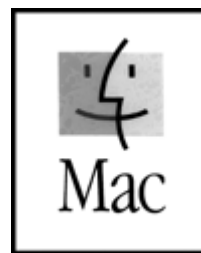


# USER'S MANUAL

# CS-80V

version 1.0



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# 1 INTRODUCTION

## 1.1 THE BIRTH OF THE YAMAHA CS-80

Yamaha was created at the end of the 19<sup>th</sup> century, in Hamamatsu, Japan.

The first electronic instrument, the Electone D-1 electronic organ, was designed and built in 1959. But the history of the CS-80 began when, in 1974, the GX-1 was released.



*The GX-1*

The GX-1 was an analog polyphonic synthesizer that was built in order to test the market. It cost \$60,000 and was premiered in the US in 1973 at the NAMM convention. Keith Emerson, John Paul Jones of Led Zeppelin, Jurgen Fritz of Triumvirat and Stevie Wonder all bought one. Stevie Wonder called it «the Dream Machine».

One of the strong features of the GX-1 is the superposition of the two full-sized velocity-sensitive keyboards. The CS-80V, with the Multi mode, allows the creation of the same type of sounds that the GX-1 offered.

In 1976, Yamaha introduced the CS-80, which has the same circuits as the GX-1. The price tag (\$6,900) put it out of the reach of most musicians, and the weight (83kgs with stand) made it sometimes hard to use on stage.

But the qualities of this synthesizer, considered Japan's first great synthesizer, made it immediately famous in the Music Industry.



#### *The CS-80*

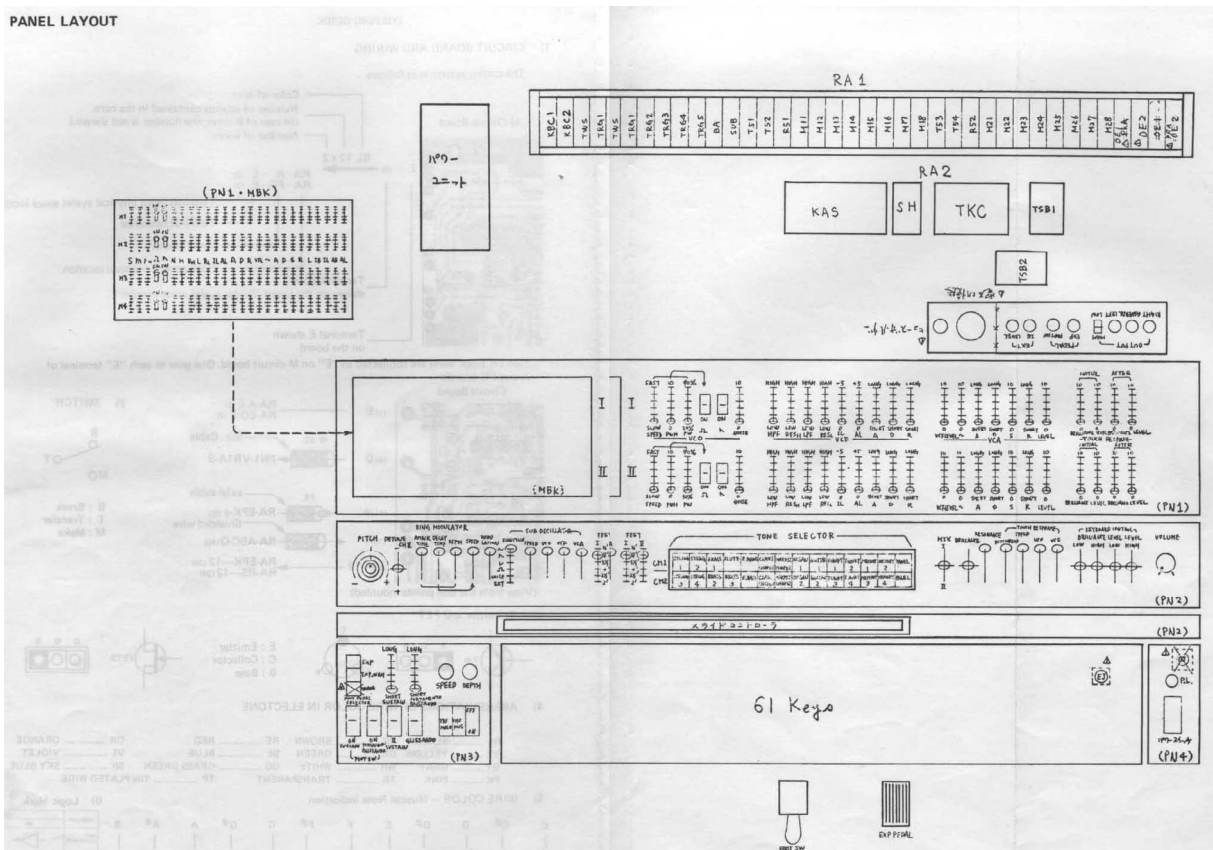
The CS-80 was made popular in the late 70's and early 80's by a number of pop groups, including Electric Light Orchestra, Toto, Paul McCartney and Wings. Other artists and bands like Vangelis, Bon Jovi, Jean-Michel Jarre, Geoffrey Down, Stevie Wonder and some others managed to turn the CS-80 into a real myth.

Let us quote Matt Friedmann from *the Vintage Synth Explorer* website: «No synth sounds greater. The best examples for its extremely fat sound are 'Blade Runner', 'Mask', or 'Bounty' by Vangelis as well as 'Dune' by Toto. (...)

