

# USER'S MANUAL

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# Oberheim SEM-V



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Special thanks to Tom Oberheim for creating such an amazing synthesizer, and to Gibson Corporation, Kosh Dukai, Akis Ziak, Charles Capsis IV, Paul Steinway, Silvere Letellier, Houston Haynes, Frank Orlich, Steve Lindsey, Sean Weitzmann, Laurent Guerin, Laurent Coueron, Alex Theakston, Christian Laffitte

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# 1 INTRODUCTION

## From the first Oberheim synthesizer up to TAE®

Thomas Elroy Oberheim was born on July 7<sup>th</sup> 1936 in Manhattan, Kansas. His first attempts at building electronic equipment came after leaving UCLA, when he built an amplifier for the PA system of his friend's band, the United States of America. Once that was completed, the singer for the United States of America asked Tom if he could build them a ring modulator- so he set to work researching how to create it. Thanks to an article by Harald Bode, Oberheim was able to hand build a model suitable for musical applications. This was the very first piece of his legendary music equipment, and the beginning of a long career in the crafting of unique and fabulous sounding electronic instruments. The ring modulator was an instant success and became widely used in music production, most notably in the soundtrack of the film "Beneath the Planet of the Apes".

Eventually, his ring modulator was released to the market as Maestro Ring Modulator RM-1A, garnering widespread positive feedback and used by many musicians like Herbie Hancock, Jan Hammer, John Lord and more.



**The Maestro RM-1A Ring Modulator**

A few years later, Oberheim became very interested with the sound of instruments played through a Leslie rotary speaker. This fascination inspired him to plan and construct a phase shifting effect which was intended to imitate the Leslie speaker sound: it was released as Maestro PS-1. It too was a true success and sold nearly 25,000 units.



**The Maestro PS-1A Phase Shifter**

In 1969, he founded "Oberheim Electronics".

At the NAMM show In 1971, Tom Oberheim approached Alan Robert Pearlman of ARP Instruments, Inc. and asked him to become an ARP dealer in Los Angeles. After a positive conversation, Oberheim Electronics became the first dealer of ARP on the west coast of the U.S. and sold ARP synthesizers to many musicians including Leon Russel, Robert Lamm and Frank Zappa.

While working for ARP, he noticed that ARP2500 had the possibility of playing two notes at the same time (known as duophonic); he found this much more interesting and powerful than regular monophonic synthesizers, and so he decided to modify the ARP2600, empowering it with the same duophonic potential as the ARP2500 in 1973.

In addition to being an electronics wizard, Tom Oberheim was also an educated computer engineer and subsequently designed the DS-2 digital sequencer to control ARP or Bob Moog's synthesizers. This pioneering device was a huge step forward because the DS-2 was one of the very first digital sequencers, and was the first step towards making his Synthesizer Expander Module (or SEM).



**The Oberheim DS-2A digital sequencer**

In May 1974, he showed the SEM, that he designed with the help of Dave Rossum of E-mu Systems, at the Audio Engineering Society Convention in L.A. The SEM was the first synthesizer with the name "Oberheim Electronics" on the market.



### The Oberheim SEM

Tom expanded its concept again with the help of Dave Rossum and Scott Wedge (Co-founder of E-mu Systems) by creating polyphonic synthesizers that were in effect combinations of the SEM with a digital keyboard in one carry-case.

They were known as the "Oberheim 2-voice (TVS-1)" and "Oberheim 4-voice (FVS-1)" synthesizers, and were released in 1975.

He realized that operating these polyphonic synthesizers in real time was not practical from a musicians standpoint so he began to think of an alternate solution, something that would render the instruments more straight forward and easy to use. The answer he came up with was the Polyphonic Synthesizer Programmer which could store the synthesizer's sound settings. This was the first voice programable synthesizer, and a huge step in the world of sound synthesis.

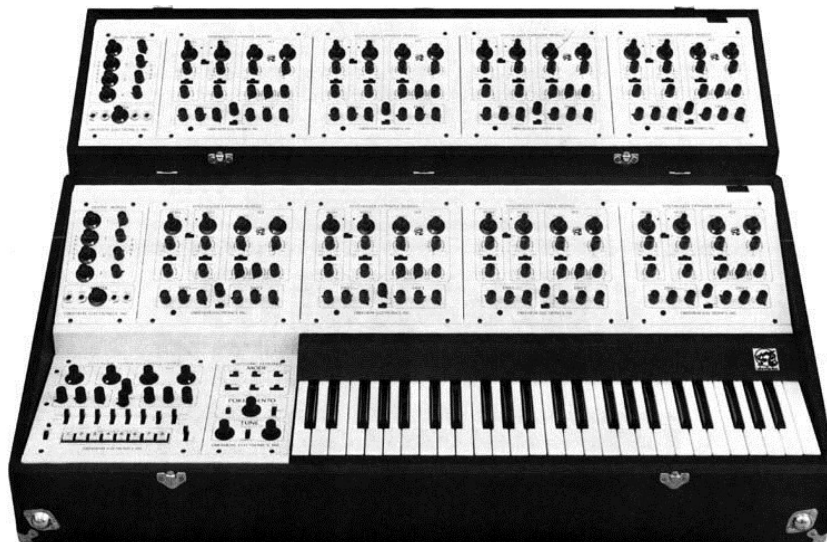


## The Oberheim 4-Voice

The Oberheim 4-Voice synthesizer had a notable feature: it was the one of the first electronic instruments to boast multi-timbrality. The 4-Voice was organized with the group of independent monophonic synthesizers (SEMs), which were controlled by master controller section that handled the main global controls (it couldn't however set the all parameter values i.e. OSC waveform, filter resonance, filter type).

This specification- while already a major innovation in the world of synthesizers- made it slightly unpractical to edit the machine in real time. On the other hand if the player wanted to have different sounds for every single note in the chord, it was possible- making it a truly powerful and unique electronic instrument. Therefore, when player played a lead, different sounds would be produced, in a cyclical manner- a very different approach to synthesizers by today's standards. It is worth noting that this feature made key split and unison available as well.

The next machine Tom created, the "Oberheim 8 voice" was very similar to the 4-voice, and can be summarized basically as the FVS-1 plus 4 externally-combined SEM modules. It released in 1977.



**The Oberheim 8-Voice**

Afterwards, Oberheim Electronics continued to be a prolific synthesizer company, releasing the OB-1, OB-X, OB-Xa, OB-8, Xpander and Matrix6 and 12, all highly regarded and influential machines.

In 1985, Oberheim Electronics closed, however. Its brand and some of the products are continued by Gibson Guitar Corporation. Tom recently began producing hand-made updated SEMs and has announced the release of a successor to his original 4-voice available in the next few years.



## A better emulation thanks to TAE®

TAE® - standing for True Analog Emulation - is a new technology dedicated to the digital reproduction of analog circuits.

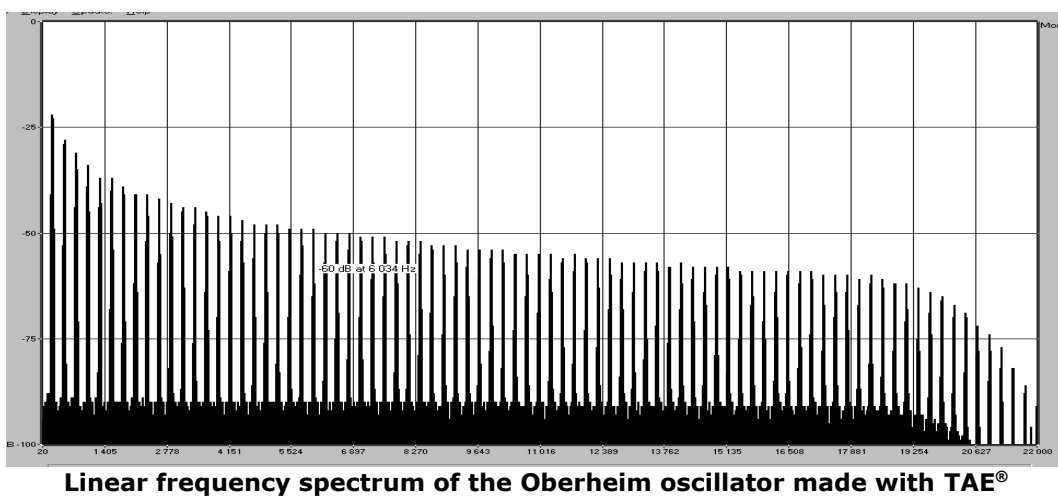
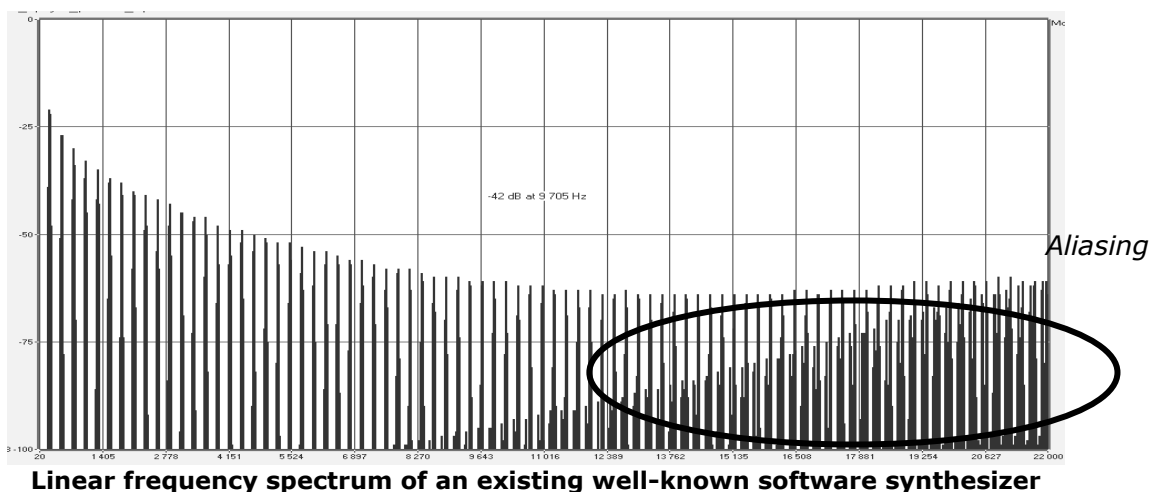
When implemented in software code, TAE® algorithms guaranty the respect of hardware specifications. This is why the Oberheim SEM-V offers an unparalleled quality of sound.

In detail, TAE® means:

### Aliasing-free oscillators:

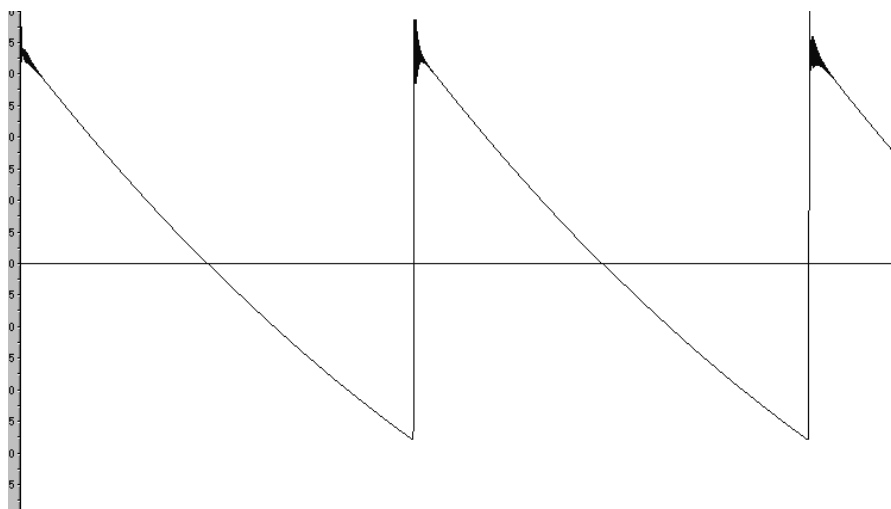
Standard digital synthesizers produce aliasing in high frequencies, and also when using Pulse Width Modulation or FM.

