is used as for the Mod Envelope (as shown above), but only the ATTACK and DECAY sliders can be used.

It is possible to make the Envelope settings vary according to how hard a note is played on the ReMOTE Audio keyboard. Notes struck with a good deal of force (velocity) will produce more dramatic changes than notes played lightly.



The VELOCITY slider in the Envelopes section controls how the envelopes respond to note velocity.

Note that there is only one slider which shared by all three Envelopes. Use the Envelopes SELECT button first to select which envelope this slider will control.

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 synthesis process, it is used instead to change (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 contribute greatly towards shaping the final sound.

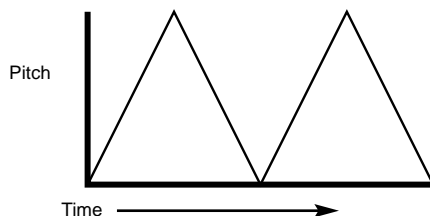
Where an Envelope is used to control a one-off modulation which occurs during the lifetime of a single note, LFOs modulate by using a cyclic repeating wave pattern. As discussed earlier, Oscillators produce a constant waveform which can take the shape of a repeating sine wave, triangle wave etc. LFOs 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. In fact, LFO actually stands for Low Frequency Oscillator.



As with an Envelope, the waveforms generated by the LFOs may be fed to other parts of the synthesizer to create the desired movements in the sound.

There are two independent LFOs available which may be used to modulate different synthesizer sections and run at different speeds. Use the LFO SELECT button to select LFO 1 or LFO 2 for editing.

A typical waveshape for an LFO would be a Triangle wave.



Imagine this slow moving wave being applied to an Oscillator's pitch. The result would be that the pitch of the Oscillator slowly rises and falls above and below its original pitch.

This would simulate, for example, a violinist moving a finger up and down the string of the instrument whilst it is being bowed. This subtle up and down movement of pitch is referred to as the 'Vibrato' effect.

Similarly, if the same LFO were applied to the Filter Cutoff frequency instead of the Oscillator pitch, a similar wobbling effect known as 'wow-wow' would be heard.

As well as LFOs being available to modify (or more commonly known as **Modulate**) different sections of the synthesizer, additional Envelopes may also be used simultaneously.

Clearly, the more Oscillators, Filters, Envelopes and LFOs there are in a Synthesizer, the more powerful it becomes.

Memories

The first generation of synthesizers, produced many years ago were large modular machines where each part of the synthesizer was housed in a separate unit (block). These blocks could only be physically connected together by combinations of cables known as patch leads. A typical sound produced by this method would often involve connecting dozens of patch leads.

Every time a new sound was required, the leads would have to be physically disconnected and reconnected. The positions and connections of the leads would have to be noted down on paper if there was to be any hope of creating that particular sound ever again! If not reconnected in exactly the same way, the sound would be lost forever.

Modern machines such as the Novation KS 4 / KS 5 have all the blocks in one compact unit and the sound generating or modifying blocks are arranged in a sensible fashion. Front panel switches and knobs determine how each block functions and where the sound modifying blocks such as the LFOs and Envelopes are routed, instead of having to physically connect them externally with cables.

Additionally, The settings of these front panel controls (which of course determine the current sound or 'patch') may then be stored in memory locations in the machine which can be recalled at any time.

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.
- 2 A Mixer that mixes the outputs from the Oscillators together.
- 3 A Filter that removes certain harmonics, which changes the characteristic or timbre of the sound.
- 4 An Amplifier that is controlled by an Envelope generator. This alters the volume of a sound over time when a note is played.
- 5 LFOs and Envelopes that can be used to modulate any of the above.

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 switches will eventually lead to a fuller understanding of how the various controls alter and help shape new sounds.

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

Introduction - Selecting Synth Patches

Introduction

The new operating system upgrade for the X-Station presents the exciting option of using the X-Station keyboard as a dedicated synthesizer.

The synthesizer is an implementation of Novation's popular KS series of synthesizers - the KS 4, KS 5 and KS Rack. The sound engine is compatible with KS series Programs, but there are some limitations :

- * The X-Station KS Synth is mono-timbral (ie it can only play one type of sound at any one time). The KS Synth will always operate in 'Program Mode'. Eight note polyphony is available.
- * Drum Maps are not implemented. The Drum waveforms found on the KS4, KS5 and KS Rack are not available for the X-Station KS synth oscillators and the X-Station KS synth arpeggiator does not use drum patterns.
- * A single bank of 128 Programs are available. No Performances are used.
- * No parameters can be synchronised to external MIDI clock.
- * Audio signals cannot be fed through the Synthesis engine. Auto input triggering and the vocoder are not available.
- * Only one Effects channel is available for the Audio Inputs / Outputs. When operating in **KS Synth Mode**, the ReMOTE Audio uses channel 2 Effects for the KS Synthesizer's Effects.
- * Hypersync Templates are not used.
- * The number of ReMOTE Audio Templates is reduced from 50 to 40 plus there is now a dedicated Template, Template 41 for KS Synth control.
- * It is not possible to use the ReMOTE Audio as a MIDI controller and KS Synth simultaneously. The ReMOTE Audio can only act as one or the other at any one time.

Selecting KS Synth Patches

The X-Station is supplied with two banks of 100 synth patches, all of which are editable and may be overwritten or modified.

The PLAY button is used to toggle between the Template mode and the KS Synth mode. While in **KS Synth Mode**, the text 'Synth Prog' is always shown on the top line of the display above the Synth patch's name. For example :

```
SYNTH PROG    100
ArkBass
```

There are two ways of selecting KS Synth Patches.

1 - Using the BANK / PAGE Buttons & DATA / VALUE Encoder

Press the PLAY button so the X-Station enters **KS Synth Mode** (the display will show the text 'SYNTH PROG' and the LED above the PLAY button will be lit).

Use the DATA / VALUE Encoder or PROGRAM buttons to select the desired Synth Patch. The BANK / PAGE buttons can be used to quickly switch between the two banks of 100 Synth patches.

Any one of the 200 available Synth patches can be selected to automatically load whenever **KS Synth Mode** is initially selected. In the above example, Synth patch 100 'ArkBass' is the default selection.

To assign a different Synth patch as the default, simply save the Global parameters while the Synth patch of your choice is selected. Global parameter saving is described on page 4.

Whenever a new Template or Synth patch is selected from front panel, both Bank Change and Program Change messages can be transmitted via MIDI Out and/or USB. It is sometimes convenient to record these messages into a sequencer in real-time.

2 - Using MIDI Bank Select & Program Change Messages

A MIDI Bank Select and Program change message sent from an external sequencer or controller keyboard can be used to select a Template or Synth patch directly. These messages should always be sent on the **Global MIDI Channel**. The Global MIDI channel is set from within the Global Menu. See page 2 for details.

The MIDI Bank Change message (CC32) should always precede the Program Change message. it is recommended that the Bank Change message is always sent *immediately* before the Program Change message.

A Bank Change message with a data value of zero can be used to select a Template. A Bank Change message with a data value of 33 is always used to select Synth patches 100 - 199 and a Bank Change message with a data value of 34 is always used to Synth patches 200 - 299.

Note that if the Bank Change message is omitted, a Program change message will *always* select a Template rather than a Synth patch.

The Program Change message specifies which actual Template or Synth patch is to be selected. When selecting Templates, only data values in the range 0 - 39 are valid. Any other values are ignored. For selecting a Synth patch, data values between 0 - 99 can be used. Any other values are ignored.

For example, to select Template 30 from a sequencer, send :

Bank Select (CC32)	0
Program Change	29

or to select Synth patch 199 from a sequencer, send :

Bank Select (CC32)	33
Program Change	99

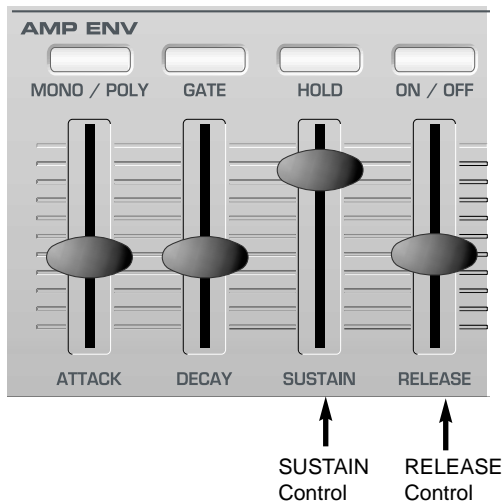
Whenever Synth patches are selected using this method, the X-Station always automatically enters **KS Synth Mode**.

Editing A Synth Patch (Sound)

Once familiar with the sounds that are available, use the PROGRAM buttons to select Synth patch number 299 - 'Init Program'. This is a very basic synthesizer sound which can be used as a starting point to create a new, more interesting sound for your own use.

When this sound is played from the keyboard, it will be noticed that the volume of the sound instantly reaches its maximum level when a key is pressed, and dies away instantaneously as soon as the key is released. The most useful sound editing controls are found on the front panel and some of these will be now be used to modify (edit) this basic sound.

While playing the keyboard, adjust the Amplifier Envelope SUSTAIN control. Notice how that the sound level when holding a key down changes. Set this control to just over half. Now adjust the RELEASE control. Notice how, when a key on the keyboard is released the sound will now gradually die away.



How quickly the sound dies away depends on the setting of this control. The sound is still a little too bright. Adjust the FREQUENCY control in the Filter area.



Notice how the sound becomes softer as the control is rotated anti-clockwise. Continue to make adjustments until a desired sound is heard. The first small edit is now complete!

Saving A Synth Patch

Edited sounds may be saved in any Synth patch memory location from 100 - 299. Note that once these factory presets are overwritten, they may only be retrieved by loading in a Sysex dump. (See page 2 for saving a sysex backup of the factory preset or user programs).

NOTE: When shipped from the factory, the global memory protect switch is set to on. The memory protect switch is a safety feature designed to prevent memories from being overwritten by accident. In order to save a sound, the global memory protect must be switched off.

If an attempt is made to save to a memory while the global memory protect is still switched on, a brief warning message will be displayed.

MEMORY PROTECTED

No data will have been written to memory. See page 2 for details on how to turn off Memory Protect.

To Save A Synth Patch To A Memory Location

Press the WRITE button.

ArkBass
To Program 100

The display will now show the destination memory number where the Synth patch is about to be saved to. In this example, **To Program 100**. Notice that the destination memory is always initially set to the currently selected Synth patch's number.

It is possible to save a Synth patch to a different memory location. Use the DATA / VALUE knob to select a different destination memory if required. Any Synth patch location can be selected, even if it previously contained a factory preset.

Press the WRITE button again.

Program ReName ?
ArkBass

On this display it is possible to edit the Synth patch's name. Use the Left and Right INST CHANNEL / CURSOR buttons to move the cursor within the Patch's name text. Use the DATA / VALUE knob to edit the character located at the cursor.

Press the WRITE button again.

PROGRAM SAVED

and the write procedure is completed.

Note : There are certain settings which are common to all Synth Patches which are **not** saved during this procedure. See page 30 for details on these.

Using Menus - The Oscillator / Mixer Section

Using Menus

Many of the more specialised features and utilities of the KS Synth are accessed from menus. There are nine separate menus, each of which consists of several pages linked together.