*With two analog oscillators per voice, the CS-80 has the potential for some really phat sounds! A great VCF filter with independent hi pass and low pass resonant filters, a powerful ring modulator and plenty of modulation controls further enhance the CS-80's sonic potential. There are 22 preset sounds (6 user) selected from bright and ugly colored buttons above the keyboard. The keyboard is weighted and has a full 61 keys with performance controllers for vibrato, pitch, brightness and volume. Surprisingly there's also a ribbon controller for the pitch-bending. There is no MIDI or cv/gate.»*

The first edition of the service manual has a lot of hand-drawn pages, including the main panel layout.





The CS-80 Service Manual

In conclusion, let's also quote another huge reference in the field: Peter Forrest (in *the A-Z of Analogue Synthesizers*, Susurreal, First published 31/10/96): «When it comes to trying to decide which of the top-flight synths is the best ever, it's not easy. From almost any practical viewpoint, and in terms of versatility of sound, there are a lot of instruments which wipe the floor with the CS-80. But if you are looking at richness of sound coupled with performance power, and sheer overkill, maybe nothing can touch it».

The CS-80V provides all the features of the original CS-80. But it offers also a unique Multi mode and a modulation matrix to create entirely new sounds. It also comes with a wide selection of presets.  
We hope you will enjoy it as much as musicians enjoyed playing the original.

## **1.2 WHY A VIRTUAL CS-80?**

Only 3,000 CS-80 synthesizers were manufactured. Weighing in at more than 80 kg, it takes at least two people to move it. And even though few have had the occasion to own one, it remains a favorite among musicians and amateurs alike. Some famous artists have gone as far as buying several, to have a permanent stock of spare parts.

Why such a success? With two independent lines of synthesis, the CS-80 offers an original structure, at the same time simple and rich. The ergonomics of the machine offered an approach that inspired musicians: moving a potentiometer, modifying a wheel can be enough to radically transform a sound.

But this synthesizer, reproduced identically, despite its particular structure would bring little innovation to today's musical landscape.

Arturia has thus brought new life to the myth, remaining faithful to the sound and the functionality, but also taking it several steps further. As you will see, these new additions bring a new lease of life to the CS-80V.

The possibility to affect a different sound to each of the polyphonic voices, an independent keyboard management, positioning in stereo space and particular tuning allow the amplification of the unique presence and the sonorities of this polyphonic synthesizer. New combinations have emerged, and the Multi mode will open enormous perspectives for those who take the time to discover its characteristics.

To this we have added a modulation matrix, which widens the possibilities of creative combinations.

A new version which respects the past while bringing the possibilities of the present and future, this was our vision for this CS-80V.

### 1.3 **A BETTER EMULATION THANKS TO TAE®**

TAE® - True Analog Emulation - is a new technology dedicated to the digital reproduction of analog circuits used in vintage synthesizers.

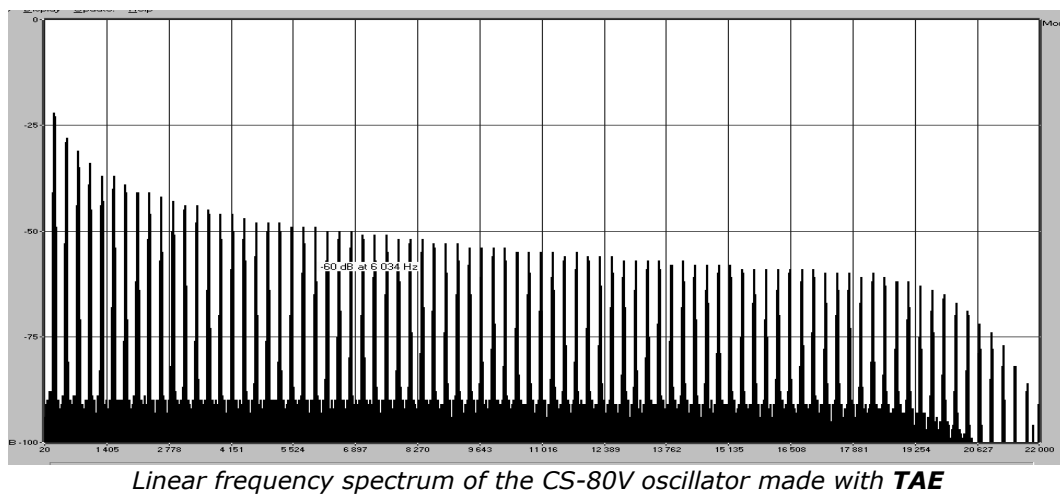
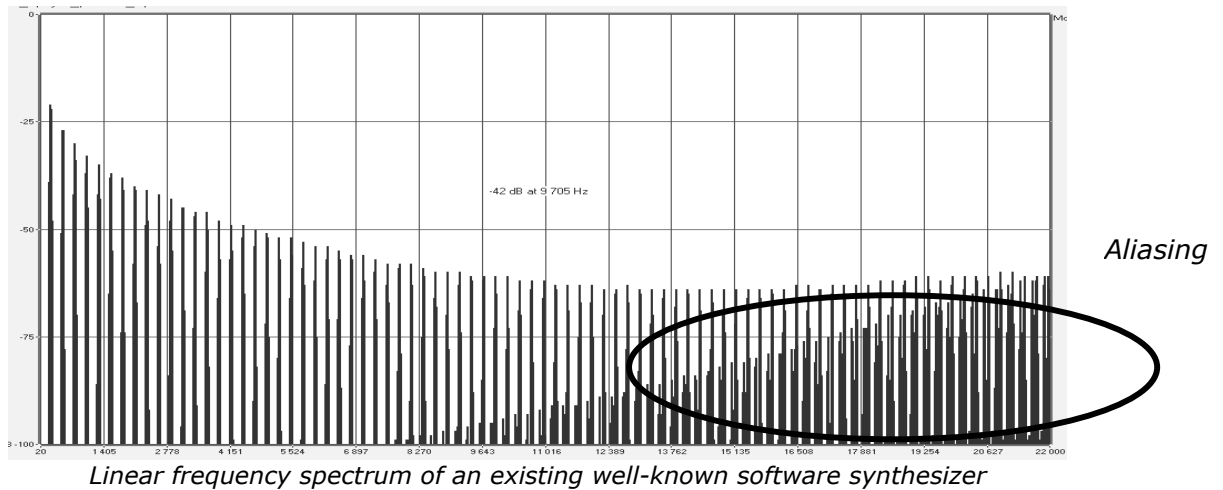
When implemented in software code, TAE's algorithms guarantee the respect of hardware specifications. This is why your CS-80V offers an unparalleled quality of sound.