TAE® allows the production of totally aliasing-free oscillators in all contexts (PWM, FM...), and at no extra CPU cost.

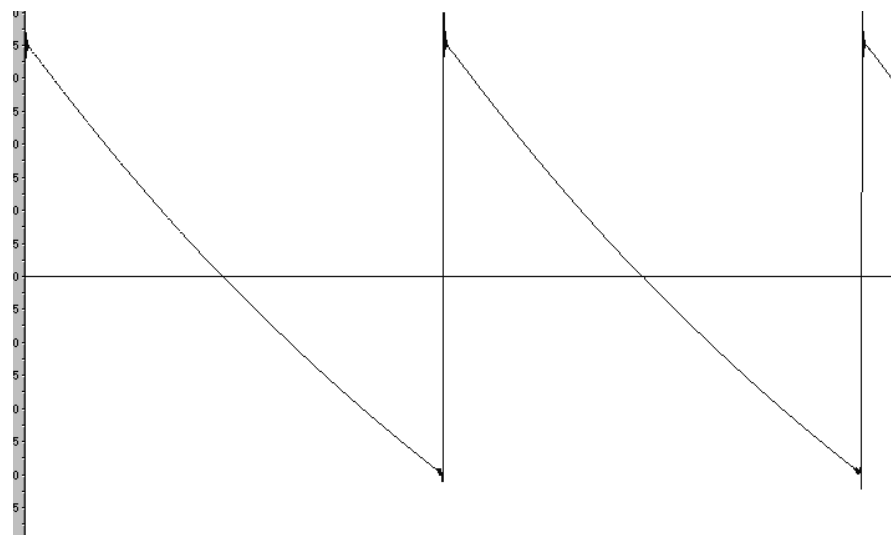


## Better reproduction of analog waveforms:

Original analog oscillators used capacitor's charge and discharge cycles to produce common wave shapes (saw tooth, triangle, square). This means that waveforms were slightly curved. TAE<sup>®</sup> allows the reproduction of the capacitors discharge.



**Temporal representation of a waveform on a Oberheim SEM**



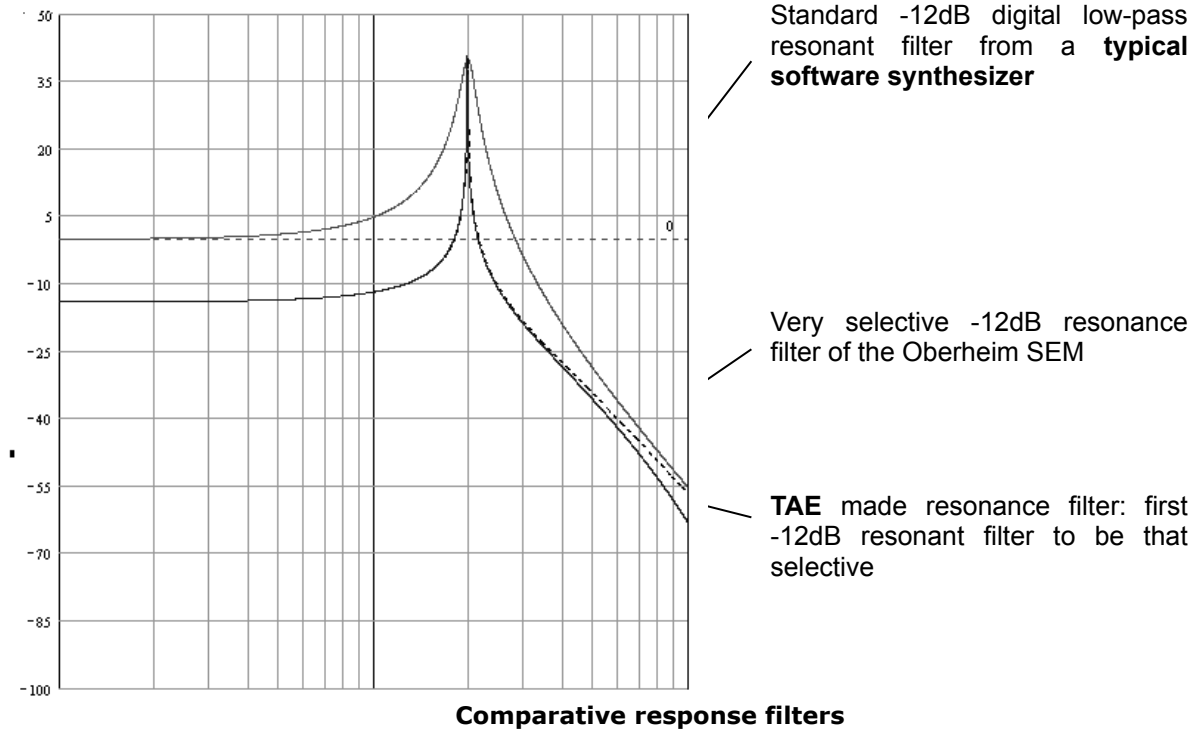
**Temporal representation of the Oberheim SEM-V waveform thanks to TAE<sup>®</sup>**

In addition, original analog oscillators were unstable. Actually, their wave shapes were always slightly different from one period to another. Also, due to analog hardware sensitivities, new period trigger times varied with the temperature and other environmental conditions.

TAE<sup>®</sup> simulates the instability of oscillators, helping to create warmer sounds, often given the affectionate term of "fat".

## Better reproduction of analog filters

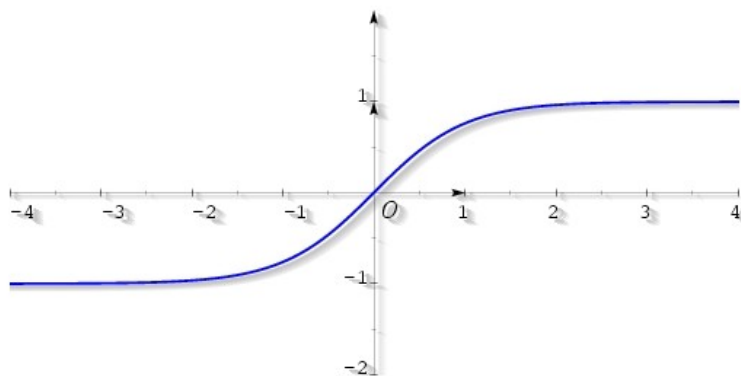
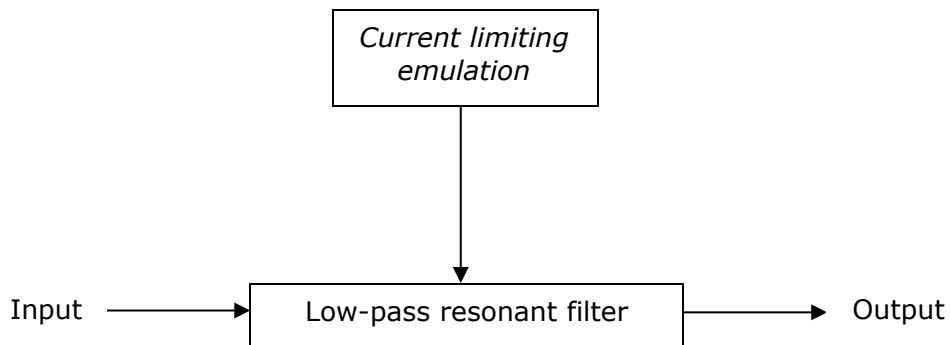
TAE® allows the emulation of analog-designed filters in a much more precise way than any existing digital filter. In particular, TAE® has managed to reproduce the legendary Oberheim -12dB low-pass resonant filter with great respect towards the original.



## Implementation of soft clipping

In analog synthesizers, particularly Oberheim's, the resonant filter at the VCA uses a current limiting function, preventing the signal from being too loud (soft clipping).

TAE<sup>®</sup> reproduces this current limiting function, making the sound more natural. It also allows filters to enter self-oscillation like original hardware synthesizers do.



**Soft-clipping transfer function**

## 2 ACTIVATION & FIRST START

Oberheim SEM V works on computers equipped with Windows 7 or 8 and Mac OS X 10.7 or later. You can use the stand-alone version or use Oberheim SEM V as an Audio Units, AAX, VST2 or VST3 instrument.



### 2.1 REGISTER & ACTIVATE

Once the Oberheim SEM V has been installed, the next step is to register the software.

The registration process will require you to enter the serial number and the unlock code you received with the product.

In order to proceed, go to this web page and follow the instructions:

<http://www.arturia.com/register>

Note: If you don't have an Arturia account yet, you will need to create one. The process is quick, but it does require that you can access your e-mail address during the registration process.

Once you have acquired an Arturia account you will be able to register the product.

## 3 QUICK START

This chapter will help you know the main aspects of how the Oberheim SEM-V works. You will be presented with an overview of the different parts of the synthesizer while using the program for the first time. You will also find a detailed description of all visible settings and controllers in the following chapters.

Chapter 6 "A few elements of sound design", is specially recommended for those who are not familiar with subtractive synthesis and who wish to learn the basics in this technique.



## Using the presets

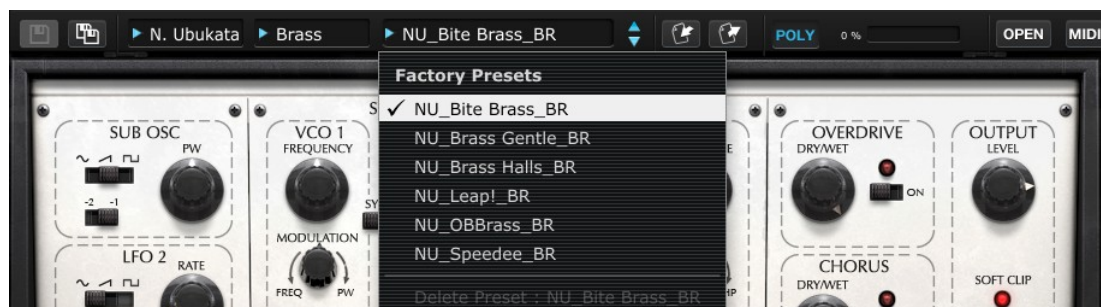
Oberheim SEM comes with a great collection of preset sound programs which were made by some of the top synthesizer sound designers in the world. Presets are categorized by Bank, Type and Name.

The preset selectors are shown in three columns, from the right side of the floppy disk icon to the center of the tool bar.

The Bank has sub-folders which are sort by the name of the each of the sound designers.

The Type has sub-folders which is named with the Type of the instruments.

For example, if you chose the subfolder which named "N.Ubukata" in the Bank column then choose "Brass" in the Type column, the list of brass sounds which made by Mr. N.Ubukata appear on the right end column (preset column).



**Selecting a preset**

If you choose "All Banks" and "All Types", the preset column shows entire preset sound programs of Oberheim SEM V.

## Modifying the preset

### VCF (Voltage Controlled Filter)

First select the following preset : Templates / Brass / Simple Brass

This is a very simple brass sound.

Second, adjust the FREQUENCY knob in the VCF section to left and right.

You may hear that tone is becoming softer or brighter because now you are modifying the cut-off frequency of the VCF.

Adjust the Frequency to about 100Hz, then turn the MODULATION knob (below FREQUENCY) to the center position. You should hear the tone become even softer.