In KS Synth mode, the top row of buttons in the Envelopes section of the front panel are used to access menus by pressing the relevant button. The menus available are :

MONO / POLY	Selects the Oscillator Menu
GATE	Selects the Mixer Menu
HOLD	Selects the Filter Menu
ON / OFF	Selects the LFO Menu
DEST	Selects the Arpeggiator Menu
GATE	Selects the Sync Menu
F1	Selects the Wheels Menu
F2	Selects the Aftertouch / Breath Menu
F3	Selects the Pan Menu

As soon as a Menu is entered, the display will show the first page of whichever menu was accessed the previous time the Menu was used.

For example, if the Filter Menu had been previously selected, the display would show one of the pages of the Filter Menu.

Filter Q norm	13
<<MENU>>	49

Once any of the Menus have been selected, the BANK / PAGE buttons to the left of the display are used to navigate forwards and backwards between the menu's pages. Once the desired menu page has been reached, the values are altered by using the DATA / VALUE knob.

The display behaves in the same way as when a front panel control is adjusted. The current value being shown on the bottom line and the new value being shown on the top line. MENU text in capitals is at the left of the display to inform that a MENU is selected.

Once in a Menu it is still possible to alter any of the front panel controls, but it will be noticed that when a knob is moved, the display text for the knob just moved will only be shown on the screen for a short period of time. (This time is set using the **Function Display time** parameter in the Global Menu - see page 2). After a short time, the display will revert back to showing the current menu page.

It is possible to exit a Menu by pressing the current Menu button again, or to move to another menu by pressing a different menu button.

The Oscillator / Mixer Section

The Oscillators generate pitched waveforms (as described in the **Synthesis Tutorial** chapter) and these are fed into the Mixer. Most of the controls which determine the pitch and waveform of the Oscillators, and how they react to modulation are in this area of the front panel. Also found here are the level controls for the Mixer.



Oscillator Select Button

There are three independent Oscillators, a Noise generator and a Ring Modulator. Each one can be independently controlled by the buttons and knobs in the Oscillator area.

To make the controls active and to see waveform and octave settings for Oscillator 1, press the OSCILLATOR button once or more until the OSC 1 LED lights. For Oscillator 2, press until the OSC 2 LED lights. For Oscillator 3, press until the OSC 3 LED lights. For the Noise generator, press until the NOISE LED lights, and for the Ring Modulator, press until the X MOD LED lights.

OCTAVE Button

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, repeatedly press the OCTAVE button until the display indicates that +1 has been selected.

NOTE: The 0 position corresponds to the concert pitch of 440Hz when note A above middle C is played.

PW SELECT Button and PWM Knob

The function of the PWM knob is dependent on the selection of the PW SELECT button. With the POSITION setting selected, 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). In order to understand how the Pulse Width knob affects various waveforms, examples, using factory presets are used. See the following paragraphs titled: **Obtaining a classic Square/Pulse PWM sound** and **Obtaining a Double Saw 'thick' detuned sound**.

With the PWM knob in the central position, the Pulse Width wave becomes a square wave. As the knob is adjusted clockwise, or anti-clockwise, the Pulse Width becomes narrower producing what is termed as a Pulse Wave.

With the LFO position selected by the PW SELECT button, 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 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, the effect is most apparent when using fairly long Mod Env Attack and Decay times.

Obtaining A Classic Square / PWM Sound

The PWM sound is one of the classic analogue synthesizer sounds. Select the factory initialisation sound (299 - 'Init Program'). This sound use only use Oscillator 1 as the source waveform. For this oscillator select a square waveform using the WAVEFORM knob in the Oscillators section. Notice how the timbre changes to a more 'woody' sound. Select POSITION using the PW SELECT button.

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. (If fact the sound will extinguish completely at maximum settings). Leave the knob at the 12 o'clock position.

Select LFO using the PW SELECT button. Slowly rotate the PWM knob. Notice that there will now be some movement in the sound. Select LFO 2 in the LFO Section using the LFO button. Rotate the SPEED knob in this section 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 'Thick' 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 product a 'huge' sound. Select the factory initialisation sound (299 - 'Init Program'). This sound use only use Oscillator 1 as the source waveform. For this oscillator select the sawtooth waveform using the WAVEFORM knob. Select POSITION using the PW SELECT button.

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. Return the PWM knob to the 12 O'clock position.

Select LFO using the PW SELECT button. Slowly rotate the PWM knob. Notice that there will be some movement in the sound.

Press the LFO button to select LFO 2. Select a sawtooth LFO wave using the WAVEFORM button in the LFOs section. Rotate the SPEED knob in this section and notice how the speed of the movement will change. Experiment with the above controls until the desired sound is achieved.

PORTAMENTO Knob

This knob adjusts the Portamento effect. With this control set to zero, when the keyboard is played, the pitches of notes change instantly from one pitch to another as different keyboard notes are played. Turning the knob clockwise introduces the Portamento effect. Notes will glide smoothly from one pitch to the next. Increasing the amount will slow the time taken for the pitch of the first note to reach that of the second note played.

Note that this knob affects all three Oscillators simultaneously.

WAVEFORM Knob

This knob sets the currently selected Oscillator's waveform. There are 16 waveforms available. The first 4 of these are the traditional waveform shapes found on classic analogue synthesizers. The next 4 are special noise types. The remaining 8 are digitally sampled waveforms that provide useful sources for emulating more traditional instruments and percussion sounds.

When this knob is at the fully anti-clockwise position, the Sine waveform is selected. As the knob is turned clockwise, the other traditional waveforms are selected. After these, the more complex harmonic waveforms are available.

Oscillator Waveforms	
Value	Display
0	SINE
1	TRIANGLE
2	SAWTOOTH
3	SQR/PULSE
4	WHT NOISE
5	HP NOISE
6	BP NOISE
7	HBP NOISE
8	ORGAN
9	HARPSICRD
10	ELECPIANO
11	SLAP BASS
12	RHODPIANO
13	RHOD TINE
14	WHURLY EP
15	CLAVINET
16	ANA BASS

SEMITONE Knob

Raises or lowers the selected Oscillator's pitch in semitone increments up to a full octave. 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 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. Use other settings for intentionally discordant sounds.

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.

ENV DEPTH Knob

Controls the amount of pitch modulation to the currently selected 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).

See **Envelopes Section**, on Page 40 for the setting of the rise and fall times.

LFO DEPTH 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 1 is set to a 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.

Note : If the Noise Generator or Ring Modulator have been selected with the OSC SELECT Button, this control actually modulates the Mixer LEVEL from LFO 1.

LEVEL Knob

Controls the signal level sent to the Mixer for the currently selected Oscillator, Noise Generator or Ring Modulator.

UNISON Button

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.

Up to eight voices may layered one on top of another when just a single note is played.

To listen to the effect, repeatedly press the UNISON Button until the display shows **2**. Play a note 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 4 voices in Unison mode will result in just two notes of polyphony being available!

The Filter Section

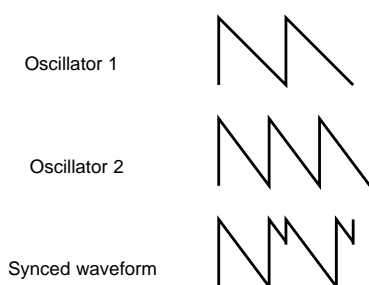
SYNC Button

This function provides a way of producing interesting, piercing, metallic sounds. It does this by using the frequency of Oscillator 1 to periodically restart the waveform used by Oscillator 2. This technique is known as Oscillator Sync. Set this to **ON** to activate Sync.

It should be remembered that the *frequency* of a waveform corresponds to the number of waveform peaks (cycles) over a given period of time. The frequency also determines the Oscillator's pitch.

Therefore if Oscillators 1 and 2 are detuned from each other, Oscillator 2's waveform will be periodically interrupted and started again from the beginning of the waveform cycle every time Oscillator 1's waveform begins a new cycle.

The diagram below illustrates this.



It can be seen that the resulting synced waveform has subsequently been modified into a different shape. Altering a waveform's shape in this way introduces new harmonics into the sound which gives the resulting waveform its distinctive synced sound qualities.

It should be realised that the greater the difference in tuning between the Oscillator waveforms, the more pronounced the sync effect will become, since more drastic changes will be made to the final synced waveform. Changing the pitch of one of the Oscillators during the duration of a note (for example, modulated by an LFO) will add a dynamic quality to the synced sound.

Other functions associated with the Oscillators and Mixer can be found in the Oscillators and Mixer Menus. See Pages 19 & 21.

The Filter Section



The Filter can be used as a Low Pass, High Pass or Band Pass type.

FREQUENCY Knob

This controls the basic Cut off frequency of the Filter. The Low Pass type of Filter is the most common type of Filter found on classic analogue synthesizers and is musically the most useful, especially for bass sounds. As the FREQUENCY knob is adjusted anticlockwise, harmonics are gradually removed from the sound. When almost closed, only the fundamental frequency remains. Fully closed and no sound at all passes.

With the High Pass Filter type, as the FREQUENCY knob is adjusted clockwise, harmonics are gradually removed from the sound. When almost fully anticlockwise, only the fundamental frequency remains. When Fully clockwise and no sound at all passes.

With the Band Pass Filter type, a narrow band of frequencies are passed, centered on the position of the FREQUENCY knob. This kind of Filter is useful when it is desired to pass only a specific frequency present in a sound.

RESONANCE Knob

This knob controls the Resonance of the Filter. The control will boost frequencies at the Cut off frequency. On some synthesizers, this control is known as Emphasis since it will emphasize certain frequencies. At the zero position 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 KS Synth produces a high pitched whistling sound, it is probably due to this knob is being 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 Cut off frequency, such as in Acid bass lines and other very edgy sounds.

KEY TRACK Knob

This controls the amount of change to the filter Cut off (set by the FREQUENCY knob) by the pitch of the note played. When the knob is turned fully anticlockwise, there is no change to the filter Cut off frequency. With clockwise movement there will be an increasing amount of modulation. The filter will be opened more 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.

ENV DEPTH Knob

Controls the amount of change to the filter Cut off (set by the FREQUENCY knob) by the Modulation Envelope. In its central position there is no change to the filter Cut off frequency. Adjusting the knob anticlockwise from centre will introduce an increasing amount of negative modulation.

The filter will close as the MOD ENV runs through its cycle. Adjusting the knob clockwise from centre will introduce an increasing amount of positive modulation. The filter will be opened by the MOD ENV.

LFO DEPTH Knob

Controls the amount of change to the filter Cut off (set by the FREQUENCY knob) by LFO 2. In its central position there is no change to the filter Cut off frequency. Adjusting the knob anticlockwise from centre will introduce an increasing amount of negative modulation. The Filter will close and open in time with LFO2 (this creates the popular wow effect of LFO2 wavefrom is set to Triangle).

Adjusting the knob clockwise from centre will introduce an increasing amount of positive modulation. The filter will open and close in time with LFO 2.

OVERDRIVE Knob

This 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.

SLOPE Button

Controls how drastically the frequencies above (Low Pass), below (High Pass) or around (Band Pass) the Cut off point are removed from the sound. When the 12dB position is selected, the Cut off slope is gentle so higher harmonics are not attenuated (reduced in volume) as sharply as they are when the 24dB position is selected.