In detail, TAE® regroups four major advances in the domain of synthesis:

#### 1.3.1 **Aliasing-free oscillators**

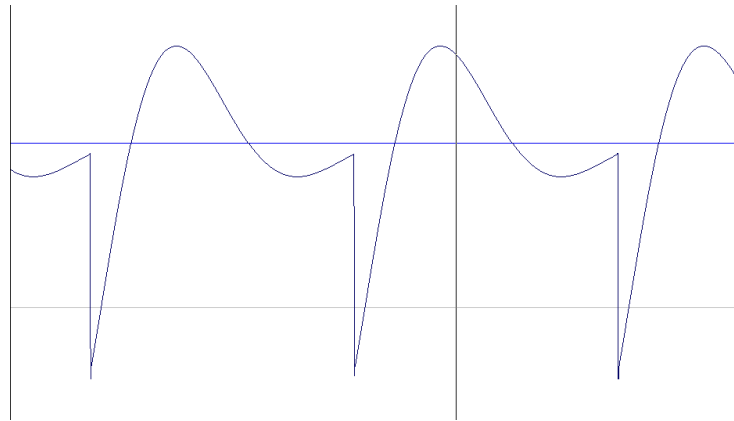
Standard digital synthesizers produce aliasing in high frequencies, and also when using Pulse Width Modulation or FM.

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



### 1.3.2 A better reproduction of analog oscillator waveforms

The waveforms produced by the oscillators in analog synthesizers are marked by the presence of a condenser in the circuits. The discharge of the condenser results in a light bend in the original waveform (notably for saw tooth, triangular and square waveforms). TAE allows the reproduction of this condenser discharge. Underneath is the analysis of a waveform from the original CS-80 original, and that of the CS-80V. They are both equally deformed by the CS-80 low-pass and high-pass filtering.



*Temporal representation of a «saw tooth» waveform (deformed by high-pass and low-pass filtering) of the CS-80V*



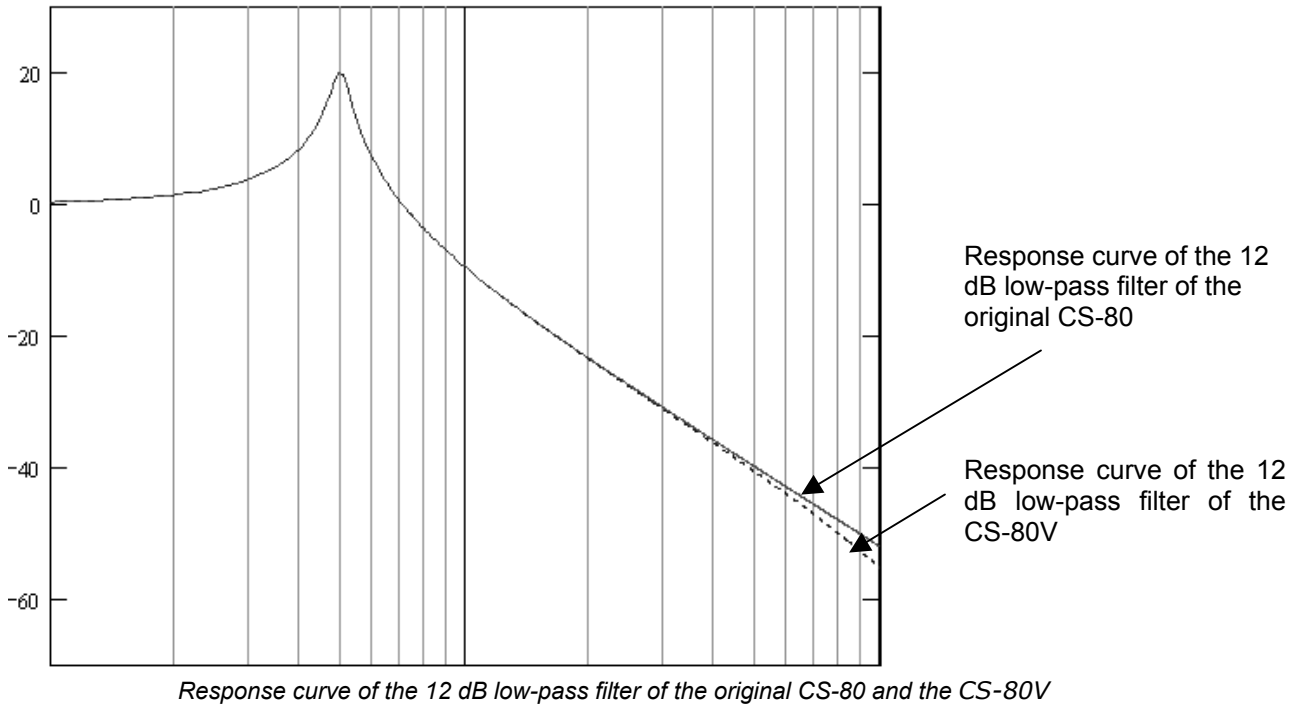
*Temporal representation of a «saw tooth» waveform (deformed by high-pass and low-pass filtering) reproduced by **TAE***

What's more, the original analog oscillators were unstable. In fact, their waveform lightly varied from one period to another. If we add to this the fact that the starting point for each period (in Trigger mode) can vary with the temperature and other environmental conditions, we find one of the characteristics that participated in the typical sound of vintage synthesizers.