The value of the modulation knob that controls the cutoff frequency of the VCF, is dependent on the setting of ENV 2.

Let's set the modulation knob to the right then turn the SUSTAIN knob to the left of ENV 2, you will notice that the cut-off frequency of the VCF will be affected by this value.

Now listen to what happens when you turn the ATTACK and the DECAY knobs of ENV 2.

Now let's toggle the modulation source from the ENV 2 to LFO 1 or LFO 2 by moving the switch below the MODULATION knob.

The tone will change continuously according to the value of the LFO rate.

Switch back to the ENV 2 and turn the modulation knob to left end then adjust the frequency knob to the right end. Now the ENV modulation for the VCF is inverted. You are now modulating the VCF cutoff negatively. Try changing the attack, the decay and the sustain

controls of ENV 2 and listen to the results.

## Oscillator mixer

The oscillator mixer is in lower part of the VCF section. You can choose either the sawtooth or pulse wave for each of the VCOs.

If you adjust the VCO 1 knob to the top center position, you will not hear any sound because the volume of the oscillator is at zero.

Let's turn the VCO 1 knob to the right, the volume of the pulse wave will be progressively increased.

Now, let's turn the VCO2 knob fully left, you can hear the mixed sound with the sawtooth and pulse wave.

## Oscillator tuning

In the oscillator section, one of the most commonly used is the tuning function. When you click on the FREQUENCY knob and drag the mouse, this knob will adjust the oscillator pitch in semitones. When you right click or Control+Click and drag the mouse, this knob will adjust the fine tuning of the oscillator.

## Templates

To help you understand better the basic operation of the synthesizer, we have provided some simple sound programs. When you click the center TYPE column, subfolders are displayed by type of instrument.

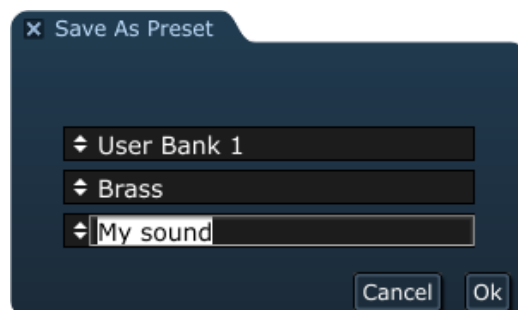
Let's select any of the sound programs that you want to try. Try turning a variety of knobs and switches on the main panel and listen to how the tone changes.

## Saving the preset

The preset now you have modified could be saved as a new "user preset".

To save a user preset, please click on the icon of the floppy disk that shows two disks stacked, this is the SAVE AS function. A dialog window will open.

Click on the rows to input the bank, type and preset name. Clicking Ok will save your new preset.



Your new User preset can now be edited. Using SAVE or SAVE AS you can overwrite the existing preset or create new presets.



## 4 USING THE OBERHEIM SEM V

### 4.1 USE OF PRESETS

Presets let you memorize the sounds of the Oberheim SEM-V that you create. A preset contains all of the information pertaining to the reproduction of a sound. In this software, the presets are classed in "Banks" and "Types" in order for you to quickly and easily access the exact sound you're looking for. Each Bank contains a certain number of Types, which generally determine a kind of sound: Types /Bass", Types /Sound effects", "Types/Pads" etc. Each Type contains within itself a certain number of presets.

Oberheim SEM-V is shipped with several "Factory" banks made by our international team of sound designers. But it is possible to create new "user" banks of sounds, each containing a number of Types and Presets. For security, the "Factory" banks cannot be directly modified. It is nonetheless possible to create or tweak a sound based on a factory preset and then save it as a "User" preset.

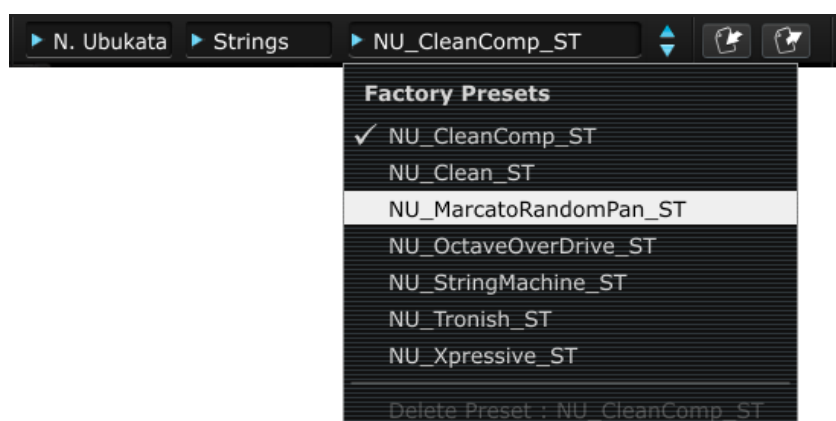
#### 4.1.1 Choice of a Bank, Type, Preset

The information for the Bank, Type and Preset currently in use by the Oberheim SEM-V is permanently displayed in the synthesizer tool bar.



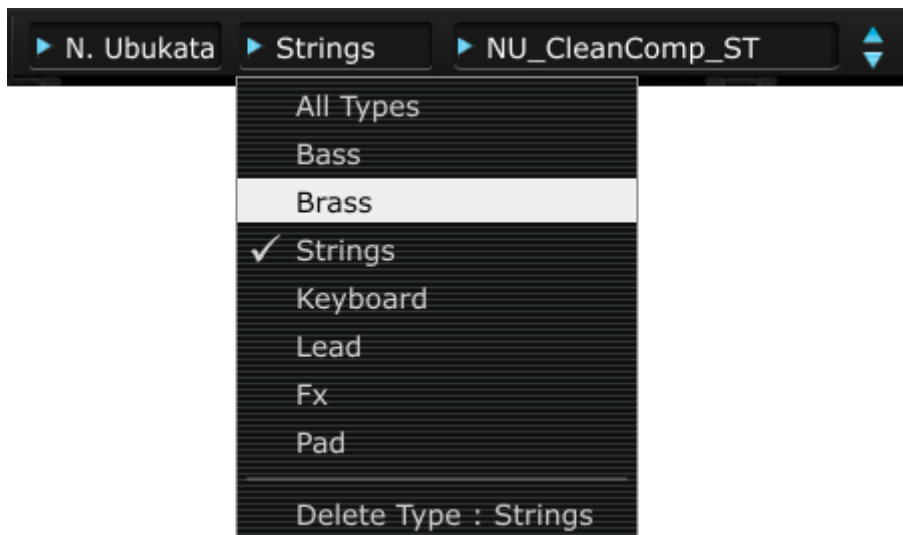
**Display of current Bank, Type and Preset**

To choose a preset in the current Type, click on the box the furthest to the right of the three. A dropdown menu appears with a list of the presets of the same Type. You can choose another preset by clicking on its name in the dropdown menu. As soon as the preset has been chosen, you can play the new sound on your MIDI keyboard or from your sequencer.



**Choose a preset in the same Type**

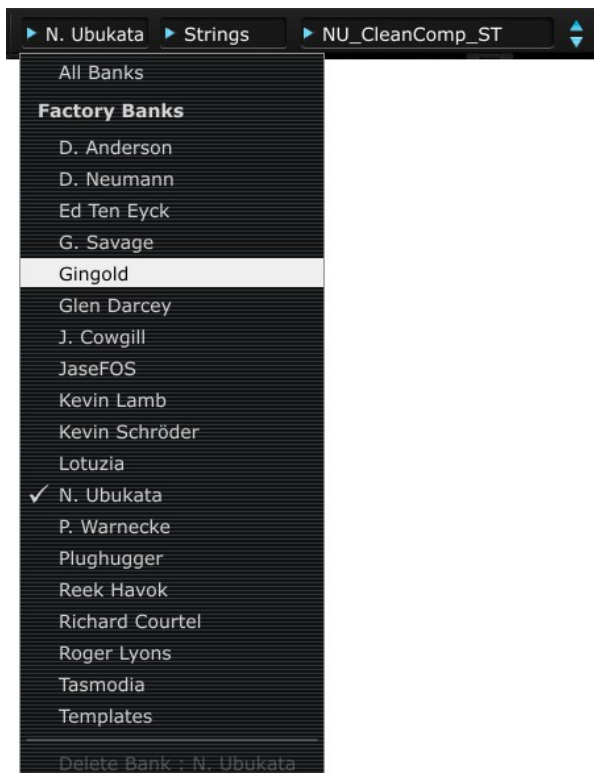
To choose a preset in the same bank, but a different type, click on the middle box. A dropdown menu appears with a list of the Types of sounds available in the current bank-choose one. Each Type listed in the menu gives access to a list of presets in the right box that resemble the Type specified. Click on the name of a preset in the right box in order to select a preset of a new Type.



### Choice of a preset in another Type

To choose a preset in another main bank, click on the left-most box. A dropdown menu appears with a list of banks available. Each bank contains a certain amount of Types and Presets contained in each of the Type sub-banks.

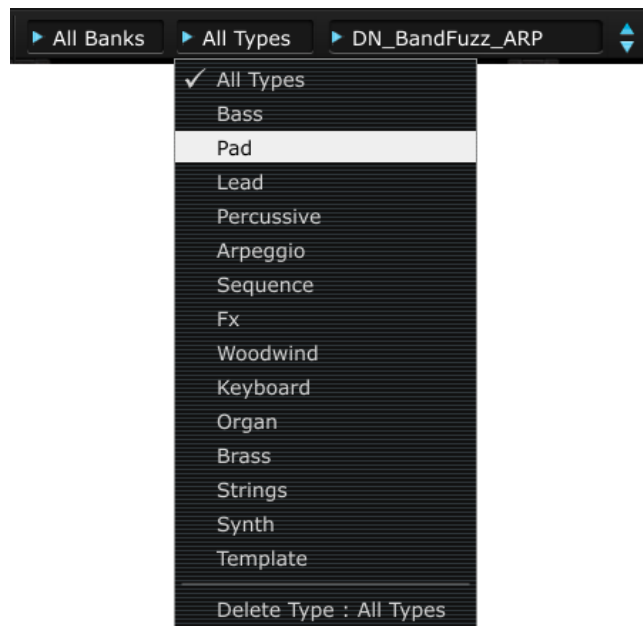
You can thus freely choose a preset by clicking on its name.



### Choice of a preset in another main bank

In each dropdown menu, the "All" option at the top allows you to open a sub-list with all of the types available in all of the banks. This gives you access directly to all of the presets of a given type, for example all of the basses, no matter which bank they are in.

This function is particularly useful to quickly see all of the presets of the same type.



#### Choice of preset regardless of bank

When a preset has been modified an asterisk appears next to its name in the tool bar.

#### 4.1.2 Saving a user preset

To save your setting modifications in the current preset, click on the "Save as" button in the tool bar. The save dialog window will appear on the screen center. It allows you to save your setting modifications (generally called a "voice program") as User preset.

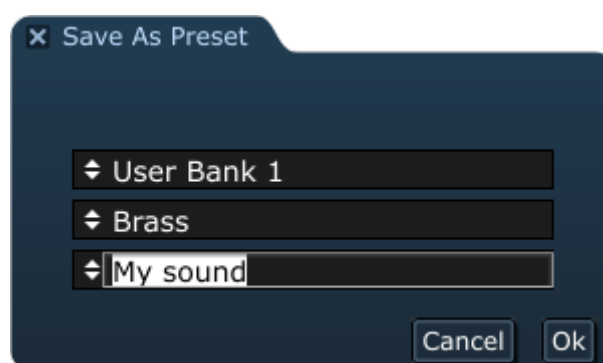


#### "Save as" button in the tool bar

As previously explained, factory preset are not allowed to be modified. You may create a new "Bank" and "Type" first.