TYPE Button

Determines whether the Filter is acting as a Low Pass, High Pass or Band Pass type.

HPF ON Button

This button is not used in KS Synth Mode.

FILTER SELECT Button

This button is not used in KS Synth Mode since the KS Synth only has a single Filter.

More functions associated with the Filter can be found in the Filter Menu. See Page 45.

The LFOs Section



There are two LFOs - Low Frequency Oscillators - available on the KS Synth. These produce regular electronic variations which are too low to be heard when converted into audio vibrations. They can modify various elements of the sound, producing regular changes in pitch (vibrato), pulse width or filter Cut off.

SPEED Knob

Controls the speed of the selected LFO. 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 or special effects.

DELAY / AMOUNT 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 effects.

LFO SELECT Button

Selects the desired LFO for editing. Only LFOs 1 or 2 can be selected on the KS Synth.

WAVEFORM & DEST Buttons

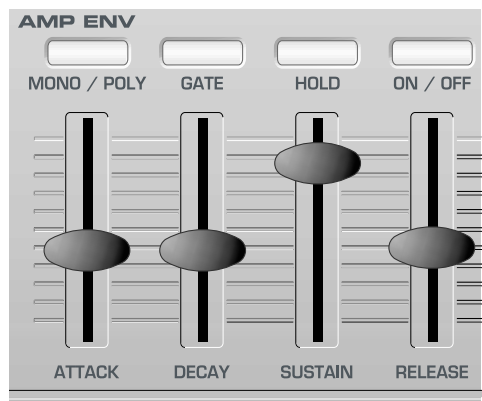
LFO Waveforms	
Value	Display
0	SINE
1	TRIANGLE
2	SAWTOOTH
3	SQUARE
4	RANDM S/H
5	QUANT S/H
6	CROSSFADE
7	EXP DEC1
8	EXP DEC2
9	EXP DEC3
10	ATT EXP1
11	ATT EXP2
12	ATT EXP3
13	SUST EXP1
14	SUST EXP2
15	SUST EXP3
16	PIANOENV1
17	PIANOENV2
18	PIANOENV3
19	EXPUPDOWN
20	CHROMATIC
21	MAJ-MODES
22	MAJOR-7
23	PATTERN 1
24	PATTERN 2
25	PATTERN 3
26	PATTERN 4
27	PATTERN 5
28	PATTERN 6
29	PATTERN 7
30	PATTERN 8
31	PATTERN 9

Selects the LFO waveform. Use the WAVEFORM button to move up the waveform list and the DEST button to move down the waveform list.

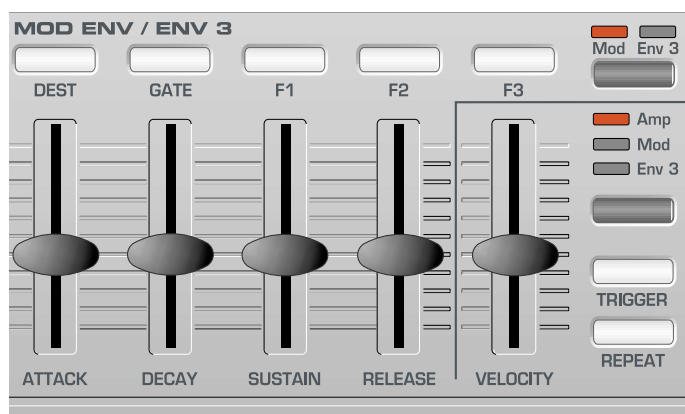
The Envelopes Section

The Envelopes Section

AMP & MOD Envelopes



The Envelopes are used to shape a sound throughout its duration. The AMP Envelope always determines the volume of the sound with respect to its duration.



The MOD Envelope 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.

ATTACK Sliders

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, less than half a thousandth of a second (instantaneous to the ear) 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 slightly until the clicks are inaudible.

DECAY Sliders

Sets how quickly the envelope falls to a sustain level after the maximum level has been reached. Set to zero, this time is about one thousandth of a second (still instantaneous to the ear) 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 Sliders

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.

RELEASE Sliders

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 about one thousandth of a second (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.

MOD / ENV 3 Button

Selects whether the MOD Envelope sliders control the MOD Envelope or the AD Envelope (indicated on the front panel as Envelope 3). When the AD Envelope is selected, only the ATTACK and DECAY sliders can be used. The LED above the button indicates which Envelope is currently selected.

AMP / MOD / ENV 3 Button

Selects whether the VELOCITY slider and TRIGGER button affect the Amp Envelope, the Mod Envelope or the AD Envelope. The LED above the button indicates which Envelope is currently selected.

VELOCITY Slider

These functions determine how the Amp, Mod and AD Envelopes respond to Velocity information.

Setting up a sound to make it's volume respond to velocity

Select the Amp Envelope using the AMP / MOD / ENV 3 button. Adjust the VELOCITY slider. At a setting of zero, a soft key stroke will produce a sound at the same volume as a hard key stroke. At a maximum positive value (63) soft key strokes will be much quieter than hard key strokes. At a maximum negative value (-64), soft key strokes will be much louder than hard key strokes.

Setting up a sound so its brightness or pitch respond to velocity

Select the Mod Envelope using the AMP / MOD / ENV 3 button. Adjust the VELOCITY slider. In the Filter section, turn the Filter FREQUENCY knob to a near zero setting or until the sound almost disappears. Turn the ENV DEPTH knob in the Filter section to a maximum clockwise position.

In the Envelopes section, Set the Mod Env ATTACK and SUSTAIN sliders to zero and the DECAY slider to nearly full. While playing notes on the Keyboard, adjust the VELOCITY slider. At a setting of zero there will be no effect on the brightness of the sound.

At maximum positive value (63), soft key strokes will produce a tone much softer than hard key strokes. At a maximum negative value (-64), soft key strokes will produce a tone much brighter sound than hard key strokes. To affect the pitch, adjust the ENV DEPTH knob in the Oscillator section.

Adjusting the Velocity Response of the AD Envelope

Select a factory preset FM sound (such as 189). Select the AD Envelope using the AMP / MOD / ENV 3 button. Adjust the VELOCITY slider. Notice how the FM effect at the start of the sound becomes dependent on how hard the keys are struck.

TRIGGER Button

Controls the triggering of the Envelope currently selected by the AMP / MOD / ENV 3 button. This function only applies to a sound which has been set up to behave in a monophonic manner (see **Polyphony Mode** on Page 19).

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.

As well as affecting the two Envelopes available on the front panel, it is also possible to set the triggering mode for the third, AD Envelope.

When an Envelope's triggering is set to **SGL** (single), the appropriate Envelope will only be triggered when the first keyboard note is played. Any subsequent legato style key presses will not re-trigger the Envelope.

When set to **MLT** (multi), the appropriate Envelope will always re-trigger on each key press, regardless of the playing style used.

REPEAT Button

This button is not used in KS Synth mode.

The Arpeggiator Section



An Arpeggiator 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.

Which Arpeggiator pattern is used and how the sequence of notes are played is determined by settings of the functions located in the Arpeggiator Menu. See Page 24 for more details on these.

TEMPO Knob

Controls the speed at which the Arpeggiator plays back its notes. When turned fully anticlockwise, the Arpeggiator will step through a sequence at 64 beats per minute. Clockwise movement increases speed. The maximum speed available is 191 b.p.m.

Arp ON Button

Activates / deactivates the Arpeggiator. While an arpeggio is running, it can be stopped immediately by pressing the ARP ON button again.

Arp LATCH Button

Enables the Arpeggiator Latch feature which enables the Arpeggiator to remember the last set of notes played on the keyboard. When Latch is activated, the Arpeggiator sequence will continue to play even after 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 MIDI 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**.

The Effects Section - The Oscillator Menu

The Effects Section



In KS Synth mode, all settings associated with the Effects are to be found within the Dual Multi Effects Processor section of the front panel.

The section of the ReMOTE Audio 25 front panel labelled Effects is used only to control the Synth's Part Volume level.

LEVEL Knob

Sets the post-Effects signal level (Part Volume). The setting can also be controlled by MIDI CC7 (Volume).

SELECT Button & CONTROL Knob

These controls do not affect any of the KS Synth's sound parameters.

However, they can be defined to transmit user defined MIDI information in a similar manner to the way controls are used in a standard X-Station Template. This is described in the section detailing **KS Synth General Settings** on page 30.

The Oscillator Menu

To complement the front panel controls in the Oscillator section, there are many other functions located in the Oscillators Menu.



This is selected by pressing the MONO / POLY button in the Amp Env section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available - See the table below.

Oscillator Menu			
Page	Function	Top Line Display	Value
1	Polyphony Mode	OSC Poly Mode	MONO...POLY 2
2	Unison Detune	OSC Uni Detune	0...127
3	VCO Drift	OSC Vco Drift	0...127
4	Preglide Semitones	OSC Preglide	-12...12
5	Portamento Mode	OSC Porta Mode	EXP-LIN
6	Start Phase	OSC Start Phase	OFF 1..127
7	Osc 2 - 3 FM Manual Level	OSC 23 FM Level	0...127
8	Osc 2 - 3 FM Env Amt	OSC 2>3 FM ADEnv	-64...63
9	Osc 2 - 3 FM LFO1	OSC 2>3 FMLfo1	-64...63
10	Osc Fixed Note Replay	OSC Fixed Note	OFF, C#-2...G8

Polyphony Mode (Menu Page 1 'OSC Poly Mode')

This setting determines if the Synth patch plays in a polyphonic or monophonic manner.

Voice mode	
Value	Display
0	MONO
1	MONO AG
2	POLY 1
3	POLY 2

When set to **MONO** or **MONO AG**, the Program plays monophonically (ie 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.

Unison Detune (Menu Page 2 'OSC Uni Detune')

Unison Detune is used in conjunction with the UNISON button as described on page 14. 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 (Menu Page 3 'OSC Vco Drift')

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!

Preglide Semitones (Menu Page 4 'OSC Preglide')

A Preglide is applied to the pitch of the Oscillators starting at a pitch determined by the Preglide 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 preglide is applied.

The time it takes to complete the Glide is determined by the PORTAMENTO knob on the front panel. The Preglide is triggered with every note received.

Portamento Mode (Menu Page 5 'OSC Porta Mode')

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 rate of sweep decreases throughout the note sweep's duration.

Start Phase (Menu Page 6 'OSC Start Phase')

When synthesizing 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 display shifts the start point of the wave approximately 3 degrees. The wave will start at a random phase when set to **OFF**.

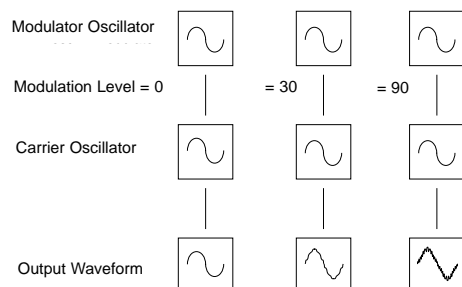
FM Synthesis

The next three menu options allow sounds based on FM (Frequency Modulation) synthesis to be created. Before looking at the operations of these controls, a little explanation of FM synthesis follows.

Earlier in this manual, the basics of subtractive synthesis were introduced. Terms such as harmonics, timbre, waveforms and oscillators became familiar.