TAE reproduces the instability of oscillators, bringing a fatter and «bigger» sound.

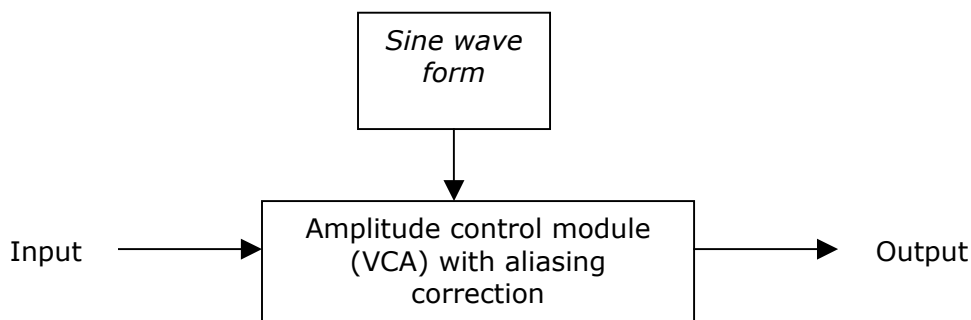
### 1.3.3 A better reproduction of analog filters

TAE allows the more precise emulation of analog filters over standard digital filters. To obtain this result, the TAE technology is based on the analysis of the analog circuits to be reproduced, and converts them in algorithms that faithfully mimic the characteristics of the original filters. The curve underneath shows the comparison of the original CS-80 filter and that of the CS-80V.



### 1.3.4 Ring modulator

The CS-80V includes a ring modulator, just like the original CS-80. The ring modulator allows the application of a waveform (a sinusoid) to another, in order to transform it. The result is a more brilliant sound, distorted, and enriched in harmonics. As a result of this increase in the number of harmonics, standard ring modulation algorithms create an audible aliasing. To avoid this unwanted effect, TAE includes a module for the dynamic control of the amplitude with aliasing correction, which removes every trace of aliasing in the signal coming from the ring modulator.



## 2 INSTALLATION

### 2.1 WINDOWS INSTALLATION (WIN9X, ME, 2000, XP)

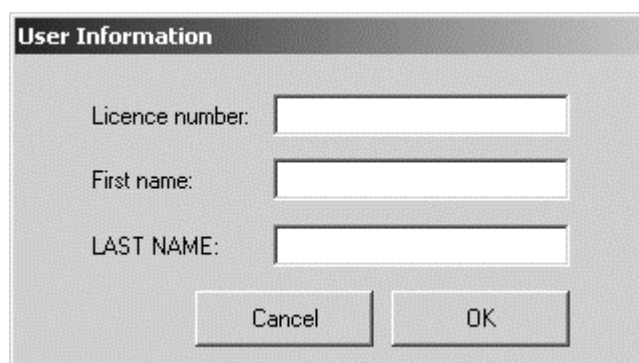
Insert the CD-ROM into the drive. Explore the contents of the CD-ROM, double click on the icon named «CS-80V Setup PC.exe»

At the first step of the installation, choose the destination folder for the CS-80V installation. By default, it will be installed at the location C:\Program Files\Arturia\CS-80V. You can change the destination with the Browse button.



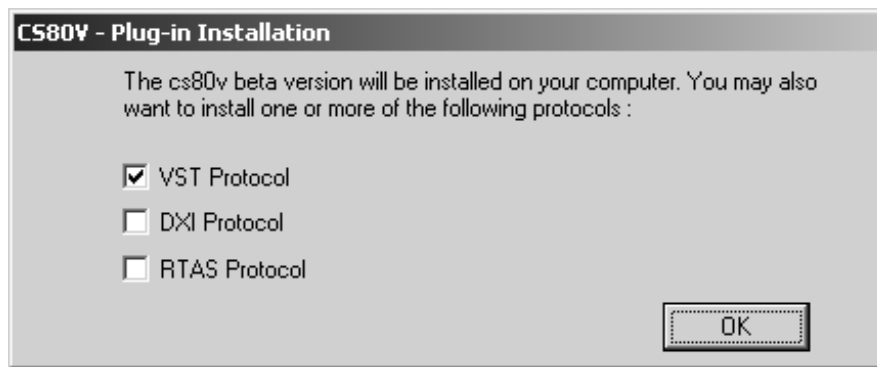
*Choose the installation folder*

Next, have your license number ready and enter it with your first and last names in the user information window.