Creating a new Bank, Type, and saving your voice program as a User preset is easy. You just click on the box on the top-left, and type in the name of your new bank. Then move to the next box (the Type box) by clicking or using the tab key and type in the Type name you wish to use. At the end, click "ok". Now all the necessary processes for saving your voice program have been completed, and you have your own Bank and Type as well !

If you want to cancel this process without saving your voice program, just click on the "X" to the left of the tab in this dialog window.



#### "Save as Preset" dialog window.

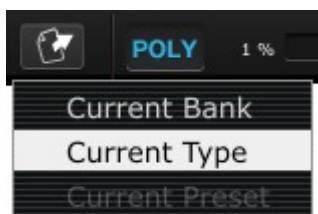
### 4.1.3 Import/ Export of a bank of presets

It is possible to import new banks of presets conceived for the Oberheim SEM-V. To import a new bank of presets, click on the preset bank import button on the tool bar:



**Preset bank import button on the tool bar**

When you click on this button, a window will appear allowing you to choose the preset bank file for the Oberheim SEM-V (".obsx" extension). Choose the file that you want to import, and click on "Open". The new bank of presets will automatically appear among the available banks. Oberheim SEM-V equally offers the possibility to export your own sounds to archive them, to use them on another machine, or to make them available to other users. It is possible to export a Preset, a Type, or a Bank. To export the current Bank, Type, or Preset, click on the export button in the tool bar of the program:



**Current preset/bank export button in the tool bar**

Select the type of export that you want to perform (bank, type or preset) and a window will appear, giving you access to a choice of destination folder and file name for the bank that you are exporting.

## 4.2 USE OF CONTROLLERS

Oberheim SEM-V uses 2 types of controllers: potentiometers and switches. Let's take a look at those 2 types of controllers:

### 4.2.1 Potentiometers

A potentiometer determines the value of the various control parameters. Place the mouse pointer over the knob, click on it and move your mouse up and down by dragging (like moving the slider). This will rotate the knobs in the GUI, and display the new value in a yellow dialog box that appears next to the knob.



**Potentiometers**

It normally works as a "Coarse" adjustment. However, knobs can also work as "Fine" adjustments for more precision, when you drag your mouse with control key pressed, or by

using the right click on your mouse.

To reset the parameter value, double click on the knob, the knob will set to the center position immediately (works only on some parameters).

#### 4.2.2 Switches

Oberheim SEM-V has two types of switches. Simply click on these switches to change their state. Some are of the "on/off" style, others allow a selection of one out of several options.



**Switches**

#### 4.2.3 Virtual keyboard

The virtual keyboard which appears below the main panel can make the synthesizer play a sound without an external master MIDI keyboard and without programming midi notes in a sequencer. Just click and drag on a virtual key to hear the corresponding sound.

#### 4.2.4 MIDI control

All the knobs and switches of the Oberheim SEM-V can be manipulated with external MIDI controllers. Click on the MIDI assign button all the way to the right of the tool bar. You will see the assignable parameters highlighted in a blue/violet color.

Click on one that you'd like to control from an external controller. Notice that after clicking, the parameter which is ready to be assigned has a black rectangle around it, in order for you to see which parameter you are about to assign.

You can always choose to move that focus by clicking on another parameter. Now move the external slider, knob or switch. Assignment will be done instantly: the colour of the parameter will become highlighted in red, and a MIDI Control Change number will be displayed. To unassign a parameter, you can right-click on it.

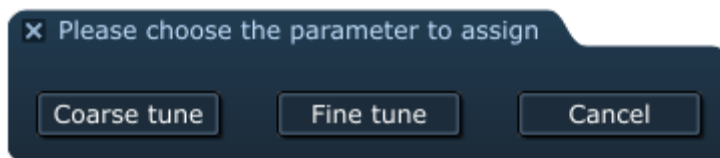


**MIDI assign button**



**External MIDI assign waiting mode**

Exceptionally, when you click on the VCO1 and 2 frequency knobs, the dialog window will show up. It allows you to assign MIDI controllers to both the coarse and fine frequency parameters separately.

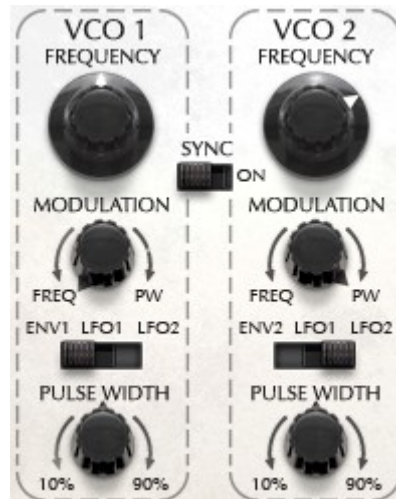


**Choosing Coarse/Fine dialog window**

### 4.3 **SYNTHESIZER EXPANDER MODULE**

This part is the core of the sound generation and almost everything that makes the Oberheim SEM-V what it is can be find here. You may notice that SEM stands for Synthsizer Expander Module.

### 4.3.1 VCO



VCO is an oscillator which generates the fundamental audio signal to be processed. There are two VCO sections in the SEM-V, named VCO1 and VCO2.

In this section, you can set the pitch by using the frequency knob, modulation depth for oscillator pitch modulation or pulse width amount. These knobs are found below the frequency knob.

Their waveforms, however, are chosen in the VCF section on the module.

The bottom-most knob in the VCO sections controls the width of the pulse wave. When this knob is set at center position, the OSC generates a symmetrical square wave, and when it moves to clockwise or counter clockwise, the waveform progressively changes to an asymmetrical shape and the tone also changes with it.

The switch in between OSC 1 and 2 is an on/off switch for oscillator pitch synchronization. When this switch is on the pitch of OSC 2 will be forced to synchronize with the pitch of OSC1.

*\* For more details of OSC sync, please have a look at the next chapter.*

The modulation knob can have two different functions: if turned to the left side, it will control how much of the selected modulation source affects the oscillator frequency. But if turned on the right side, it will affect the modulation of the pulse width. In the center position, which can be reached by double-clicking for ease of use, there is no modulation of frequency or of pulse width.

The switch below the modulation knob determines the VCO's modulation source: either ENV, LFO1 or LFO 2.



### 4.3.2 VCF



This section determines the tone character of your sound.

**FREQUENCY** : This parameter indicates the frequency to be filtered which is dependant on the filter type.

**RESONANCE**: It normally enhance the frequency determined by the FREQUENCY knob except when the filter type is set to notch.

*\* For more details about filter type, please have a look at the next chapter.*

**MODULATION** : The depth of filter frequency modulation. +(clockwise) means positive value and -(counter clockwise) means negative value. A double click will reset the value to zero.

The filter type selector is the knob to the right of the MODULATION knob. You can choose the type of filter you'd like to use, among the 4 kinds of filter types available: low pass, notch, high pass or band pass.

**Modulation Source selector** : This switch determines the modulation source affecting the filter frequency: ENV2, LFO1 or LFO2.

On the very bottom of the VCF section are three additional 'mix' knobs.

**VCO 1**: This knob works as waveform selector between sawtooth (if turned towards the left) and pulse (if turned towards the right) and also works as volume for each waveform, since the center point is no volume for either waveform. You can double-click on it to reset it to the center.

**VCO 2** : This knob works for VCO2, and the function is the same as the VCO1 knob. You can also double-click on it to reset it to the center.

**EXT** : This knob works as source selector between sub oscillator (if turned to the left) and the noise (if moved to the right) and also works as a volume control for each audio signal. You can double-click on it to reset it to the center.

### 4.3.3 ENV 1



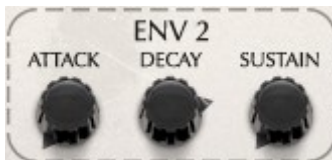
ENV is an abbreviation of Envelope. It creates a modulation shape that is used to control the VCA amplitude, or volume, of each SEM-V voice. This shape is generated every time a note is



played, and the three knobs present in the ENV1 section (Attack, Decay and Sustain) help determine the shape of the envelope.

In the case of the SEM-V, the ENV1 can also be sent as a modulation source to VCO1's pitch or pulse width.

#### 4.3.4 ENV 2



ENV 2 is not directly sent to a SEM-V parameter like ENV 1 (sent to the VCA). It can be viewed as an external Modulation source, and can be sent to the filter frequency in the VCF or else to the frequency or pulse width modulation of VCO2.

*\* On Oberheim SEM-V, the Decay knob controls the release time as well. Please have a look next chapter for more details.*

#### 4.3.5 LFO 1



LFO 1 generates a sinewave for modulation purposes. The frequency knob sets how "fast" the LFO is running. If you turn the switch to the "on" position, the frequency will be synchronized with the host sequencer's tempo and you can set the ratio between 1/32 to 16 times the host tempo.

**The following parameters include brand-new, original modules of Arturia's Oberheim SEM-V that the real SEM didn't have.**

#### 4.3.6 Sub Osc (Oberheim SEM V original)



The upper switch determines the wave form of the Sub Oscillator, either sine, sawtooth or pulse. You can choose the pitch to be either of 1 or 2 octaves lower than VCO 1's pitch. The knob on the right side controls the width of pulse wave.

*\* Sub Osc is not a independent oscillator, the pitch is always identical of Osc 1 and is either 1 or 2*

octaves lower. For the detail, please read the chapter 5.

#### 4.3.7 LFO 2 (Oberheim SEM V original)



On this LFO, you can choose the modulation waveform by using the upper switch: either sine, sawtooth or square.

If you turn the "SYNC" switch to the "ON" position, the frequency will be synchronized with the host sequencer's tempo and you can choose the ratio between 1/32 to x16 the tempo.

If the "RETRIG" is set to "ON", the LFO phase will be reset when a key is played, if there are no other keys pressed. Otherwise, the LFO will be free-running.

The "FADE IN" knob allows the LFO amplitude to rise continuously from the moment a key is pressed, with a duration which is set by this knob.

The LFO 2 is a monophonic LFO: when playing the Oberheim SEM V in a polyphonic way, it will modulate all voices identically. On the other hand, LFO1 is part of the SEM module, so it is replicated in each voice.

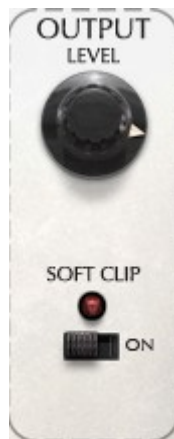
#### 4.3.8 Effects (Oberheim SEM V original)



Oberheim SEM-V has 3 kinds of effects (Distortion, Chorus and Delay). You can turn them on or off by using the switches on the right side and control the dry/wet balance by adjusting the knobs to the left.

*\* For the details of the function of these effects, please read the chapter 6.*

### 4.3.9 Output



The Level or Master Volume knob adjusts the final output level of the audio signal. It can range from -80dB to +24dB, so be careful, because it may cause audio clipping if set too high.

The Soft-clip feature allows to introduce a very subtle distortion to the signal which brings some additional warmth, like on analog output stages. At high volume levels, this may cause unwanted distortion.

### 4.3.10 Arpeggiator (Oberheim SEM V original)



When the upper left switch is on, the SEM automatically plays an arpeggio according to the notes which you play. When the switch is in the "HOLD" position, the Arpeggiator continues to play the note or chord which you played after keys are off- and until next note or chord is played.

The lower left switch determines the type of arpeggio when more than 1 octave is played: upward, downward, upward and downward, or random notes.

The rate knob controls the speed of arpeggio. If the upper right switch is on (Sync), the speed is synchronized with the host sequencer and the knob works as tempo ratio that is set according to the host sequencer's tempo.