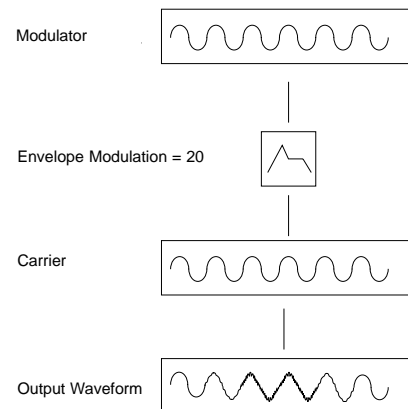
FM Synthesis is the technique of using *one waveform to Frequency Modulate - FM- another to produce a resultant more harmonically complex waveform.*

The following diagram illustrates that the higher the modulation between the Modulating wave and the Carrier wave, the more the waveform changes.



In the illustration, the Oscillators are producing Sine waves. It is the *change* in harmonics over time that makes a sound interesting to our ears.

In FM synthesis, an envelope generator is inserted between the modulator and carrier waveforms 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 shown in the next illustration.

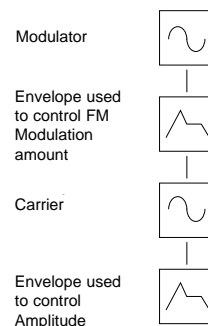


It can be seen that the output waveform begins by being identical to the carrier, but becomes more complex (harmonics are added) as the amount of FM modulation increases via the envelope. It then returns to a simple wave again as the envelope decays.

The timbre of the Waveform is changing with time. This is the opposite of subtractive synthesis where a *low pass Filter* is used to *remove harmonics*.

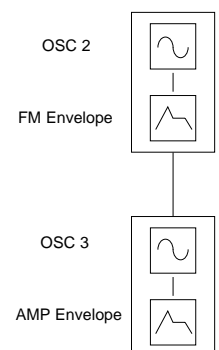
To complete a simple synthesizer, a further envelope is added to control the output volume.

The complete FM building block is illustrated below.



OSC 2 is able to FM (Frequency Modulate) OSC 3 via the dedicated FM envelope. *It is important that it is realized that this Envelope is used only for FM purposes.*

The diagram below shows in block diagram format how the KS Synth can produce FM sounds.



The easiest way to be totally familiar with FM is to take one of the factory preset FM sounds, for example Synth Patch 189, an electric piano / bell sound and to experiment by modifying the various FM settings.

The Mixer Menu

OSC 2 to 3 FM Manual Level (Menu Page 7 'OSC 23 FM Level')

Controls the amount that Oscillator 3 is directly Frequency Modulated by Oscillator 2. Whilst playing a note, adjust this value by using the PERF / PROG / DATA knob. Notice that increasing amounts of modulation level make the sound more metallic.

OSC 2 to 3 FM Amount from AD envelope (Menu Page 8) ('OSC 2>3 FMADEnv')

Many sounds have complex harmonic movements at the start of the sound. Introducing envelope modulation with a fast attack and decay time to control the FM amount will simulate this fast changing harmonic effect.

There is a dedicated Envelope - See below - that can be applied to control the FM amount between the oscillators 2 and 3.

The amount of modulation from the envelope can be adjusted by using the DATA / VALUE knob. Notice how the 'spit' at the beginning of the sound may be accentuated. Experiment with Oscillator 2's pitch using the OCTAVE button and the SEMITONE and DETUNE knobs.

Adjusting the AD Envelope Attack and Decay Times

Changing the AD Envelope attack and decay times (which is used as the FM modulation envelope) is done by selecting the AD Envelope using the AMP / MOD / ENV 3 button and using the ATTACK & DECAY sliders as described on Page 17.

OSC 2 to 3 FM Amount from LFO 1 (Menu Page 9) ('OSC 2>3 FM Lfo1')

Allows the FM amount between Oscillators 2 and 3 to be modulated by LFO 1.

Osc Fixed Note Replay (Menu Page 10 'OSC Fixed Note')

Rather than playing chromatically across the keyboard (as is the usual case), a sound may be set to just play a fixed note - pitch - when ANY note is played from the Keyboard or when triggered from an incoming MIDI note on event.

Use the DATA / VALUE knob to change the pitch of the sound. If desired, save the sound in the normal way.

The Mixer Menu

To complement the Mixer LEVEL controls in the Osc / Mixer section, there are other Mixer functions located within the Mixer Menu.



This is selected by pressing the GATE button in the Amp Env section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available -

Page	Function	Top Line Display	Value
1	Overall Mixer Level	MIXER Out Level	0 - 30dB
2	Osc 1 Mod > Lfo1	MIXER Lfo1>Osc1	-64...63
3	Osc 1 Mod > Lfo2	MIXER Lfo2>Osc1	-64...63
4	Osc 2 Mod > Lfo2	MIXER Lfo2>Osc2	-64...63
5	Osc 3 Mod A/D Env	MIXER ADenv>Osc3	-64...63

See the table below.

Overall Mixer Level (Menu Page 1 'MIXER Out Level')

Sets the audio output level of the mixer. Here the level of the pre-effects signal can be boosted or cut. It is sometimes useful to adjust this setting if the synth patch is exceptionally quiet or is distorting while being processed by the Effects.

It is likely that if a monophonic factory sound is changed to polyphonic sound that playing more than one note at a time will cause the effects processor to clip. In this situation reduce the mixer level.

LFO1 to OSC 1 Level Mod (Menu Page 2 'MIXER Lfo1>Osc1')

Controls the amount of modulation applied from LFO 1 to Oscillator 1. The amount of modulation from the LFO is adjusted by using the DATA / VALUE knob. At a central setting of 0, no modulation is applied.

LFO2 to OSC 1 Level Mod (Menu Page 3 'MIXER Lfo2>Osc1')

Controls the amount of modulation applied from LFO 2 to Oscillator 1. The amount of modulation from the LFO is adjusted by using the DATA / VALUE knob. At a central setting of 0, no modulation is applied.

LFO2 to OSC 2 Level Mod (Menu Page 2 'MIXER Lfo2>Osc2')

Controls the amount of modulation applied from LFO 1 to Oscillator 2. The amount of modulation from the LFO is adjusted by using the DATA / VALUE knob. At a central setting of 0, no modulation is applied.

A/D Env to OSC 3 Level (Menu Page 5 'MIXER ADenv>Osc3')

Controls the amount of modulation applied from the AD Envelope to Oscillator 3. The amount of modulation is adjusted by using the DATA / VALUE knob. At a central setting of 0, no modulation is applied.

The Filter Menu

To complement the front panel controls in the Filter section, there are other functions located within the Filter Menu.



This is selected by pressing the HOLD button in the Amp Env section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available - See the table below.

Filter Menu <small>HOLD BUTTON</small>			
Page	Function	Top Line Display	Value
1	Velocity Sensitivity	FILT Velocity	0...127
2	Q Normalise	FILT Q Normalise	0...127

Velocity Sensitivity (Menu Page 1 'FILT Velocity')

This setting is used to modulate the Cutoff FREQUENCY of the Filter up or down in response to the velocity information present in incoming note messages or notes played on the keyboard.

Set in the range **-1** to **-64**, the Filter will close (the Cutoff FREQUENCY will decrease) as velocity data is applied. With a range of **1** to **63**, the Filter will open (the Cutoff FREQUENCY will increase) as velocity data is applied. Greater values will open (increase the Cutoff FREQUENCY) as velocity data is received. At a setting of **0**, note velocity will have no effect.

Q Normalise (Menu Page 2 'FILT Q Normalise')

This value 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.

The LFO Menu

To complement the front panel controls in the LFOs section, there are other functions located within the LFO Menu.



This is selected by pressing the ON / OFF button in the Amp Env section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available - See the table below.

LFO Menu <small>ON/OFF BUTTON</small>			
Page	Function	Top Line Display	Value
1	LFO1 Velocity	LFO1 Velocity	-64...63
2	LFO1 Triggering	LFO1 MonoDelTrig	SGL-MLT
3	LFO1 Keysync	LFO1 Keysync	OFF-ON
4	LFO1 Keysync Phase Offset	LFO1 Init Phase	0...127
5	LFO1 Polarity	LFO1 Unipolar	OFF-ON
6	LFO1 Common to all Voices*	LFO1 Common	OFF-ON
7	LFO2 Velocity	LFO2 Velocity	-64...63
8	LFO2 Triggering	LFO2 MonoDelTrig	SGL-MLT
9	LFO2 Keysync	LFO2 Keysync	OFF-ON
10	LFO2 Keysync Phase Offset	LFO2 Init Phase	0...127
11	LFO2 Polarity	LFO2 Unipolar	OFF-ON
12	LFO2 Common to all Voices*	LFO2 Common	OFF-ON

LFO Velocity (Menu Pages 1 & 8 'LFO1 Velocity')

The intensity of the LFO may be set to respond to velocity. As an example of this. Set the LFO1 depth control to a positive value from the front panel such that pitch modulation occurs on Oscillator 1. Using this Menu, setting the LFO1 velocity to a positive value. Notice that, when pressing a key on the keyboard, a soft press results in a very small amount of pitch modulation or wobble and a hard press results in a large amount.

When an LFO is used in the mixer section as a modulation source, this feature is useful for controlling the volume of each Oscillator in proportion to how hard a key is struck.

LFO Delay Triggering (Menu Pages 2 & 9 'LFO1 MonoDelTrig')

When the **Polyphony Mode** is set to any of the Mono options (see Page 19), 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 **SGL** (single) achieves this.

Setting this to **MLT** (Multi) sets the LFO delay to apply to every note played.

LFO Keysync (Menu Pages 3 & 10 'LFO1 Keysync')

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 **LFO Common To All Voices** function (detailed on Page 23) is set to **ON** for the LFO, *altering this value will have no effect*. How a keysync is applied to the LFO is determined by the changing the **Synth Global Sync** setting (found in the KS Synth Global Menu). See Page 29 for details.

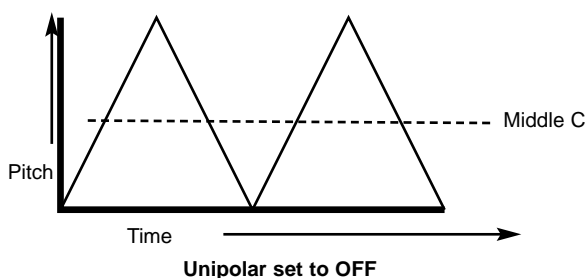
The LFO Menu

LFO Keysync Initial Phase Offset (Menu Pages 4 & 11) (‘LFO1 Init Phase’)

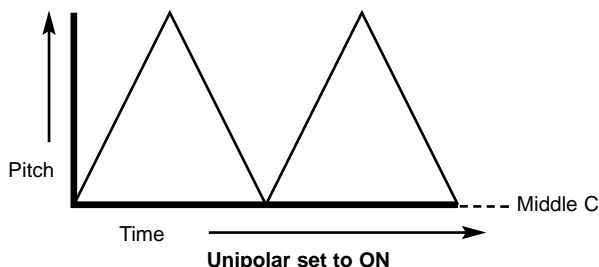
This setting provides an alternative point in the LFO's waveform cycle where the waveform will be restarted from when **LFO Keysync** is set to **ON**. To hear the difference, set a slow LFO to modulate Oscillator pitch modulation and experiment with different LFO waveforms and **LFO Keysync Phase Offset**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

LFO Polarity (Menu Pages 5 & 12 ‘LFO1 Unipolar’)

Determines whether the LFO modulates in a positive and negative direction or solely in a positive direction.