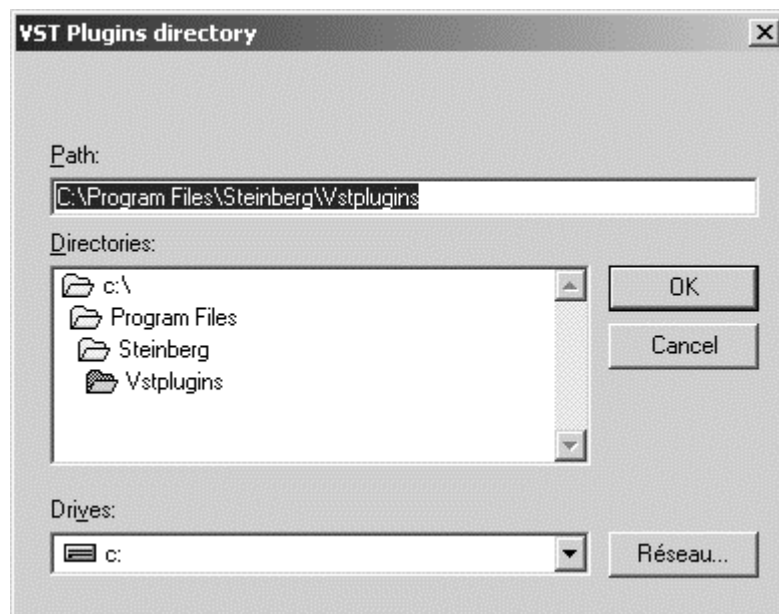
*User information window*

The CS-80V will next be installed as a standalone application. The following stage will let you choose to install the CS-80V as a plug-in. To do this, choose the protocol(s) that you wish to use (VST, RTAS or DXi). For more information on these protocols, go to chapter 8.



*Choice of protocols*

For the VST and RTAS protocols, you must choose an installation folder in order for the host application to use the CS-80V as a plug-in. If you do not know how to make this choice, go to chapter 8.



*Choice of VST plug-in installation folder*

The installation program now has enough information to complete the installation. In a few seconds, you will be able to use the CS-80V.

## 2.2 MAC OS X INSTALLATION

Insert the CD-ROM into the drive. Explore the contents of the CD-ROM, double click on the icon named «CS-80V Setup Mac».

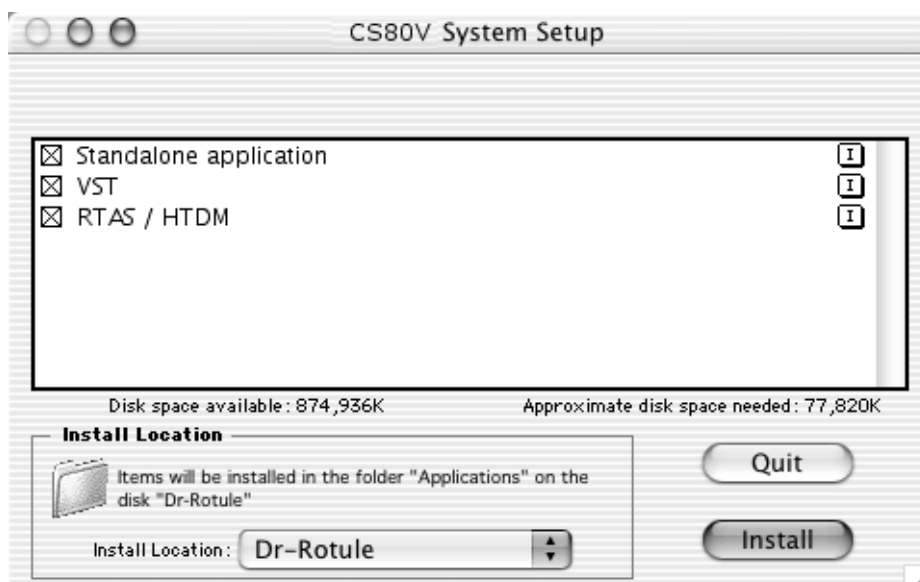
Enter the administrator name and password of your computer in the authentication window.



*Authentication window*

The CS-80V will next be installed as a stand-alone program. The following step will let you choose to install the CS-80V as a plug-in. Then, choose the protocol that you wish to use (VST, RTAS/HTDM). For more information on these protocols, go to chapter 8.

By default the CS-80V will be installed in the Applications folder. But you can choose the disk and installation folder for the CS-80V.



*Choice of protocols, disk and installation folder*

Next, have your license number ready and enter it with your first and family names in the user information window.



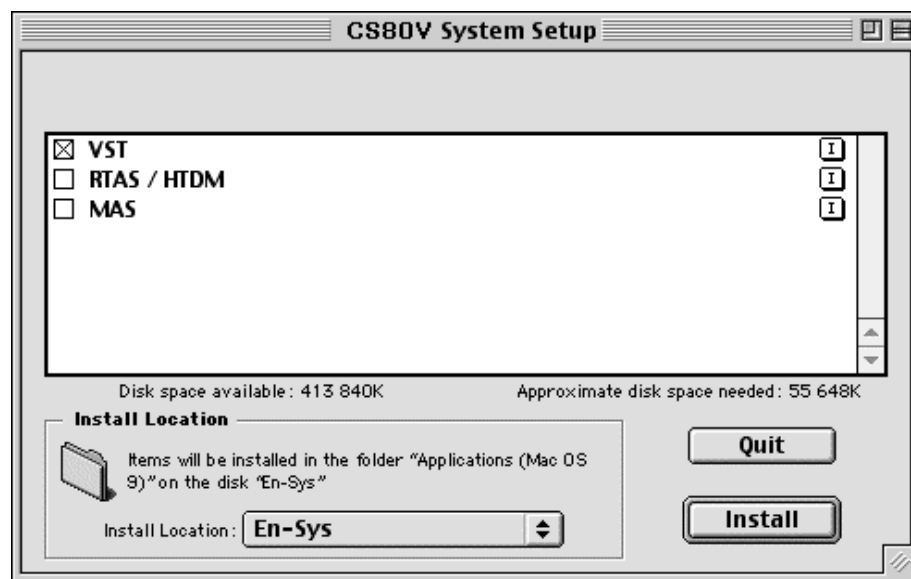
The installation program now has enough information to complete the installation. In a few seconds, you will be able to use the CS-80V.