The lower right switch selects the octave range of the arpeggio. (1 to 4 octaves)

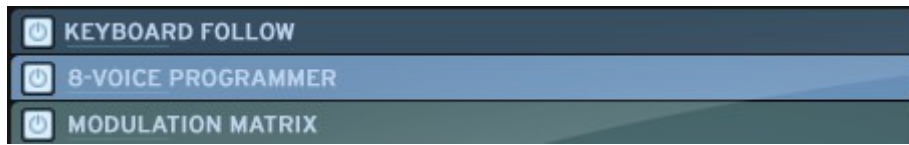
### 4.3.11 Tune And Portamento



TUNE controls the master tuning of Oberheim SEM-V within A=420Hz to 460Hz.

The PORTAMENTO section has 2 parameters. The ON-OFF switch and the knob that adjusts portamento time in between 0 millisecond to 2000 milliseconds. Portamento creates a glide in pitch between two notes that are played one after the other.

## 4.4 THE TOP PANEL MODULATION MODULES



The top panel (which can be opened by clicking on the "OPEN" button on the right side of the toolbar) gives access to 3 special functions especially made for the Oberheim SEM-V. These advanced modulation functions are not available on the original analog SEM and highly enhance the sound making capacities of the SEM-V: the "Keyboard Follow", the "8 Voice programmer", and the "Modulation Matrix".

Keyboard follow is a fairly common parameter for many kinds of synthesizers; however, this "keyboard follow" has a several new features which are sure to make it stand out from the rest.

### 4.4.1 Keyboard Follow



The Keyboard Follow module of the Oberheim SEM-V allows you to modify the value of up to 6 parameters according to the note that is played on the keyboard. It does this by letting you draw the curve of 'reactivity', so to speak, between the pitch of the note and the parameter modulated.

#### 4.4.1.1 Activate/Deactivate Keyboard follow

You can activate or deactivate keyboard follow function globally (for all 6 parameters) and individually for each parameter.

To activate or deactivate the entire keyboard follow function, click on the top left button (next to the words "KEYBOARD FOLLOW"): it will toggle the function on and off.

To activate or deactivate individual keyboard follow parameters, click on the corresponding button to the right of each individual parameter name (in the parameters column on the left).

#### 4.4.1.2 Multi break points

Each keyboard follow parameter has 5 default break points: 2 fixed position points (for low and high end) and 3 movable ones in between.

You can easily add or remove the number of break points. Just click anywhere on the screen to add a new point. Right-click on the circle to remove the breakpoint. To move a breakpoint's position, simply click and hold on the circle and move it by dragging.

The number of the breakpoints is limited to 32.

#### 4.4.1.3 Linear and exponential slope

The slope between each breakpoint can be between linear or exponential. You can change the curve between two points by dragging the up and down arrows that are in the middle of each line segment between two breakpoints.

#### 4.4.1.4 Changeable destination and activation switch

The keyboard follow destinations are changeable. Just right click on the columns on the left side: a drop down menu will appear showing you the parameters that can be assigned as destinations of the keyboard follow. You will also have the option of clearing the current curve for the selected parameter.

### 4.4.2 Voice Programmer



The 8 Voice Programmer module of the Oberheim SEM V allows you to change the value of up to 6 parameters according to the current state defined by the "board" (see 2.2). The word board references the Circuit Boards used in the original Oberheim polyphonic synthesizers to give it 2, 4 or 8 separate multi-timbral voices. With this module, you can think of the Oberheim SEM V as an Oberheim 8-Voice synthesizer, where each voice can play a different sound, opening up an entire world of multi-timbrality.

#### 4.4.2.1 Activate/Deactivate Voice Programmer

You can activate or deactivate *Voice Programmer* function globally and individually. To activate or deactivate entire function of the voice programmer, click on the top left button (next to "Voice Programmer"): it will toggle the function on and off.

To activate or deactivate individual Voice Programmer settings, click on the buttons to the right of the parameter names.

#### 4.4.2.2 Polyphony

The polyphony of Oberheim SEM-V is, in theory, limited to 32 voices (depends on CPU power). However, in order to reproduce the multi-timbral function like a real Oberheim 4 voice or 8 voice, the SEM-V is equipped with eight sound modules (which are called "boards").

To set the number of multi-timbral 'boards' (when in poly mode), click on buttons 1 to 8 (visible on the bottom of the window) to turn the corresponding board on or off.

#### 4.4.2.3 The Barlines

The barlines of the window allow one to offset the desired parameter value from its original value defined on the main panel (using the normal GUI interface knobs). For each barline, the center position represents the same parameter value as the value defined on the main panel: there is no modulation of the parameter. Moving the barline upwards means giving the

parameter a positive offset whereas moving the barline downwards means giving the corresponding parameter a negative offset.

#### 4.4.2.4 Changeable destination and activation switch.

The Voice Programmer destination is changeable. Just right click on the columns on the left side: a drop down menu will appear showing you the parameters that can be assigned as destinations of the Voice Programmer.

#### 4.4.2.5 Allocation modes

The bottom left black box determines the mode of voice allocation; in essence, the direction. On FWD (forward), the board goes from left to right. It goes the other way on BWD (backward), and can also be played back and forth on FWD BWD (Forward and backward). Finally, it can make the boards play randomly with the RANDOM setting.

### 4.4.3 Modulation Matrix



Thanks to this feature, you can modulate many parameter values by several control sources such as Pitch bend, Modulation wheel, Velocity, Aftertouch, LFOs and Envelopes.

To operate the modulation matrix, just click on the 'Source' columns and select the control source. Then click on the destination column and select one of the destination parameters.

The Amount knob, in between the two 'source' and 'destination' menus, sets how much modulation is sent from the source to the destination. The center position is the zero value, meaning no modulation is sent. Turning this knob to the left means giving the destination parameter a negative amount of modulation; turning it to the right means a positive amount.

You can also make a "layered assignment", meaning you can select multiple sources (in the left column) to be the same modulation source, then assign them to different destinations. For example, with the modulation wheel, you can control the LFO depth and VCF cut off at the same time.

Conversely, you can control same destination with different sources, for example, control LFO depth by both the Modulation wheel and by Aftertouch.

## 4.5 EFFECTS

Oberheim SEM-V has 3 kinds of effects which are distortion (overdrive), chorus and delay.

### **4.5.1 Overdrive**

DRIVE: Adjusts the degree of distortion.

DAMPING: Reduces the high-frequency content of the output.

### **4.5.2 Chorus**

SHAPE : Selects the chorus modulation waveform. You can chose either sine wave or noise.

RATE : Modulation speed.

DEPTH : Modulation depth/amount.

FEEDBACK : Value of the modulation feedback.

SPREAD : Stereo width of the chorus effect.

DELAY : Delay time of modulated signal (wet signal).

TEMPO SYNC : When this button is highlighted, the modulation rate varies in proportion to the host sequencer's tempo.

### **4.5.3 Delay**

LINK : When this button is highlighted, left and right channel's delay times will be identical.

TIME : Delay time.

FEEDBACK : Delay feedback level.

PING PONG : When this button is highlighted, the delayed signal will be repeated with stereo panning.

DAMPING : Tone control of the delay signal. Moving this knob to the right will reduce high frequencies.

TEMPO SYNC : When this button is highlighted, the delay times are proportional to the host sequencer's tempo.



## 5 THE BASICS OF SUBTRACTIVE SYNTHESIS

Of all forms of sound synthesis, subtractive synthesis is one of the oldest and still certainly one of the most employed today. It is this method that was developed on analog synthesizers like the ones from Bob Moog, ARP, Yamaha, Buchla, Oberheim, Sequential Circuits (Prophet series), Roland, Korg and many others towards the end of the 70's. This concept of subtractive synthesis is still used on most current digital synthesizers, complementing sample reading or wave tables, which progressively replaced the analog oscillators of the first synthesizers in the 80's. Oberheim SEM, or even your own Oberheim SEM-V, is among the best illustrations of the enormous possibilities of subtractive synthesis.

### The three main elements

#### 5.1 OSCILLATOR, OR VCO

Oscillator (**Voltage Controlled Oscillator**) is the starting module (with the noise generator which is often classed among the oscillators) for the creation of a sound on an analog system.

It will generate the initial sound signal. We can think of the oscillator like a violin string that once stroked or plucked, vibrates to create its sound.



The oscillators

The main oscillator settings are:

- ▶ The **pitch**, determined by the oscillation frequency. You can set the frequency of the oscillator with controller knob.

---

*On the Oberheim SEM -V, pitch changes are made by semitone steps (Corse) when you move the knob. If moving with the control key pressed, the knob works as a "fine" tuning knob (changes the frequency in Cents).*

---

- ▶ The **waveforms**, which determine the harmonic richness of the audio signal. On the Oberheim SEM-V, the waveforms shown below are available:
  - Sawtooth
  - Pulse
  - Sub Oscillator (1 or 2 octaves lower than OSC1, selectable as a saw or square )



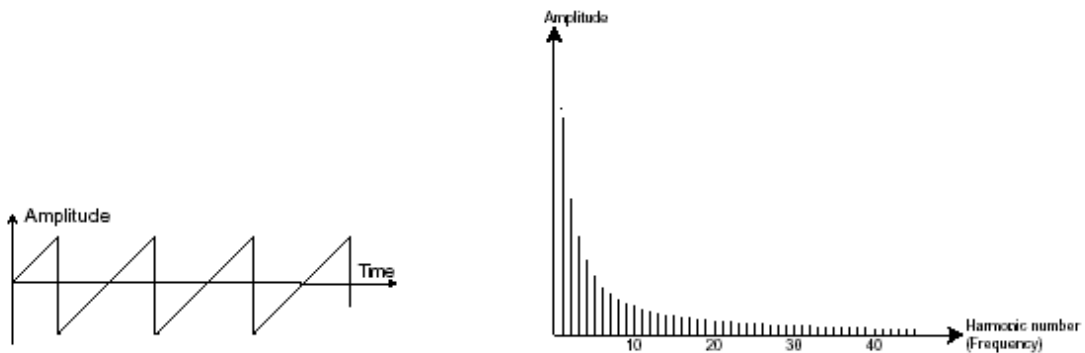
- Noise



**Oberheim SEM-V waveform selector**

### 5.1.1 Sawtooth

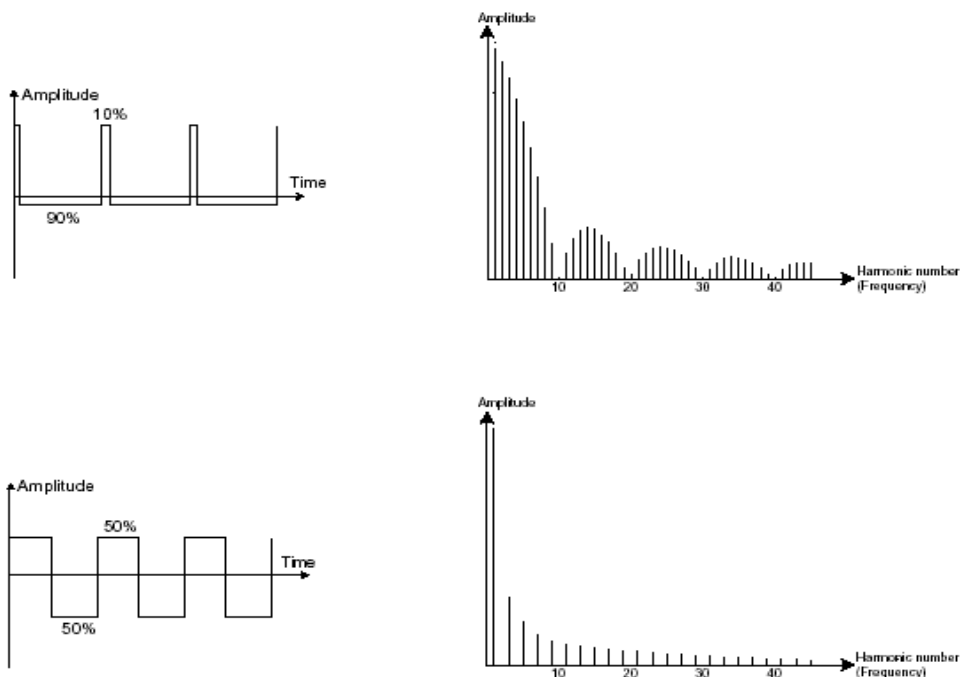
The **sawtooth wave** presents a rich audio signal (it contains all of the harmonics at decreasing volume levels in high frequencies). Its sound is ideal for brass, string, percussive bass, or rich accompaniment sounds.