As an example of how this works, imagine an LFO assigned to modulate an Oscillator's pitch while a key of middle C is played on the keyboard. When **Unipolar** is set to **OFF**, the pitch would be modulated between a note some interval *below* middle C and another note at an equal interval *above* middle C. The interval between the notes is determined by the modulation amount applied to the pitch by the LFO.



If the LFO was modulating the pitch with **Unipolar** set to **ON**, the pitch would only be modulated in a positive direction, so the pitch would modulate between middle C and another note located at some interval above.

It is often useful to set an LFO's **Unipolar** setting to **ON** if an LFO is being used as a simple Envelope Generator (by setting its ONE SHOT mode).

LFO Common to all voices (Menu Pages 6 & 13 ‘LFO1 Common’)

Each of the 8 voices (notes of polyphony) have two LFOs - 16 in total. The eight LFOs designated LFO 1 (one per voice) may be ‘phase’ locked together and similarly the eight LFOs 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 sixteen 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 synchronization’ with others. Imagine a String section of eight violin players. With the LFO locked and the LFO being used to create a vibrato, all sixteen of the string players would have the bow in exactly the same position. This obviously does not occur in a real string section and if it did the sound would be very unusual. In reality, each player's bow would be in a different position which gives the strings a ‘chorus’ type sound. To simulate the string section the LFOs would not be locked.

Setting this to **ON** will ‘lock’ the LFO.

When **LFO Common To All Voices** is set to **ON**, changing the setting of the **LFO Keysync** function will have no effect. Instead, how a key-sync is applied to the LFO is determined by the setting of the **Synth Global Sync** value (found in the KS Synth Global Menu). See Page 29 for details.

LFO One-Shot (Menu Pages 7&14 ‘LFO1 One-Shot’)

Determines if the selected LFO will repeat its waveform at the end of the first cycle throughout the duration of a voice or if the selected LFO will only cycle through its waveform once, to effectively become an envelope.

The selected LFO will repeat if the One-Shot setting is ‘off’. The selected LFO will only cycle once if the One-Shot setting is ‘on’.

The Arpeggiator Menu

To complement the front panel controls in the Arpeggiator section, there are many other functions located in the Arpeggiator Menu.



This is selected by pressing the DEST button in the Mod Env / Env 3 section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available - See the table below.

Arpeggiator Menu			
Page	Function	Top Line Display	Value
1	Mode	ARP Mode	UP ... CHORD
2	Octave Range	ARP Octaves	1...4
3	Pattern	ARP Pattern	OFF - 1 - 32
4	Pattern Velocity On - Off	ARP Pattern Vel	On - OFF
5	Gate Time	ARP Gate Tim	0...127
6	Keysync	ARP Keysync	OFF-ON
7	Arp Note Desitination	ARP Notes	INT- EXT- I + E

Mode (Menu Page 1 'ARP Mode')

ARP Mode	
Value	Display
0	UP
1	DOWN
2	UP-DOWN 1
3	UP-DOWN 2
4	PLAYED
5	RANDOM
6	CHORD

This determines the Arpeggio mode used by the Arpeggiator. There are seven types of mode 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.

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.

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.

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.

Random

Notes played will be arpeggiated in a random order.

Chord

All notes held on the keyboard are played simultaneously.

Octave Range (Menu Page 2 'ARP Octaves')

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

Pattern (Menu Page 3 'ARP Pattern')

Normally allows various rhythmic patterns to be applied to the Arpeggiator modes. 32 different patterns are available. Experiment with different patterns numbers to achieve the desired rhythm. When set to **OFF**, each note played has an equal duration.

Pattern Velocity (Menu Page 4 'ARP Pattern Vel')

When set to **ON**, the note velocities for each note played by the Arpeggiator will be preset values. When set to **OFF**, the note velocities used when playing the keyboard notes are used by the Arpeggiator.

Gate Time (Menu Page 5 'ARP Gate Time')

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 (Menu Page 6 'ARP Keysync')

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

Arp Note Destination (Menu Page 7 'ARP Notes')

For flexibility, the Arpeggiator output may be routed to a number of destinations. Setting the Arp destination to **INT** routes the Arpeggiated notes to the internal sound engine. This could be considered as the normal mode of operation. Only notes played on the keyboard to generate the Arpeggio are transmitted as MIDI note on/off messages.

If the Arpeggiator is to be controlled by a sequencer, it is recommended that this setting is set to **INT** when the notes played on the keyboard are recorded into a sequencer track with **Synth Local Control** (see page 29) set to **OFF**.

*Beware - setting this to **EXT** or **I + E** while recording into a sequencer track will probably cause horrible MIDI feedback problems since any echoed notes will be interpreted as additional keyboard notes !!!*

Setting the destination to **EXT** will route the **ONLY** the notes played by the Arpeggiator to the MIDI output socket (transmitted as MIDI note on/off information).

Setting the destination to **I + E** (internal and external) will route Arpeggiated notes to both the MIDI output socket and the internal sound engine. As with the **EXT** option, it is the notes generated by the Arpeggiator which are transmitted via MIDI.

The Sync Menu

The Sync Menu

All of the settings associated with synchronising the Arpeggiator, LFOs and Effects to the Arpeggiator clock are found here.



The Sync Menu is selected by pressing the GATE button in the Mod Env / Env 3 section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available - See the table below.

Sync Menu			
Page	Function	Top Line Display	Value
1	Sync Type	SYNC Arp Tempo	32T...1 bar
2	LFO1 Sync Del Time	SYNC Lfo1 Delay	OFF...12bars
3	LFO1 Sync Speed	SYNC Lfo1 Speed	OFF...12bars
4	LFO2 Sync Del Time	SYNC Lfo2 Delay	OFF...12bars
5	LFO2 Sync Speed	SYNC Lfo2 Speed	OFF...12bars
6	Delay Sync time	SYNC Delay Time	OFF...2 bars
7	Chorus/Phaser Sync Time	SYNC Chor Rate	OFF...12bars
8	Panning Sync Time	SYNC Pan Rate	OFF...12bars

In all cases, when a feature is synchronized, the tempo is controlled by the Arpeggiator TEMPO knob.

In all cases, when a feature is synchronized to the Arpeggiator Clock, its front panel controls (for example LFO SPEED) will have no effect. These controls will only become effective once the feature's Synchronization rate has been set to **OFF**, when the feature will no longer be governed by the Arpeggiator's TEMPO knob setting.

SYNC Arp Tempo (Menu Page 1)

Allows Sets the basic timing deviation for the arpeggiator and also for any parameters that are synced to the arpeggiator clock.

Arp Sync Setting	
Value	Display
0	32nd T
1	32nd
2	16th T
3	16th
4	8th T
5	16th D
6	8th
7	4th T
8	8th D
9	4th
10	2nd T
11	4th D
12	2nd
13	1bar T
14	2bar D
15	1 bar

SYNC Lfo1 Delay / SYNC Lfo2 Delay (Menu Pages 2 & 4)

Allows either LFO's delay time to be synchronized to arpeggiator clock. A range of synchronization values are available up to 12 bars in length.

SYNC Lfo1 Speed SYNC Lfo2 Speed (Menu Pages 3 & 5)

LFOs may be synchronized to Arpeggiator Clock. As an example, a very pleasing audio effect may be achieved when LFO 2 is modulating the filter cut off frequency and this is synchronized to the tempo of an arpeggio.

The synchronisation value selected is the period taken for the LFO to complete one whole cycle of its waveform.

To synchronize an LFO, alter this value until the desired musical timing

is displayed. See the synchronization table given below (for the LFO Delay synchronization) for details on the settings available.

Sync Setting			
Value	Display	Value	Display
0	OFF		
1	32nd T	18	1bar D
2	32nd	19	2 bars
3	16th T	20	4bar T
4	16th	21	3 bars
5	8th T	22	5bar T
6	16th D	23	4 bars
7	8th	24	3bar D
8	4th T	25	7bar T
9	8th D	26	5 bars
10	4th	27	8bar T
11	2nd T	28	6 bars
12	4th D	29	7 bars
13	2nd	30	5bar D
14	1bar T	31	8 bars
15	2bar D	32	9 bars
16	1 bar	33	7bar D
17	2bar T	34	12bars

SYNC Delay Time (Menu Page 6)

Enables the time of the Delay repeats to be synchronized to the tempo of the arpeggiator clock. Synchronization rates up to 2 bars are available for the Delay Effect.

Delay Sync Setting	
Value	Display
0	OFF
1	32nd T
2	32nd
3	16th T
4	16th
5	8th T
6	16th D
7	8th
8	4th T
9	8th D
10	4th
11	2nd T
12	4th D
13	2nd
14	1bar T
15	2bar D
16	1 bar
17	2bar T
18	1bar D
19	2 bars

SYNC Chor Rate (Menu Page 7)

Similar to Delay Sync, the Chorus internal LFO may be synchronized to arpeggiator clock tempo.

The available Sync resolutions are the same as those available for the LFO Delay time as shown in the earlier table.

SYNC Pan Rate (Menu Page 8)

A very pleasing audio effect may be heard when the Panning effect is synchronized to the tempo of the arpeggiator. The synchronization table given earlier for the LFO Delay time describes the musical timings available for the Pan.

The Wheels Menu

This menu controls how the much response there is to Pitch and Modulation from the built in Pitch / Modulation joystick.



The Sync Menu is selected by pressing the F1 button in the Mod Env / Env 3 section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available - See the table below.

Page	Function	Top Line Display	Value
1	Osc 1 Pitch Bend Semitones	BW Osc1 Bend	-12...12
2	Osc 2 Pitch Bend Semitones	BW Osc2 Bend	-12...12
3	Osc 3 Pitch Bend Semitones	BW Osc3 Bend	-12...12
4	Osc 1,2,3 Pitch Shift in Semitones	MW Pitch Direct	-64...63
5	Osc 1,2,3 Pitch Mod (LFO1)	MW Pitch Mod	-64...63
6	Filter Frequency Shift	MW Filter Freq	-64...63
7	Filter Frequency Mod (LFO2)	MW Filt Freq Mod	-64...63
8	Amplifier Gain (post-distortion)	MW Output Level	-64...63
9	Wheel Delay Send	MW Delay Level	-64...63
10	Wheel Reverb Send	MW Reverb Level	-64...63
11	Wheel Chorus Send	MW Chorus Level	-64...63

Oscillator 1,2 and 3 Pitch Bend Amount (Menu Pages 1, 2 and 3)

('BW Osc1 Bend')

This setting is used to shift the absolute pitch of the Oscillators up or down in response to the joystick pitch bend axis position. Values **1 to 12** will result in a higher pitch from 1 to 12 semitones when the joystick is pushed to the right. Display values **-1 to -12** will result in a lower pitch.

NOTE: If the current program uses more than one Oscillator, it is recommended that the bend amount is set equal for each Oscillator. If chord type effects are required when moving the joystick, different pitch bend amounts may be set for each Oscillator.