## 2.3 MAC OS 9 INSTALLATION

Insert the CD-ROM into the drive. Explore the contents of the CD-ROM, double click on the icon named «CS-80V Setup Mac».

The following stage will let you choose to install the CS-80V as a plug-in. To do this, choose the protocol(s) that you wish to use (VST, RTAS/HTDM, and MAS). For more information on these protocols, go to chapter 8.

By default the CS-80V will be installed in the Applications folder. But you can choose the disk and installation folder for the CS-80V.



*Choice of protocols, disk and installation folder*

Next, have your license number ready and enter it with your first and family names in the user information window.

*User information window*

The installation program can automatically detect folders containing VST plug-ins on your computer.



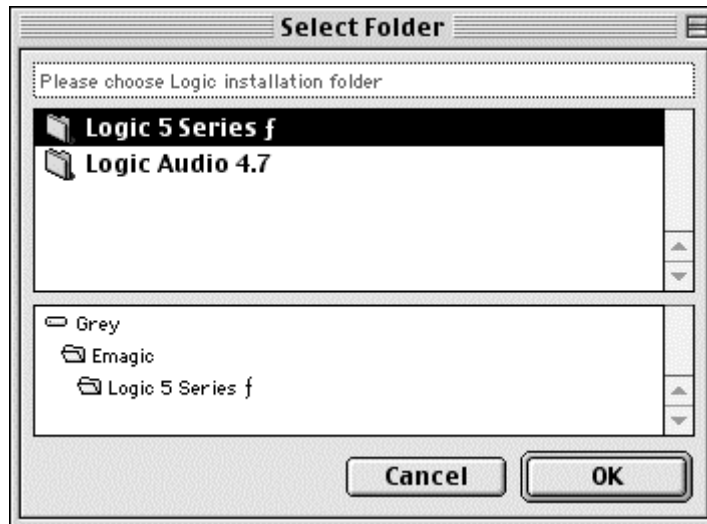
*Auto detection of VST folders*

Choose the applications for which you wish to install the CS-80V as a VST plug-in.



*Choice of VST applications*

For each of the selected applications, if several versions are present on your computer, select the version for which you want to install the CS-80V as a VST plug-in.



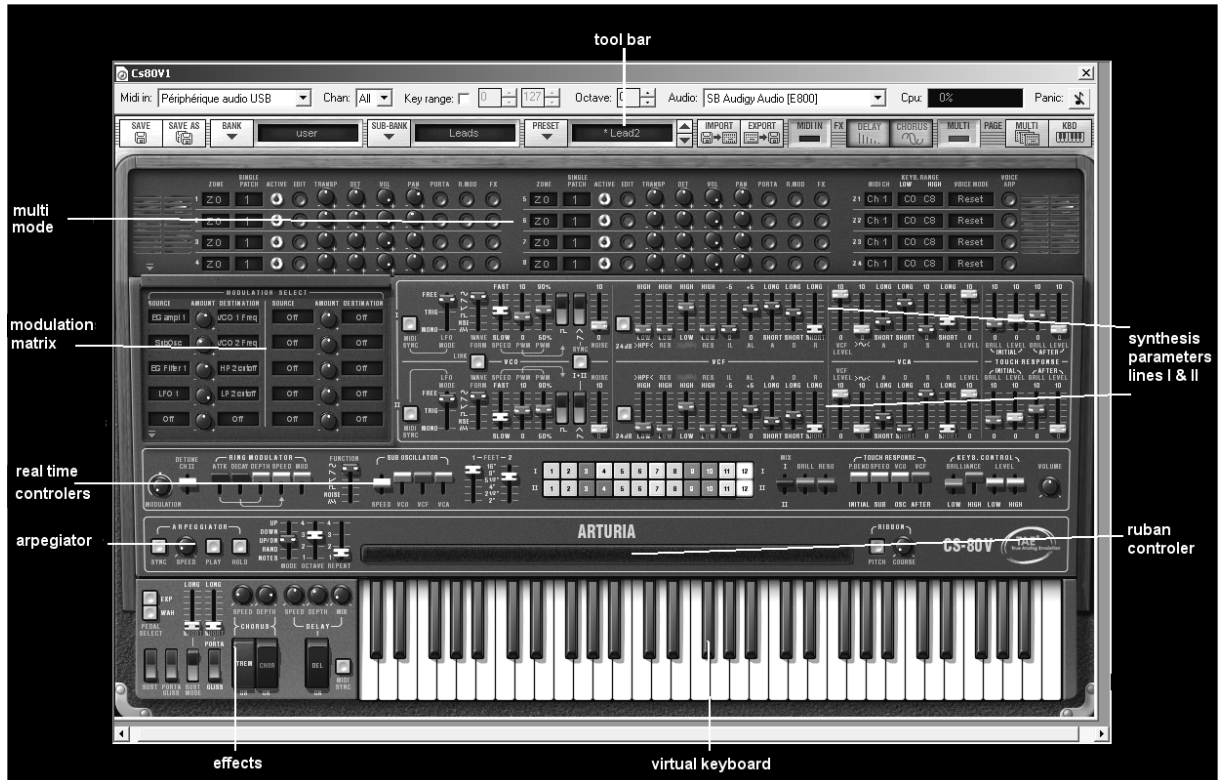
*Choice of the version of Logic Audio*

The installation program now has enough information to complete the installation. In a few seconds, you will be able to use the CS-80V.

## 3 QUICK START

This chapter will help you to familiarize yourself with the general usage of the CS-80V. You will be presented with an overview of the different sections of the synthesizer as well as the Single voice and Multi mode settings. You will find a precise and detailed description of all settings and controllers in the chapters that follow.

Chapter 6, *A few elements of sound design* will be of particular interest for users who have never worked with a subtractive synthesizer, but wish to understand the basics in this domain.