**Time and spectral representations of the sawtooth waveform**

### 5.1.2 Pulse

**Pulse wave** possesses a more "hollow" sound than the sawtooth (it contains only odd harmonics). It is often used for woodwind sounds like clarinet or oboe (depending on the percentage of Pulse Width), and decaying sounds such as piano or guitar.



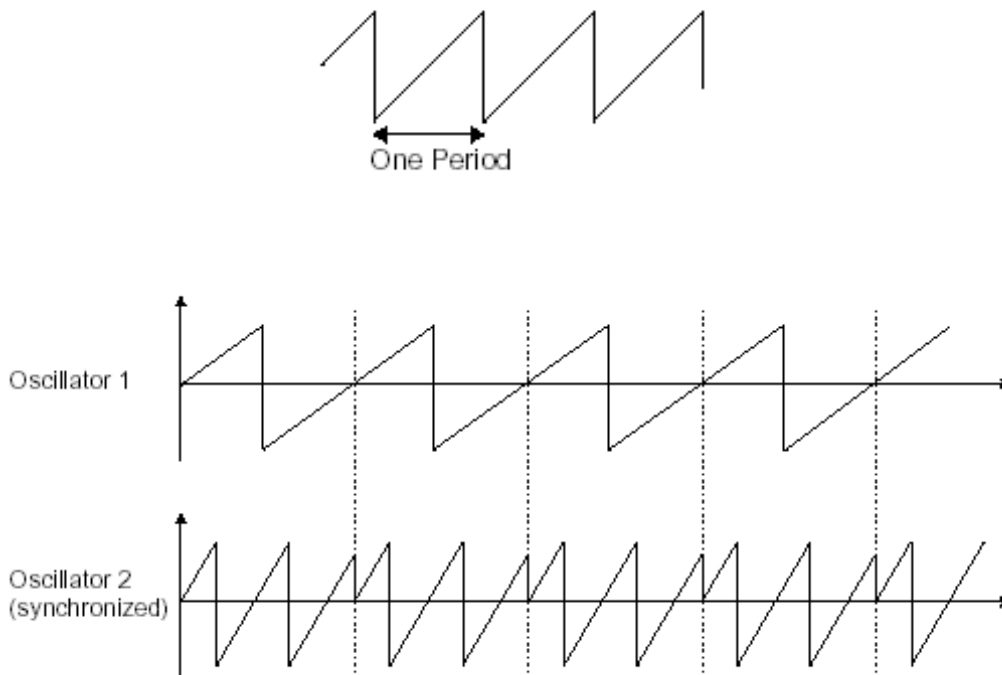
**Time and spectral representations of the pulse (top) and square (bottom) waveforms**

### 5.1.3 Pulse width Modulation

**PWM (Pulse Width Modulation)** is a setting that allows you to modify the percentage of the asymmetric diversity of pulse wave by using an LFO or the Envelope generator. This pulse width variation translates to a spectrum modification, resembling a waveform change.

### 5.1.4 Synchronization

The **synchronization** of an oscillator with another creates more complex waveforms. If for example, you synchronize oscillator2 with oscillator1, oscillator2 will restart a new period every time the first oscillator completes a period, even if oscillator2 has not completed a full period (this signifies that it is not tuned to the same tonality!) The more you tune oscillator2 upwards, the more you will encounter composite waveforms.



**In the above image, oscillator2 is synchronized with the first oscillator and tuned to double the tonality. The resulting waveform is unique in that it cannot be created by standard synthesis techniques such as layering or filtering.**

### 5.1.5 Sub Oscillator

The Sub Oscillator is not an independent oscillator module. Its pitch is derived by taking the pitch from Oscillator 1 and using a frequency divider to drop the pitch by either 1 or 2 octaves.

It is often used in single OSC synthesizers to make the sound richer and fatter, like an octave unison bass sound.

### 5.1.6 Noise

The noise signal spectrum has all frequencies at an equal volume level, often referred to as "white noise". For this reason, the noise is used to create special sound effects, like the imitation of the wind, jet planes, helicopters, steam locomotives and much more.

On pre-cabled (patched) synthesizers, the noise is either integrated into the oscillator (its audio output being placed to compliment the waveform outputs), or within the mixer directing

the signals towards the filter.

### 5.1.7 Filter or VCF

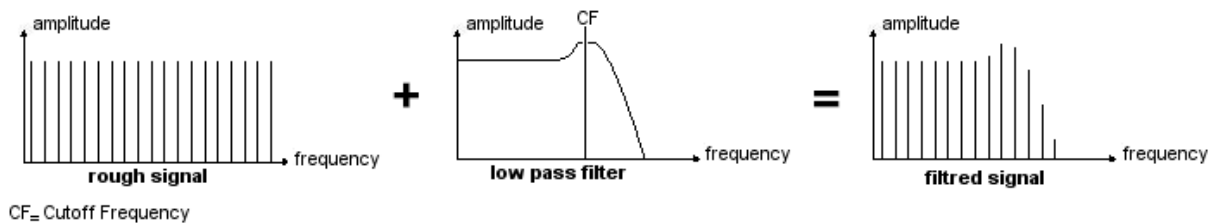


The audio signal generated by an oscillator (the waveform) is then usually directed to a filter module (**Voltage Controlled Filter**). It is this module that we use to control the sound by filtering (by subtraction, which explains the name given to this type of synthesis) the harmonics situated around a cut-off frequency. It can be seen as a sophisticated equalizer that reduces, depending on the case, the high or low frequencies of a sound.

#### 5.1.7.1 Cut-off frequency

The removal of undesirable frequencies at the cut-off frequency is not done suddenly but progressively, depending on the filtering slope. This filtering slope is expressed in decibels per octave (or dB/Oct). The filters used in classic analog synthesizers have 24 dB/Oct or 12 dB/Oct slopes.

Oberheim SEM-V offers one type of slope: 12 dB/Oct slope.

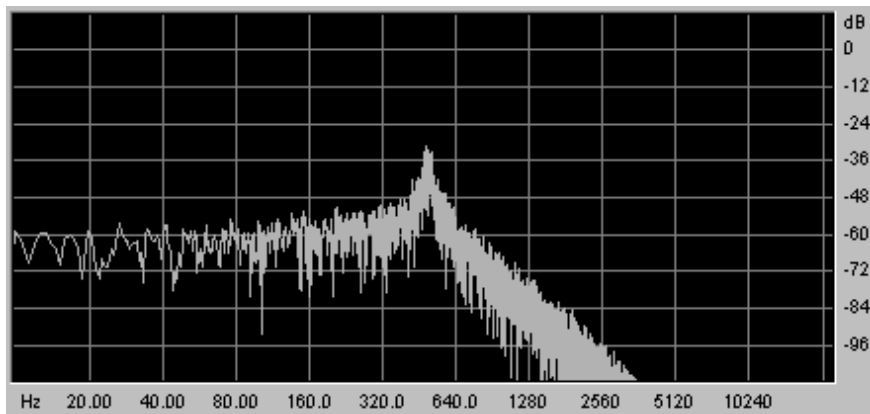


**Spectral representation of 12DB LP filtered signal (rough)**

With the Oberheim SEM-V, you have access to three types of filtering.

The Low-pass filter (LPF) progressively eliminates high frequencies above the assigned frequency limit (cut-off frequency) and allows the frequency of the sound below the cut-off to pass through. We will hear the sound becoming more “bright” as we augment the cut-off frequency, or more “muffled” as we lower the cut-off.

This is the type of filtering that you will find most often on synthesizers that use subtractive synthesis. It can be found on most of the recent analog and digital synthesizers.



**Spectrum of a noise signal processed with a low-pass filter**

The Notch Filter eliminates frequencies around the cut-off frequency and allows all other frequencies to pass through.

The High-pass filter progressively eliminates high frequencies below the cut-off frequency and allows the frequencies above the cut-off to pass through. We will hear the sound becoming more "thin" as the cut-off frequency is augmented, or more "thick" as the cut-off is reduced.

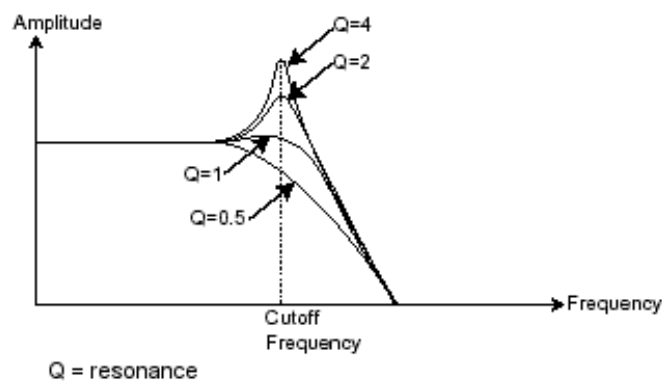
Band-pass filter eliminates the frequencies above and below the cut-off, and allows the band around the cut-off frequency to pass through.

#### 5.1.7.2 Resonance

A second setting to complement the cut-off frequency is the resonance. You will also find it called "Emphasis" or "Q" – for Quality of filtering on certain synths.

Resonance amplifies the band around the cut-off frequency. Depending on the type of filter, resonance reduces the frequencies above or below the cut-off frequency more or less drastically. However, resonance exceptionally works as the "band width" when used on the notch filter.

When you increase the resonance a lot, the filter range becomes narrower and the cut-off frequency is strongly amplified: the sound begins to ring.

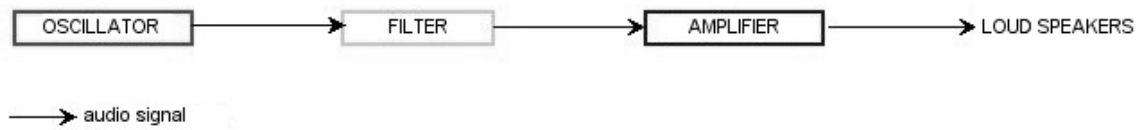


With a very high resonance level, the filter will begin to self-oscillate, creating sound which is close to a sine wave. At this stage, using a key follow on the filter frequency is very important, since it will allow you to play a melody with correct tuning.

#### 5.1.8 Amplifier or VCA

The Amplifier (**Voltage Controlled Amplifier**) receives the audio signal coming from the filter and adjusts the volume before it is sent to the speakers.

In conclusion, here is a diagram that should help you to understand the composition of a basic sound:



**Basic audio path in analog synthesis**

## 5.2 OTHER MODULES

### 5.2.1 The keyboard

If we stop here, the sound that you will obtain will be uniform, without life and without an end!! The oscillator delivers a sound signal (the audio output of a waveform) of a fixed pitch in a continuous manner. In the diagram above, the only way to stop this quickly unpleasant sound is to lower the filter cut-off frequency so that it becomes more and more damp until it finally disappears; or simpler yet, lower the volume of the amplifier!