Modulation Wheel Pitch shift in Semitones (Menu Page 4)

('MW Pitch Direct')

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

Oscillator 1, 2 and 3 Pitch Modulation from LFO 1 (Menu Page 5)

('MW Pitch Mod')

Enables LFO 1 to modulate the pitch of the Oscillators, introducing a vibrato effect. As the joystick is pushed forwards, LFO 1 modulation will be applied. As the joystick is pulled back the amount of LFO 1 modulation to the Oscillators pitch will decrease.

Adjust this value to set the depth of pitch modulation applied by LFO 1.

For best results, ensure that LFO 1 is using a Triangle waveform. This will give a smooth, traditional vibrato effect.

Opening or Closing the Filter using the Modulation Wheel (Menu Page 6)

('MW Filter Freq')

The filter Cut off frequency may be raised (opening the filter) or lowered (closing the filter) directly from the modulation axis of the joystick using this menu option.

Positive values from **1 to 63** will open the Filter when the joystick is pushed forward. Negative values from **-1 to -64** will close the Filter when the joystick is pushed forward.

Filter Frequency Modulation from LFO 2 using the Mod Wheel (Menu Page 7 'MW Filt Freq Mod')

Enables LFO 2 to modulate the Cutoff FREQUENCY of the Filter,. The popular 'wow-wow' effect will be heard if LFO 2 waveform is set to Triangle.

A positive value **1 to 63** will open the filter in time with LFO 2 above the basic Cut off frequency. A negative value **-1 to -64** will close the filter in time with LFO 2 below the basic Cut off frequency.

Using a high value and setting LFO 2 to different waveforms will introduce dramatic effects when moving the modulation wheel.

Control of Main Volume from the Modulation Wheel (Menu Page 8) ('MW Output Level')

By routing the joystick modulation axis 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 joystick is pushed forwards. Negative values from **-1 to -64** decrease the output volume of the Amp Envelope as the joystick is pushed forwards. At a setting of **0**, the joystick will have no effect.

Wheel Delay Send (Menu Page 9 'MW Delay Level')

Enables the joystick modulation axis to control the send level to the Delay effect.

Positive values of **1 to 63** increase send level as the joystick is pushed forwards. Negative values from **-1 to -64** decrease send level as the joystick is pushed forwards. At a setting of **0**, the joystick will have no effect.

Wheel Reverb Send (Menu Page 10 'MW Reverb Level')

Enables the joystick modulation axis to control the send level to the Reverb effect.

Positive values of **1 to 63** increase send level as the joystick is pushed forwards. Negative values from **-1 to -64** decrease send level as the joystick is pushed forwards. At a setting of **0**, the joystick will have no effect.

Wheel Chorus Send (Menu Page 11 'MW Chorus Level')

Enables the joystick modulation axis to control the send level to the Chorus effect.

Positive values of **1 to 63** increase send level as the joystick is pushed forwards. Negative values from **-1 to -64** decrease send level as the joystick is pushed forwards. At a setting of **0**, the joystick will have no effect.

Wheel Distortion Send (Menu Page 11 'MW Distort Level')

Enables the joystick modulation axis to control the send level to the Distortion effect.

Positive values of **1 to 63** increase send level as the joystick is pushed forwards. Negative values from **-1 to -64** decrease send level as the joystick is pushed forwards. At a setting of **0**, the joystick will have no effect.

The Aftertouch & Breath Menu

The Aftertouch & Breath Menu

This menu controls how the KS Synth responds to Aftertouch and Breath Control (CC2) MIDI messages.



The Aftertouch / Breath Menu is selected by pressing the F2 button in the Mod Env / Env 3 section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available - See the table below.

Aftertouch / Breath Menu			
Page	Function	Top Line Display	Value
1	Atouch : Osc 1,2,3 Pitch Shift	AT Pitch Direct	-64...63
2	Atouch : Osc 1,2,3 Pitch Mod (lfo1)	AT Pitch Mod	-64...63
3	Atouch : Filter Frequency Shift	AT Filter Freq	-64...63
4	Atouch : Filter Frequency Mod (lfo2)	AT Filt Freq Mod	-64...63
5	Atouch : Amp Gain (post-distortion)	AT Output Level	-64...63
6	Breath : Osc 1,2,3 Pitch Shift	BR Pitch Direct	-64...63
7	Breath : Osc 1,2,3 Pitch Mod (lfo1)	BR Pitch Mod	-64...63
8	Breath : Filter Frequency Shift	BR Filter Freq	-64...63
9	Breath : Filter Frequency Mod (lfo2)	BR Filt Freq Mod	-64...63
10	Breath : Amp Gain (post-distortion)	BR Output Level	-64...63

Ensure that a connected wind controller MIDI device is configured to transmit Breath Control MIDI data (if in doubt, consult the device's manual for details).

In order to hear the effect of any of these settings, press a key down firmly on the X-Station keyboard or blow into the breath controller while adjusting the values.

All Aftertouch settings will respond to the Aftertouch generated by playing the X-Station keyboard.

Atouch : Osc 1, 2, 3 Pitch Shift (Menu Page 1 'AT Pitch Direct')

This setting is used to shift the absolute pitch of the Oscillators up or down in response to incoming Aftertouch data.

Set in the range **-64** to **-1**, any Aftertouch data will shift the pitch of the Oscillators downwards. With a range of **1** to **63**, any Aftertouch data received will shift the pitch of the Oscillators upwards. Greater values increase the amount of pitch shifting applied.

At a setting of **0**, Aftertouch messages will have no effect.

Atouch : Osc 1, 2, 3 Pitch Mod (LFO 1) (Menu Page 2) ('AT Pitch Mod')

Enables LFO 1 to modulate the pitch of the Oscillators, introducing a vibrato effect. As Aftertouch messages are received, the LFO 1 modulation will be applied. As the Aftertouch data falls back towards zero, the amount of LFO 1 modulation to the Oscillators pitch will also decrease.

Adjust this value to set the depth of pitch modulation applied by LFO 1. At a setting of **0**, Aftertouch messages will have no effect.

For best results, ensure that LFO 1 is using a Triangle or Sine waveform. This will give a smooth, traditional vibrato effect.

Atouch : Filter Frequency Shift (Menu Page 3 'AT Filter Freq')

This setting is used to modulate the Cutoff FREQUENCY of the Filter up or down in response to incoming Aftertouch data.

Set in the range **-1** to **-64**, the Filter will close (the Cutoff FREQUENCY will decrease) as Aftertouch data is applied. With a range of **1** to **63**, the Filter will open (the Cutoff FREQUENCY will increase) as Aftertouch data is applied. Greater values will open (increase the Cutoff FREQUENCY) as Aftertouch data is received. At a setting of **0**, Aftertouch

messages will have no effect.

Atouch : Filter Frequency Mod (LFO 2) (Menu Page 4) ('AT Filt Freq Mod')

Enables LFO 2 to modulate the Cutoff FREQUENCY of the Filter, introducing a 'wow-wow' effect. As Aftertouch messages are received, the LFO 2 modulation will be applied. As the Aftertouch data falls back towards zero, the amount of LFO 2 modulation to the Filter Cutoff FREQUENCY will also decrease.

Adjust this to set the depth of modulation applied by LFO 2. At a setting of **0**, Aftertouch messages will have no effect.

For best results, ensure that LFO 2 is using a Triangle or Sine waveform. This will give a smooth, traditional 'wow-wow' effect.

Atouch : Amp Gain (post - distortion) (Menu Page 5) ('AT Output Level')

Allows Aftertouch messages to directly alter the Amplifier level, allowing the overall volume of a sound to be altered.

Positive values of (**1** to **63**) increase the output volume of the Amp Envelope as Aftertouch is applied. Negative values (**-1** to **-64**) decrease the output volume of the Amp Envelope as Aftertouch is applied. At a setting of **0**, Aftertouch messages will have no effect.

Routing Breath Control Level (Menu Pages 6 - 10) ('BR Pitch Direct')

It is also possible to use incoming Breath Control MIDI messages to affect and modulate sounds. The principle of using Breath Control is exactly the same as the way in which Aftertouch is applied.

The remaining four pages in the menu offer exactly the same features and routings as are available for Aftertouch, but these settings apply to breath control.

The Pan Menu

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



The Pan Menu is selected by pressing the F3 button in the Mod Env / Env 3 section on the front panel. Use the BANK / PAGE up/down buttons to scroll through the Menu functions available - See the table below.

Note : The Panning LFO should not be confused with the two LFOs available on the front panel.

Chorus Initial Start Position (Menu Page 4 'CHOR Init Pos')

Similar to the **Pan Initial Start Position** on Menu page 3, this setting specifies the start position of the Chorus Effect LFO.

Note : The Chorus LFO should not be confused with the two LFOs available on the front panel.

Pan Menu - F3 BUTTON		
Page	Function	Top Line Display Value
1	Pan Mod Depth	PAN Mod Depth 0...127
2	Mod Rate	PAN Mod Rate 0...127
3	Pan Initial Start Position	PAN Init Posn OFF...RGT
4	Chorus Initial Start Position	CHOR Init Posn OFF...RGT

Changing the Pan Position of a sound

The Panning effect dictates where in the stereo field a sound is placed when heard through stereo speakers or headphones. It is possible to position a sound hard to the left, hard to the right or anywhere in between.

Turn the Effects section BALANCE knob clockwise or anticlockwise to move the sound across the Stereo field.

Pan Modulation Depth (Menu Page 1 'PAN MOD Depth')

Introduces an amount of panning modulation which affects the location of the sound in the stereo field. When set fully counter-clockwise, the sound will only be heard in the position set by the BALANCE control.

At the fully clockwise position, the sound will be move automatically from the left to the right-hand side at the rate determined by the panning rate control found in the Panning Menu.

Modulation Rate (Menu Page 2 'PAN Mod Rate')

This function controls the Panning LFO's speed. If the **Mod Depth** 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 front panel.

Pan Initial Start Position (Menu Page 3 'PAN Init Posn')

As well as being able to be synchronized to the arpeggiator clock, the Panning LFO may have its initial position set after a specific MIDI event is received (see the **Synth Global Sync** function on Page 29).

Pan LFO Sync Initial Postion	
Display	Function
OFF	Off
LFT	Left
MID	Centre
RGT	Right

The initial positions are shown in the table above. For example, if the Panning initial position sync is set to **RGT** (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.

The KS Synth Mode Global Menu

The KS Synth Mode Global Menu

While in **KS Synth Mode**, an additional Global Menu is available which contains settings relevant to KS Synth operation.

To access this menu, press the GLOBAL button to access Global Mode in the normal way. Pressing the GLOBAL button once more brings up the extra KS Synth Mode Global Menu. The following Menu pages are available :

KS Synth Mode Global Menu			
Page	Function	Top Line Display	Value
1	Synth Tuning	Synth Tune Cents	-64...63
2	Synth Global Sync	Synth Glob Sync	PROG...SONG
3	Synth Velocity Response	Synth Vel Resp	SOFT...HARD
4	Synth Local Control	Syn Local Cntrl	OFF...ON
5	Synth MIDI Source	Synth Midi Src	OFF...USB

Synth Tuning (Menu Page 1 'Synth Tune Cents')

Adjusts the master tuning. At the factory, this value will have been set to **0**. This setting of zero is equivalent to concert pitch tuning (middle C = 440 Hz).