The CS-80V

### 3.1 USE OF PRESETS

Use of presets is one of the main areas of evolution of the CS-80V when compared to the original. In fact, it allowed only 4 spaces in memory for saving 4 sounds!

In the CS-80V, a preset (memorized sound) contains all parameter settings of the synthesis voice (Single), as well as Multi mode parameters and the different real time controllers and effects needed to reproduce the sound.

To get to know a few of the different sounds contained in the CS-80V, we will select the preset «Brass1».

- For this, click on the button «BANK» (at the left of the display indicating the name of the bank currently in use). By clicking, you will see a dropdown menu indicating the available banks. Choose the bank «JMB».

When the menu appears, it opens sub menus in a step-by-step manner. This allows us to get to the «SUB BANK» and «PRESETS» of a sound designer with a single click.

- ▶ Choose the «SUB BANK» called «Brass» and finally select «Brass1» among the «PRESETS».



*Select the preset brass1*

The CS-80V is shipped with 400 presets, which will allow you to get to know the sounds of the synthesizer. A bank called «User / Temp» proposes a selection of presets which allow you to work from a basic template when programming a sound.

(The sound «1 voice», for example, is presented with a single active synthesis line: an oscillator is directed to the low-pass filter, the signal is then routed towards the VCA.)

---

*It is also possible to visualize the totality of presets corresponding to a type of sub-bank by choosing the option «All» in the bank. For example, to see all bass presets, click on «All» in the bank selections and then on «Bass».*

---

### 3.1.1 Modifying this preset

For this, we'll begin with a simple manipulation.

- ▶ Modify the brilliance of the «Brass 1» sound with the «Brilliance» controller on the synthesizer. For this, increase or decrease the green linear «brill» knob on the control panel (above the virtual keyboard). The tone of the sound will become more or less «brilliant». Set this knob to your convenience.
- ▶ In the same manner, you can change the range of the oscillator by decreasing the linear «Feet I» knob to one of the 6 values expressed in «Feet» (like organs). The lower the number, the higher the pitch. (The standard tuning can be found at the value 8')



*Change the brilliance of the sound*

With these first settings, you have already modified the preset «1 voice». You can now save the sound that you have just created.

- ▶ To save a user preset («user»), click on the save icon in the tool bar: The settings of the current sound will be saved in the preset being used without changing its name.

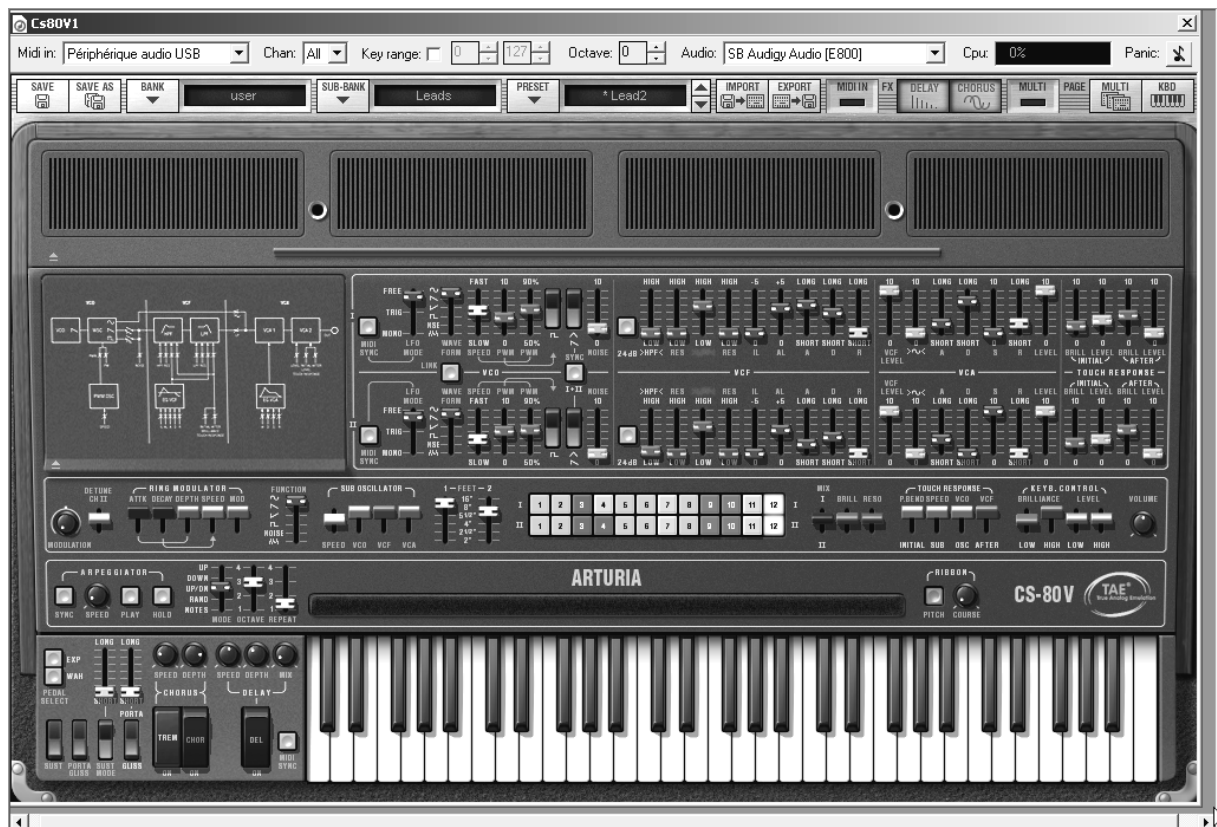
If the current preset is a «factory» preset, the factory preset will not be replaced.