- ▶ To start and stop the sound, at the pitch that we require, we use a keyboard that is connected both to the VCA through a gate and to the frequency of the oscillators. This will “play” the sound as soon as a key is pressed, and mute it when released. Of course, this connection is made through MIDI (it replaces the “gate” type of connections on analog synthesizers, which trigger the note when a key is pressed and stop it when released).
- ▶ The key position provides a control voltage that tells the oscillator what pitch level to play when the gate opens.

---

*If you don't have a MIDI keyboard, you can also play on the virtual keyboard of the Oberheim SEM-V to hear sounds while editing voices on your computer.*

---

### 5.2.2 The envelope generator

The envelope generator, connected to the amplifier, is used to “sculpt” the volume of the sound when we press a key on the keyboard. It ends (volume returns to zero) after the note is released.

The most common modules developed use 4 settings that we can vary:

**Attack** is the time that the sound will take to reach its maximum volume once we have pressed a key on the keyboard.

**Decay** (fall) is the time that the sound will take to diminish after the attack portion is complete.

**Sustain** (hold) is the maximum volume level that the sound will reach after the decay is complete. It stays at this level as long as the key is held.

**Release** is the time that the sound will take to fade to silence once the key has been released.

---

*The two envelopes of the Oberheim SEM-V contain only 3 parameters: **Attack**, **Decay** and **Sustain**. The release time is thus identical to the decay time of the envelope.*

---



**The Oberheim SEM-V ADS(R) envelope**

### 5.2.3 Low frequency oscillator

The LFO (*Low Frequency Oscillator*) possesses more or less the same characteristics of the classic oscillator but it only produces frequencies lower than 20 Hz. In other words, you won't hear the sound from this oscillator.

It will create a cyclic modulation of the parameter to which it is connected.

For example:

- ▶ If the sine waveform of an LFO modulates the volume of an amplifier, the sound will increase in volume then disappear in a varying manner following the speed (the frequency) of this LFO. This will produce a **tremolo** effect.
- ▶ A sine waveform on an LFO modulating the frequency of an oscillator would produce a **vibrato** effect.
- ▶ With an LFO sine wave modulating the cut-off frequency of a slightly resonant low-pass filter, you will obtain a "**wah-wah**" effect.

---

*Oberheim SEM doesn't have LFO modulation for the VCA, so the Oberheim Sem-V doesn't either.*

---



**The LFO modules of the Oberheim SEM-V**

## 6 ELEMENTS OF SOUND DESIGN

Here are some examples that will guide you to make your own original sounds with Oberheim SEM-V.

### 6.1 SIMPLE SYNTH BRASS

One of the typical Oberheim sounds is simple but powerful synth brass sound. Let's try to make it from scratch (Templates / Init Voice 1).

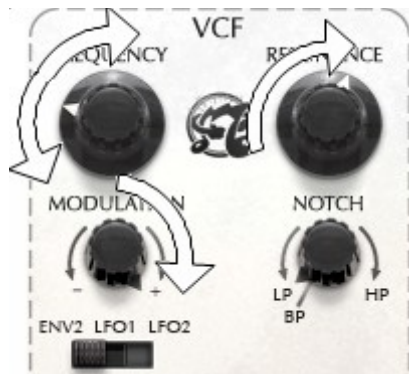


First of all turn VCO 2 knob to the left in the VCF section. Now both of the oscillators are sounding.



Secondly, in the VCO2 section (to the left of the VCF section), turn the VCO 2 FREQUENCY knob slightly to the right with control + click (or right-click with the mouse) in order to get a comfortably detuned sound.

Next, returning to the VCF section, set the modulation source to ENV 2 then make the amount of modulation maximum (positive, towards the right). Turn FREQUENCY knob to the left to get the effect of ENV 2's modulation: the frequency here sets the point where the modulation returns to. Because the modulation is set to positive, when a note is played the frequency of the filter will increase (depending on the ENV2 settings that we'll look at in the next paragraph), brightening momentarily the sound, then return to the frequency set here. Turn RESONANCE to the right to get sound to ring a bit more (enhance the filter frequency): the filter type should be set to LP (low pass filter)



Go to ENV2 and adjust ATTACK between 20 to 100ms (recommended to emulate the fast attack of brass instruments), then adjust DECAY to about 100ms.



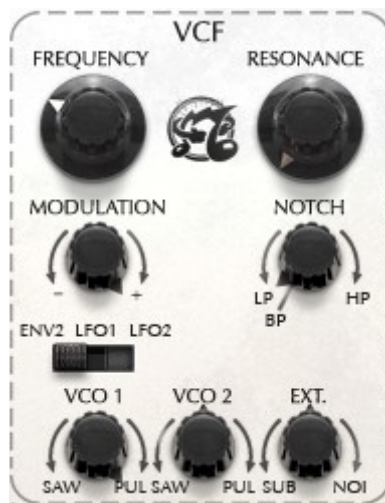
Now the basic Brass sound is completed.

## 6.2 CLAVINET-LIKE DECAYING SOUND WITH KEYBOARD FOLLOW

This is another typical Oberheim sound.

Stay on the Brass sound that you have just made in the previous section. In the VCF zone, adjust the VCO 1 knob to fully right and VCO 2 to center. This means using VCO 1 only with pulse wave: VCO 2's volume is set to zero.

Leave FREQUENCY and MODULATION as they are, then adjust RESONANCE value to what ever you want (between 0% and 50% is recommended).



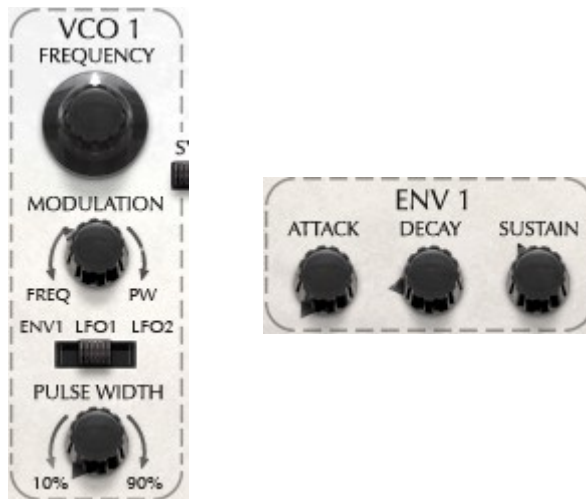
Go to ENV 2 and set the SUSTAIN knob to left-most setting (-60.00 dB) and adjust decay time to somewhere around 2000 ms: this gives our filter envelope no sustain but a very long decay and release time.





The next steps involve adjusting VCO 1 and ENV 1. In the VCO 1 section, turn the PULSE WIDTH knob to left-most setting in order to set the PW value to 10.00%, then go to ENV 1 and adjust the decay time to about 100ms and the sustain level to about -7 to -8dB.

This should give you a clavinet like sound with a long decay!



## 7 MODES OF OPERATION

### 7.1 STANDALONE

The Oberheim SEM V application can be used as an instrument independently from a sequencer software (Standalone mode).

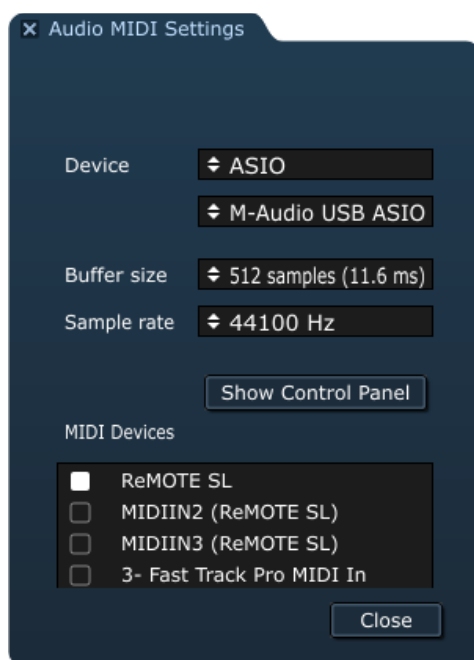
This allows you launch the application as a single instrument, and to play with an external MIDI keyboard.

#### Launching the application

To launch the Oberheim SEM V application on Windows, go to the menu Start > Program Files > Arturia > Oberheim SEM V and choose "Oberheim SEM V".

On Macintosh, open the Finder > Applications > Arturia and double-click on the Oberheim SEM V application icon.

#### Configuration of an instrument



Click on the "Settings (Windows, on the application menu bar)" or "Preferences... (Mac)". It will show the following "Audio MIDI Settings" dialog box.

In this options menu, you can :

- ▶ Set the audio output port
- ▶ Chose the audio interface
- ▶ Chose memory buffer size (smaller size will increase the load on the CPU)
- ▶ Choose sample rate between 44100Hz and 96000Hz
- ▶ Choose one or several active midi input port(s)

## 7.2 VST3™

VST3 is a new protocol of audio plugins. This has improved performance over previous versions of the VST protocol and has many new features as well.

With VST3 on Windows, users do not have to choose a folder path to install the plugin. The installer will put .vst3 files automatically into the appropriate directory on your hard drive.

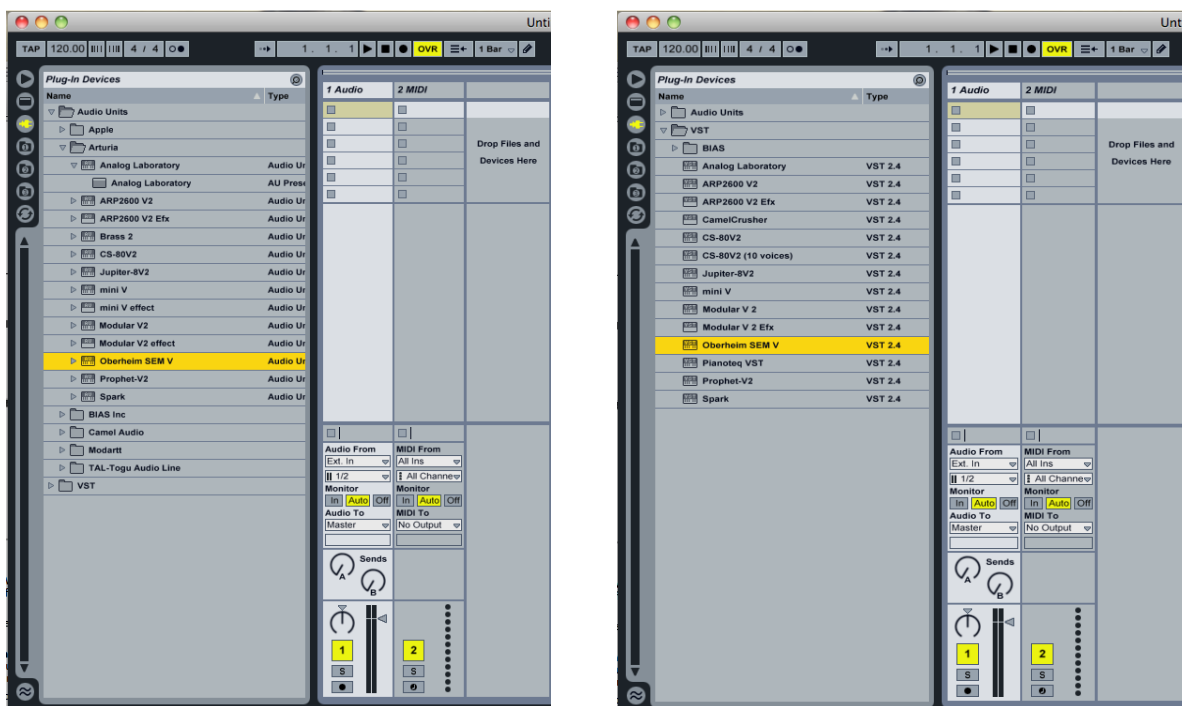
## 7.3 64-BIT COMPATIBILITY

The Oberheim SEM V is optimized for both 32-bit and 64-bit modes. If you have a 64-bit OS and a 64-bit DAW, you should use 64-bit version of the plug in (Windows).