Synth Global Sync (Menu Page 2 'Synth Glob Sync')

This allows the *first note played after all notes have been released or the first note played after a MIDI Program Change or MIDI Start Song Message* to synchronize the Panning and Chorus LFOs as described on page 28.

This setting allows them to have their start position locked in time with the musical piece for stunning effects.

Synth Velocity Response (Menu Page 3 'Synth Vel Resp')

The response to MIDI velocity information from an external device such as a MIDI controller keyboard or a sequencer 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.

Synth Local Control (Menu Page 4)

This function can be thought of as a switch which when set to **OFF**, disconnects the front panel controls and keyboard from the internal synthesizer sound engine.

Playing the keyboard or moving any of the controls still results in the appropriate MIDI information being transmitted from the MIDI OUT socket, but they will have no direct affect on the synth sound engine. *The sound engine will only be affected if the MIDI signals are routed back into the MIDI IN or USB port - probably by a sequencer.*

It is recommended that **Synth Local Control** is set to **ON** unless the full MIDI implications are appreciated of having it set otherwise.

When not connected to a sequencer, it will not be possible to play the KS Synth at all unless **Synth Local Control** is **ON** !

Setting the synth local control to 'off' will stop the KS synth from playing voices directly when using the X-Station as a master keyboard to play other software / hardware instruments.

Synth MIDI Source (Menu Page 5 'Synth Midi Src')

Specifies which (if any) port can be used to trigger the KS Synth engine. There are three options available :

OFF The KS Synth can only be played by the ReMOTE 25 Audio's keyboard (provided **Local Control** is set to **ON**).

MIDI IN The KS Synth can only be triggered by MIDI messages arriving from the MIDI IN port or played by the X-Stations keyboard (provided **Local Control** is set to **ON**).

USB The KS Synth can only be triggered by MIDI messages arriving from the USB port or played by the X-Stations keyboard (provided **Local Control** is set to **ON**).

Routing MIDI To And From The KS Synthesizer

In **KS Synth Mode**, the X-Station always receives and transmits using the **Global MIDI Channel** (see page 2 for details on how to set this)

The Ports where MIDI information is transmitted when a front panel control is moved or the keyboard is played while in **KS Synth Mode** is determined by the **Keyboard MIDI Port** setting found in the Template Common Menu. Note that it is entirely possible to be able to play the KS Synthesizer without it actually transmitting any MIDI information to any port.

The KS Synth can be triggered by incoming MIDI messages received at either the USB or MIDI IN port. This is set by the **Synth MIDI Source** parameter detailed above.

At all times, the KS Synth can be controlled by the front panel and by playing the X-Station keyboard unless **Synth Local Control** (see above) is set to **OFF**.

Note it is not possible to have both the USB and MIDI IN selected for MIDI reception simultaneously. This arrangement helps to avoid potential 'MIDI feedback' loops when incoming MIDI is being configured 'thru' the X-Station.

Playing The KS Synth From A Sequencer While Using The X-Station As A Master Keyboard

Set the **Synth MIDI Source** parameter to **MIDI IN** or **USB** as appropriate. Make sure the X-Station is connected to the sequencer by MIDI in both directions - this is achieved if the USB MIDI connection is made.

Set **Synth Local Control** to **OFF**. The keyboard will now transmit MIDI information but will **not** play the KS Synth directly.

Select the sequencer track according to which instrument you wish to play or record via the X-station Keyboard. The sequencer will now re-channelise the MIDI information transmitted by the X-Station appropriately.

With this configuration, it is also possible to play the KS Synth directly without having to turn **Synth Local Control** back on. Simply select the sequencer track using the same MIDI channel as defined by the **Global MIDI Channel** (found in the Global Menu - see page 2) and ensure that this sequencer track MIDI input is set to ReMOTE Audio / X-station, and this sequencer track MIDI output is also set to ReMOTE Audio / X-Station. MIDI data will now flow from the X-Station into the sequencer and the sequencer will route this data out of the sequencer into the X-Station. The KS synth will then respond to this data and play as expected.

THE KS SYNTHESIZER

The KS Synth General Settings - Saving The KS Synth General Settings

The KS Synth General Settings

In KS Synth Mode, there are some settings which are common accross all 200 Synth patches, that is to say they affect all of the Synth patches in the same way. These settings are :

The Audio settings for Channel 1 (the KS Synth Effects use Channel 2 and can be unique for each Synth patch).

The operation of the Footswitch.

The operation of the Expression Pedal.

The operation of the Pitch Bend / Modulation joystick.

The operation of the touchpad.

The function of the Transport buttons.

The function of the SELECT and CONTROL controls in the Effects section of the front panel.

Except for the Audio Channel 1 settings, all of these features can be re-programmed in a similar fashion to programming a control in **Template Edit Mode** in a standard ReMOTE Template. Simply press the TEMPLATE EDIT button from within **KS Synth Mode** and edit the feature in the normal way.

If re-programming these features, remember that they will behave in the same manner accross all Synth Patches.

Saving The KS Synth General Settings

When an edited Synth Patch is written to memory in the procedure described on page 12, the General Settings are not included in the data saved.

To save the KS Synth General Settings, press either the TEMPLATE COMMON or TEMPLATE EDIT button from **KS Synth Mode** (the appropriate button LED lights) and press the WRITE button. The display shows :

Save General
Settings

Press the WRITE button to continue the saving process or the PLAY button to abandon the save. If WRITE is pressed, the display shows :

TEMPLATE SAVED

and the KS Synth General Settings are stored. The KS Synth General Settings can be thought of as residing in an additional 41st Template memory which is referenced whenever a KS Synth Patch is being used.

Troubleshooting - Using Reason

Troubleshooting

ReMOTE 25 Audio will not power up properly when connected to a Laptop computer via USB

When using a USB connection to power the ReMOTE 25 Audio from a Laptop computer, the ReMOTE 25 Audio may not power up successfully. This is due to the ReMOTE 25 Audio not being able to draw enough power from the Laptop computer.

The ReMOTE requires approx 350mA of power to operate dependent on various conditions. Switching on the Phantom power, Turning up the monitor volume in the headphones and Charging the batteries will add to the power consumption. Although the USB specification dictates that all computers should be able to supply in 500mA of power which is ample, some Laptops are not able to supply this much current.

The solution is to either :

- 1 Power the ReMOTE from a suitable AC:DC power adapter (such as Novation PSU6- included) or;
- 2 Insert Dry or (recommended) rechargeable batteries.
- 3 Connect the ReMOTE 25 Audio to a powered USB Hub.

Transmitting MIDI Program Change does not affect a connected MIDI device

Some MIDI devices will not accept Program Change messages without receiving a Bank Select (CC32 or CC0) first.

Transmitting Bank Select does not affect a connected MIDI device

The ReMOTE 25 Audio sends a Bank select message using CC32. Some MIDI devices use CC0 for this purpose. It may be necessary to configure a control in a Template to send CC0 instead.

System Exclusive messages not accepted by connected MIDI device

There are several possible reasons :

- 1 The MIDI device is set to filter out System Exclusive, or
- 2 The Manufacturer ID is set incorrectly in the Sysex data - consult your manual for details, or
- 3 The Sysex message contains the wrong number of data bytes, or
- 4 The Sysex message requires a checksum which has been calculated incorrectly - consult your manual for details.

X-Station cannot be selected as a AUDIO / MIDI device from within an application

When opening an application that uses the X-Station as it's source for MIDI and Audio and it is found that the X-Station cannot be selected as the MIDI input - either the RX-Station is greyed out or it does not appear in a list of available MIDI devices close the application, wait for 10 seconds, reopen the application and try again. For the Mac platform it is important that the ReMOTE is turned on only once the Mac has booted fully. If this is not done, the true Novation combined core audio driver will not load.

The KS Synth stops responding to note data if the X-Station is connected to a computer via USB.

If the computer does not have the MIDI driver installed (Windows PC or Apple Mac running OSX), or if an Apple Mac does not have an application open that could use the MIDI driver, stuck notes may occur as the X-Station waits for communication with the computer. Either load the driver (Win / OSX), open an application that could use the X-Station (OSX -even selecting the utility application Audio MIDI set up will suffice) or simply stop the X-Station from transmitting data to the USB port (set in the template common menu).

Using The ReMOTE 25 Audio With Reason

It is possible that when using the Reason instrument templates that certain controls don't respond as would be expected.

If this is the case, it is most likely that the version of Reason being used is not responding to the incoming MIDI controller information correctly. It is possible the template in use has been programmed incorrectly. To check which controller numbers are being sent, observe the LCD display when a control is moved. The ReMOTE will be sending these values over MIDI or USB.

Known Anomalies With Reason

General

Reason will NOT currently respond to Program change commands. Therefore it is NOT possible to select new sounds from the ReMOTE.

Reason 1.0

The transport bar will not respond to incoming MIDI messages and therefore will not work with the transport buttons.

Reason 2.0

The transport bar will respond to incoming MIDI messages but they are not allocated a standard MIDI control message. They may however be 'Auto Learn't. The Transport buttons have been factory pre-programmed as below for all the Reason instruments. Refer to the Reason documentation for information on using the Auto learn feature.

Name	CC	Number Range	Type	Channel
Rewind	112	0 - 127	Momentary	16
Forward	113	0 - 127	Momentary	16
Stop	114	0 - 127	Momentary	16
Play	115	0 - 127	Momentary	16
Record	103	0 - 127	Momentary	16

Malstrom

There is no external MIDI control to change the Osc A or B Waveforms. The Wave control for MODS A and B does not respond correctly to external MIDI control. (The ReMOTE sends values from 0 - 31 and incorrect selection occurs)

Many of the 'A' and 'B' controls for the Malstrom are have been given the wrong controller numbers in the Reason documentation. (They are swapped - A controls B and B controls A etc.) These have been altered in the ReMOTE to allow correct operation with the application.

NN-XT - Use the Sampler Template

The Touchpad is set to send Breath on CC 2 It has to be auto learnt since Wheel 2 does not respond as specified in the documentation.

Dr:Rex - Use the Sampler Template

Transpose control does not respond correctly to external MIDI control

Redrum

Many of the controls do not respond correctly to MIDI.

Check the Reason Website www.propellerheads.se for recent updates.

APPENDIX

The KS Synth Patch Preset Listings

Bank1		
No.	Category	Name
100	Bass	ArkBass
101	Dance	Trance Attack
102	Arpeggio	Moving Target
103	Dance	Mr Gurner
104	Pad	Hark Angel
105	EP/Clav	Rodywhirl
106	Strings	Legato Strings
107	Strings	PPG Me
108	Organ	My mighty Organ
109	Soft Lead	First Solo
110	Bass	Accoustic Bass
111	Arpeggio	MonoSeq
112	Bells	Crystal Harp
113	Softlead	Sine On
114	Pad	Come On In
115	Pad	Get me to Heaven
116	Strings	Big Big String
117	Brass	BrassString
118	Organ	ChinOrgan
119	Hard Lead	Nose Bleed
120	Bass	It's The Bass
121	Hard Lead	Sync Leader
122	Arpeggio	MONO Dance
123	Dance	Trancer
124	Pad	Home Front
125	EP/Clav	Fine Tines
126	Strings	Symphones
127	Brass	EV Bas
128	Organ	Mr Ben
129	Soft Lead	Summertime
130	Bass	F Bass
131	Soft Lead	Arksun
132	Arpeggio	Loop the Loop
133	Pad	Perfect Poly
134	Pad	Beauty Lives
135	EP/Clav	EPic
136	Strings	Arco Strings
137	Brass	Give me the Horn
138	Dance	Throater MW
139	Pad	Moving Out
140	Bass	Techno Prison
141	Arpeggio	Machinery
142	Arpeggio	Bugs
143	Motion	Lazy Strumit
144	Pad	Fifthmas
145	EP/Clav	Harpsi Cord
146	Soft Lead	Square Law
147	Brass	Classy Brassy
148	Motion	Dancing fifths
149	Soft Lead	Elp Me

Bank1		
No.	Category	Name
150	Bass	Hertz Ears
151	Dance	Acid drop
152	Arpeggio	Impress Me
153	Dance	Classic 303
154	Pad	Pad it Out
155	EP/Clav	Girls Toy
156	Strings	Wake up
157	Brass	Obie Joyful
158	Organ	Plucky Organ
159	Strings	Film It
160	Strings	No Drama
161	Motion	Arp an Sass
162	Arpeggio	Insect a Side
163	Arpeggio	Lets Dance
164	Pad	Sweet Thing
165	Soft Lead	Velo 303
166	Strings	Wooden Arc
167	Bass	Thud Bass
168	Organ	Skanking
169	Soft Lead	Zy Lophone
170	Bass	Don't Fret
171	Hard Lead	Classic Sync
172	Arpeggio	Pooch
173	Pad	Glider
174	Pad	KLM
175	Motion	Rise up
176	Strings	How Long String
177	Arpeggio	HarpiArp
178	Organ	Draw the Bar
179	EP/Clav	ElectroClav
180	Bass	Flat Puppet
181	Hard Lead	Prog Rocker
182	Arpeggio	Sticky Spitter
183	Dance	Je' t'aime
184	Pad	Time Traveler
185	Arpeggio	Gaviscon
186	Strings	String of Pearls
187	Strings	Pull the String
188	Bass	Wow Bass
189	EP/Clav	Quite Times
190	Bass	In the Moog
191	Pad	Fade to Grey
192	Arpeggio	Maroder
193	Organ	Dance Worgan
194	Pad	Infinite Pad
195	Dance	Club it
196	Soft Lead	Pipe It
197	Arpeggio	Simon Templar
198	Hard Lead	Wired
199	Arpeggio	Ride the Pluck

The KS Synth Patch Preset Listings

Bank2		
No.	Category	Name
200	Bass	Passion Bass
201	Dance	Cake dear?
202	Arpeggio	Rhythm Flight
203	Dance	Go Lieth
204	Pad	Paddle Wheel
205	Bass	Bass Addict
206	Trance	Join the Club
207	EP/Clav	Chick Career
208	Bass	Thick Bass
209	Bells	Big Benny
210	Bass	Travelator
211	Hard Lead	Arabia
212	Arpeggio	Game Show
213	Dance	A Touch 2 Much
214	Dance	Azzeed
215	Dance	Trance Bass
216	Trance	A Wasp
217	Dance	Ian Vandal
218	Bass	String Bass
219	EP/Clav	Choco Eclav
220	Bass	Fruit Gums
221	Arpeggio	Sun Cream
222	SFX	Hyperspace
223	Dance	Circus of Humans
224	Soft Lead	PP3
225	Arpeggio	Round In Circles
226	Pad	Flush
227	Dance	All OScs blazing
228	Organ	F' Ground
229	EP/Clav	Plink
230	Bass	Lay Tex
231	Sweep / Brass	Ky Lee Sweep
232	Arpeggio	ChatterBox
233	EP/Clav	Metal Tines
234	Arpeggio	Rand n Rand
235	Strings	Bow and Flex
236	Hard Lead	Twin Overdrive
237	Brass	Softy
238	Motion	Acidout
239	Hard Lead	Edgeit
240	Bass	On the Bounce
241	Hard Lead	It Feels Like
242	Arpeggio	Whos from Mars
243	EP/Clav	Klavicord
244	Pad	Radio Head
245	Soft Lead	Go to Church
246	Trance	Suspender
247	Brass	Simple Saw
248	Arpeggio	Arp Pad
249	Bass	FemBass

Bank2		
No.	Category	Name
250	Bass	Bootsy Bass
251	Hard Lead	Rub the Band
252	Arpeggio	Told you So
253	Dance	On the Ice
254	Arpeggio	Banjo Strump
255	Hard Lead	Squeeze One Out
256	Trance	Squeeler
257	Brass	Liquid Brass
258	SFX	Suck Me In
259	Brass	PWM block
260	Bass	Dark Paper
261	Hard Lead	Suck the Guitar
262	Arpeggio	Fly By
263	Soft Lead	Soft Finger
264	Pad	Lets Pluck
265	Dance	Get the Timp
266	Sweep	Pins and Needles
267	Pad	Silly Pad
268	Bass	BulgeBass
269	Drums / Perc	Witneys Pluck
270	Bass	Rubber Bass
271	Soft Lead	Toy string Guitar
272	Arpeggio	OctaBass
273	Dance	Swallow It!
274	Arpeggio	Arp Fantasy
275	EP/Clav	Light Finger
276	Bass	ResoBass
277	Sweep	At Mosfet
278	SFX	Cyber Landing
279	Bass	Garge Bass
280	Bass	Eastern Bass
281	Soft Lead	Arp not Arp
282	Arpeggio	Press a Chord
283	Dance	Chambers
284	Pad	Glass Whisper
285	Arp	Ali Gatter
286	Arpeggio	Blippy
287	Brass	Welcome Brass
288	Hard Lead	Lick Quid
289	Pad	The END
290	Bass	Slip Bass
291	Hard Lead	Monster Modular MW
292	Ep/Clav	Wurlit
293	Dance	Stop It Soon
294	Pad	Talk the Talk
295	Motion	Kotoswitch
296	Arpeggio	HarpBeat
297	Pad	Fminate
298	SFX	Space Storm
299	Vibratine	Vibratine

Version 1.0 - 13 / 4 / 2004

Model : Novation X-Station

Function		Transmitted	Received	Remarks
Basic Channel	Default	1 - 16	X	Memorised in Template data
	Changed	1 - 16	X	
Mode	Default	X *****	X	Memorised in Template Data
	Messages Altered		X	
Note Number	True	0 - 127 *****	0 - 127	
	Voice			
Velocity	Note On	O v = 1 - 127 X	O	Fixed Velocity used for button definitions
	Note Off		X	
Aftertouch	Keys	X O	X	
	Channel		O	
Pitch Bend		O	O	Combined Modulation & Pitch Bend joystick
Control Change		0 - 127	0 - 127	Definable RPNs & NRPNS
Program Change	True	0 - 127 *****	0 - 99	0 - 39 Valid For Selecting Templates
System Exclusive		O	O	Single & All Template data dumps. Synth Patches. OS upgrades Definable Strings MMC codes
System Real-Time		X	O	
System Common		X	X	

Mode 1 : OMNI ON, POLY
Mode 3 : OMNI OFF, POLY

Mode 2 : OMNI ON, MONO
Mode 4 : OMNI OFF, MONO

Safety - CE Notices And Approvals

IMPORTANT SAFETY INSTRUCTIONS

Warning - When using electric products, basic precautions should always be followed, including the following:

1. Read all the instructions and observe the graphic symbols above before using the product.
2. Do not use this product near water - for example near a bathtub, washbowl, kitchen sink, in a wet basement, near or in a swimming pool, a swamp or the like.
3. This product should be used only with a cart or a stand that is recommended by the manufacturer.
4. This product, either alone or in combination with an amplifier and headphones or speakers may be perfectly capable of producing sound levels that could cause permanent hearing loss. Do not operate for a long period of time at a high volume level or at a level that is uncomfortable. If you experience any hearing loss or ringing in the ears, you should consult an audiologist.
5. The product should be located so that its location or position does not interfere with or obstruct its normal flow of ventilation.
6. The product should be located away from heat sources such as radiators, heat registers or other products that produce
7. The product should be connected to a power supply only of the type described in these operation instructions or as marked on the product.
8. The power supply cord of the product should be unplugged from the outlet when the product is left unused for a long period of time.
9. Care should be taken so that objects do not fall, or liquids are not spilled into the enclosure through openings.
10. The product should be serviced by qualified service personnel when:
 - A. The power supply cord has been damaged; or
 - B. Objects have fallen or liquids have been spilled onto the product; or
 - C. The product has been exposed to rain; or
 - D. The product does not appear to operate normally or exhibits a marked change in performance; or
 - E. The product has been dropped or the enclosure has been damaged.
11. Do not attempt to service the product beyond those means described in this operating manual. All other servicing should be referred to qualified service personnel.

FCC Information (U.S.A.)

1. IMPORTANT NOTICE: DO NOT MODIFY THIS UNIT! This product, when installed as indicated in the instructions contained in this Manual, meets FCC requirements. Modifications not expressly approved by Novation may void your authority, granted by the FCC, to use the product.
2. IMPORTANT: When connecting this product to accessories and/or another product use only high quality shielded cables. Cable/s supplied with this product MUST be used. Follow all installation instructions. Failure to follow instructions could void your FCC authorization to use this product in the USA.
- 3 NOTE: This product has been tested and found to comply with the requirements listed in FCC Regulations, Part 15 for Class "B" digital devices. Compliance with these requirements provides a reasonable level of assurance that your use of this product in residential environment will not result in harmful interference with other electronic devices. This equipment generates/uses radio frequencies and, if not installed and used according to the instructions found in the users manual, may cause interference harmful to the operation of other electronic devices. Compliance with FCC regulations does not guarantee that interference will not occur in all installations. If this product is found to be the source of interference, which can be determined by turning the unit "OFF" and "ON", please try to eliminate the problem by using one of the following measures:

Relocate either this product or the device that is being affected by the interference.
Utilize power outlets that are on different branch (Circuit breaker or fuse) circuits or install AC line filter/s.
In the case of radio or TV interference, relocate/re orient the antenna. If the antenna lead-in is 300 ohm ribbon lead, change the lead-in to co-axial type cable.
If these corrective measures do not produce satisfactory results, please contact the local retailer authorized to distribute this type of product.

The statements above apply ONLY to products distributed in the USA.

CANADA

The digital section of this apparatus does not exceed the "Class B" limits for radio noise emissions from digital apparatus set out in the radio interference regulation of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la "Classe B" prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère Des Communications du Canada.

This only applies to products distributed in Canada.
Ceci ne s'applique qu'aux produits distribués dans Canada.

Other Standards (Rest of World)

This product complies with the radio frequency interference requirements of the Council Directive 89/336/EC.

Dette apparat overholder det gældende EF-direktiv vedrørende radiofrekvenser. Cet appareil est conforme aux prescriptions de la directive communautaire 89/336/EC.

Diese Geräte entsprechen der EG-Richtlinie 89/336/EC.

Specifications subject to change:

The information contained in this manual is believed to be correct at the time of going to press. However, Novation reserves the right to change or modify the specification without notice or obligation to update existing units.

Copyright 2004
Novation Electronic Music Systems Ltd. V1.2

Notes