Usually on 32-bit Windows, all (32-bit) programs are installed in "C:\Program Files". however on 64-bit Windows, you can find the 64-bit programs in "C:\Program Files\" and the 32-bit programs in "C:\Program Files (x86)"

Mac users don't have to bother with this, because the same plugin file contains both the 32-bit and the 64-bit versions, and the host automatically chooses the better one.

## 7.4 USING A VST AND AUDIO UNIT INSTRUMENT IN ABLETON LIVE



From the plug-ins tab, simply double click on the SEM V VST icon or drag-and-drop the plug-in into a MIDI track.

### **Using Audio Unit and VST Instruments in Live**

If necessary, you can perform a rescan of the plug-in directory in the Preferences, "File Folder" tab: press the "Scan" button or press "Scan" while holding "Alt" for a full rescan.

## 7.5 RTAS – PRO TOOLS

### Utilization of the plug-in

- ▶ Opening of the plug-in

Access to the Oberheim SEM V plug-in is like all other plug-ins in ProTools, via an audio track insert:



### Opening the Oberheim SEM V in Pro Tools

The Oberheim SEM V must be loaded on an audio stereo track. We can now make the Oberheim SEM V sound by playing with the mouse on the virtual keyboard.

- ▶ Connection to a MIDI channel

To enable the Oberheim SEM V to play the information coming from a MIDI track, you have to associate it to a MIDI channel via the appropriate menu. (See the Pro Tools menu for more information on plug-in connection).

- ▶ Saving the presets

When the session is saved, the status of the Oberheim SEM V is saved as it is, even if its programming does not correspond to the preset. For example, if you are working on a preset "P1" in which you have modified the parameters (without saving them in the plugin itself), the next time you open the session, the Oberheim SEM V will load the "P1" preset plus the

modifications you made to it. The “Librarian Menu” of Pro Tools can be used with the Oberheim SEM V like with all other plug-ins. Nevertheless it is highly recommended to use the internal Oberheim SEM V menu: with the presets saved like this, they are usable no matter which mode is chosen (standalone or other sequencer), and they can be exported, exchanged more easily, and will stay compatible with future versions of the Oberheim SEM V.

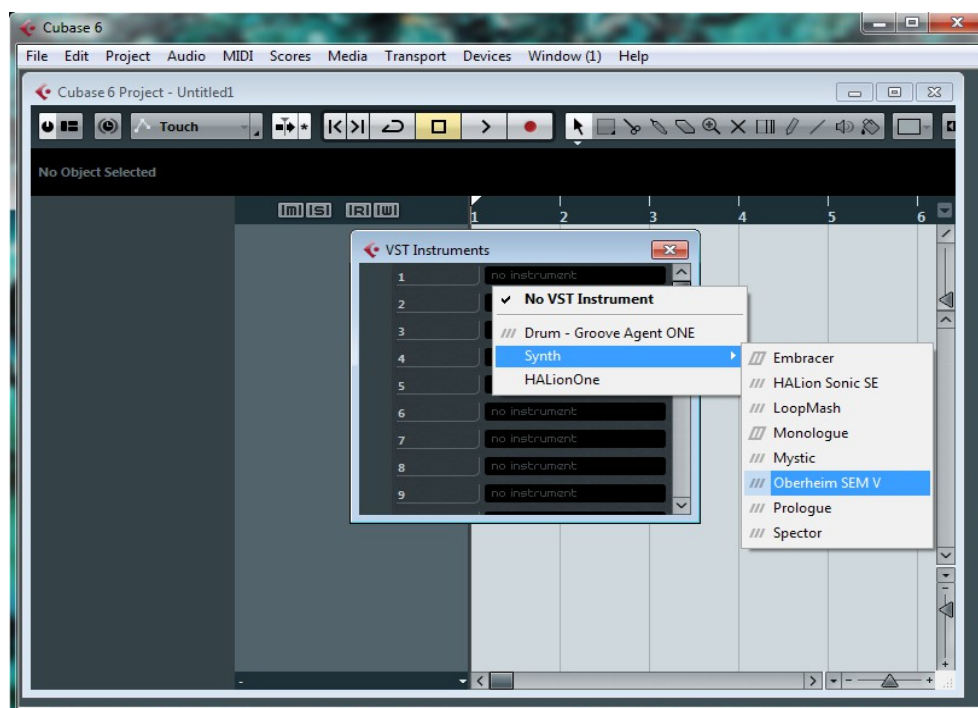
- ▶ Automation under Pro Tools

The automation function with Oberheim SEM V functions like with all RTAS/HTDM plug-ins (check the Pro Tools documentation for more details on plug-in automations).

## 7.6 CUBASE VST

- ▶ Instrument use in VST mode

The opening of an Oberheim SEM V VST plug-in is the same as opening all other VST plug-ins. Please consult the instruction manual of your host sequencer for more specific information. Under Cubase, open the menu / VST Instruments, and choose Oberheim SEM V in the rack.



**Using Oberheim SEM V as VST instrument in Cubase**

- ▶ Rescan the plug-in directory in Cubase

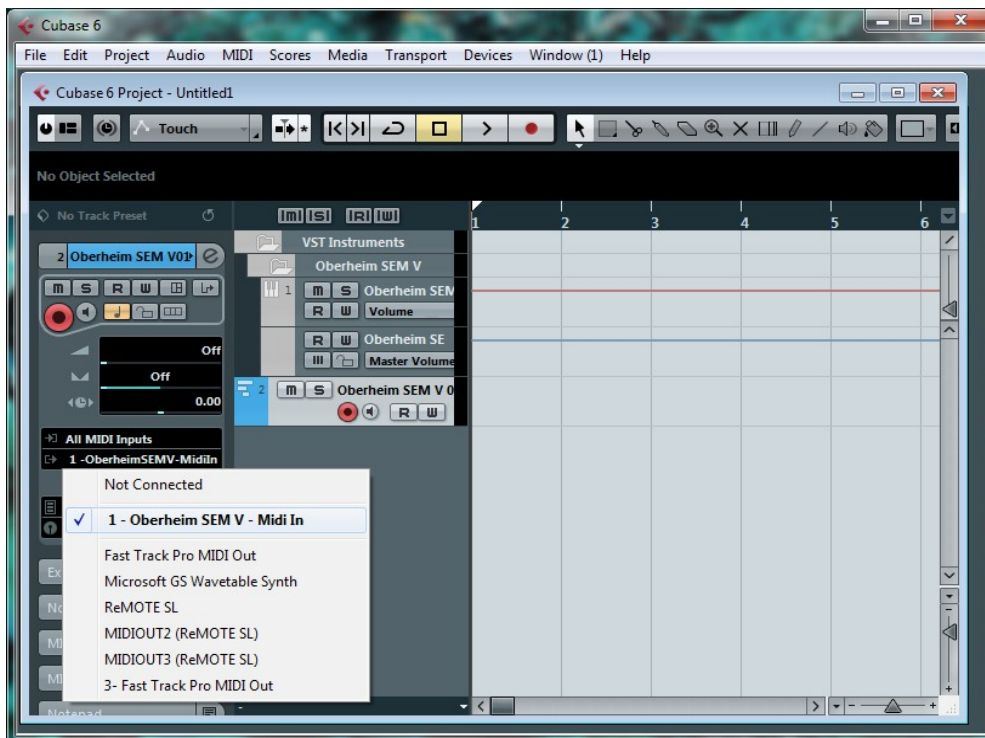
If the Oberheim SEM V does not appear in the list of VST plug-ins, you can perform a “rescan” of the plug-in directory.

- ▶ Connection to a MIDI track

In order for the Oberheim SEM V to play information coming from a MIDI track, you have to choose a MIDI track and select Oberheim SEM V as the MIDI output of this track. See the picture below for more details on how this is accomplished.

Cubase asks you directly if you wish to create a MIDI track for the newly inserted VST. The events played on a MIDI keyboard are recorded by your host sequencer, and now you can use

the MIDI editing possibilities of the sequencer to control any parameter with the Oberheim SEM V.



► Saving of presets

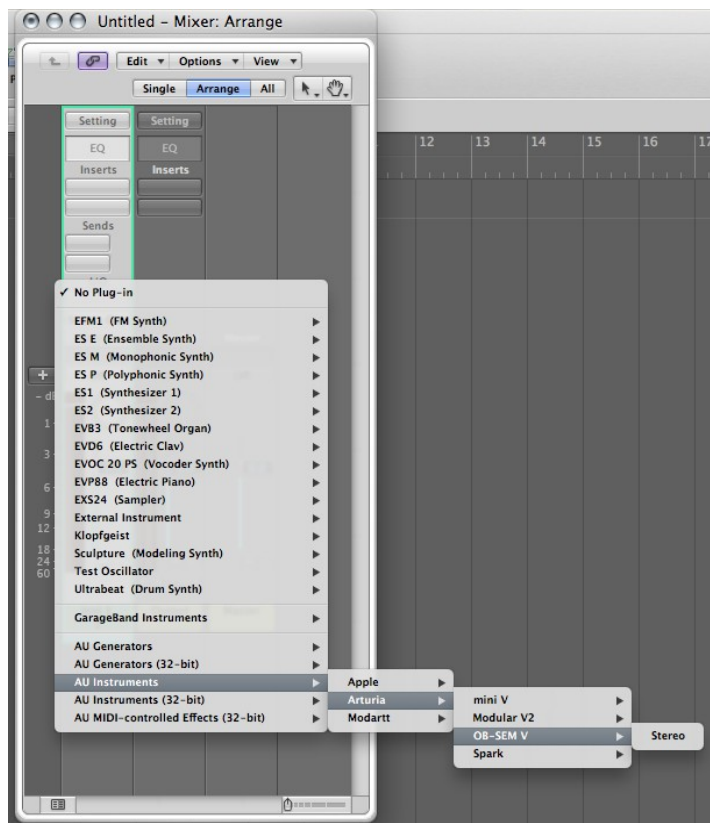
When the session/project is saved, the Oberheim SEM V is saved in its last mode of operation, with all modifications intact. For instance, if you were working on a "P1" preset in which you had modified parameters (without saving them as a separate preset within the plug-in itself), the next time you open the project, the Oberheim SEM V will load the "P1" preset plus the modifications you made previously.

The drop-down menu in which the VST sequencer allows you to save a new preset is of course usable with the Oberheim SEM V. However, it is highly advised to use the Oberheim SEM V internal menu: the presets saved in this way are usable in any other mode (standalone or with other sequencers), they can be exported and exchanged more easily, and they will remain compatible with the future Oberheim SEM V versions.

## 7.7 LOGIC & AUDIO UNITS (MAC OS X ONLY)

- ▶ Use in Logic Audio

Select an Instrument track. On the channel of the mixer corresponding to the selected track, click on the button "I/O" to obtain the list of plug-ins, then select "Stereo > AU Instruments > Arturia Oberheim SEM V".



**Oberheim SEM V opening in Logic**

Since version 7, there has been an Audio Unit plug-in manager in Logic. To launch it, click on the menu "Preferences > Start Logic AU Manager".

This Manager allows us to see the list of available plug-ins, to test their compatibility with Logic, and to activate or de-activate them.

If it happens that one of the Arturia plug-ins poses a problem in Logic, start by checking that this plug-in has passed the compatibility test, and that it is actually selected for use.

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