- ▶ To choose another destination for the sound, click on the «Save as» icon and then choose the destination. For example, select «new» in the choice of banks. 2 new bank and sub bank locations as well as a new preset are immediately created. The names «new bank», «new sub bank» and «new preset» appear in their respective displays.
- ▶ Click on each of these displays to customize the name for each of these 3 parts, bank, sub-bank, and preset.

### 3.2 METHODS OF PLAYING

The CS-80V offers 2 playing modes:

- ▶ The «Single» mode allows you to play a single sound (here we will call it timbre) redistributed across the keyboard.
- ▶ The «Multi» mode allows you to play a group of single timbres distributed across 4 zones on the keyboard («split») or several single timbres superimposed across the keyboard («unison»).



*The single mode (the original CS-80)*



*The Multi mode*

The single mode presents the exact architecture of the original CS-80, which is a single timbre, distributed across the whole of the keyboard with an 8 note polyphonic limit.

The Multi mode takes from the GX1, the «father» of the CS-80, which used 3 keyboards (2 polyphonic and 1 mono) and a separate pedal keyboard to play different sonorities distributed to each of the keyboards.

- ▶ To get to the «Multi» mode, click on the button to open the hatch situated above the synthesis parameters. A virtual LED display on the right of the tool bar now indicates «Multi» mode is active.
- ▶ To go back to «Single» mode, simply click on the close hatch button. The LCD display now indicates «Single».



*Opening the Multi mode hatch*

- ▶ You also have the option to keep the keyboard and its assignable controllers visible on the screen by clicking on the «KBD» icon. The advantage being quick access to real time controllers and sound presets while having a reduced work surface. You can activate the reduced mode by clicking on the «Kbd» icon, which is on the right of the tool bar.



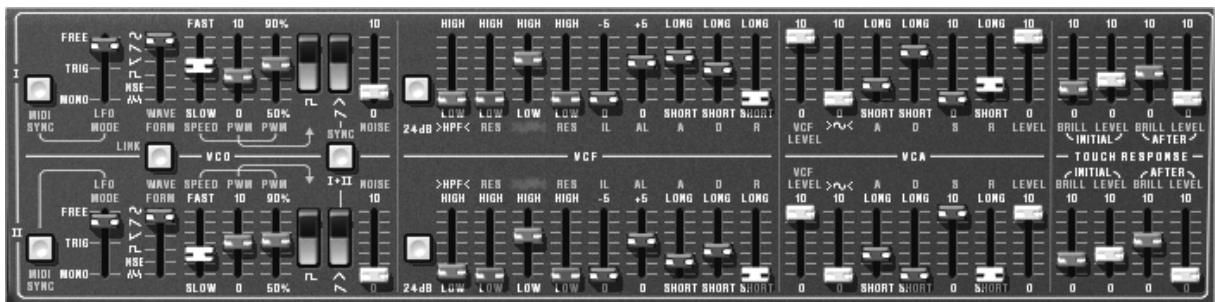
*The reduced mode*

### 3.3 OVERVIEW OF SINGLE MODE (CS-80)

The single mode contains 62 synthesis parameters, which will allow you to create a nearly infinite variety of sounds. The controllers associated with these parameters are found regrouped in 2 rows just under the Multi hatch.

Each of these 2 rows is composed of:

- ▶ 1 oscillator (VCO), which provides the base audio signal with its 3 waveforms: square, saw-tooth and triangle. Also, this section allows control of the pitch of the oscillator (the frequency) and the impulse width of the waveforms.
- ▶ 1 low frequency oscillator («Sub oscillator») used to modulate the impulse width.
- ▶ A high-pass resonant filter, tied to the 12 dB/24 dB cutoff selector
- ▶ A low-pass resonant filter, tied to the 12 dB/24 dB cutoff selector
- ▶ An ADR envelope that modulates the high-pass and low-pass filters
- ▶ 1 amplifier (VCA) allowing the amplification of the signal coming from the filter to direct it to the stereo output.
- ▶ An ADSR envelope modulates the signal going through the amplifier.
- ▶ Velocity and after touch settings on volume (VCA) and brilliance (VCF).



The synthesis parameters

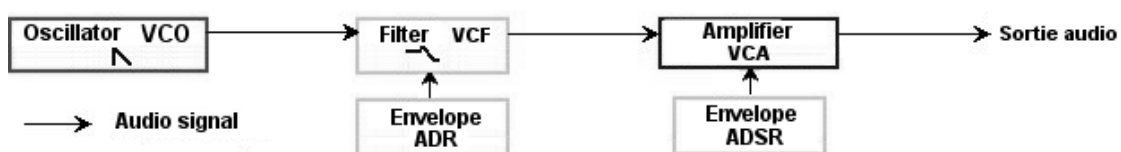
A series of 24 buttons of factory presets will give you base examples for the programming of synthesis parameters. These presets are found on the control panel. They offer the presets of the original CS-80.



Synthesis line presets

Let's see how to quickly create a polyphonic sound that evolves through time:

- ▶ To really understand the programming of the CS-80V, let's take a very simple sound. Select the preset «1\_voice» (in the «User / Temp» sub bank). The structure of this sound is very basic: the oscillator1 saw tooth waveform is active and the signal is directed through the low-pass filter (the high-pass filter is deactivated), and then the output amplifier.



The route of the preset sound «1\_voice»

- ▶ Start by reducing the cut-off frequency of the low-pass filter (LPF). This will make the sound more muted.  
For this set the linear green LPF knob.



*Set the cut-off frequency*

Note that the filter cut-off frequency is modulated by an ADR envelope (Attack, Decay and Release).

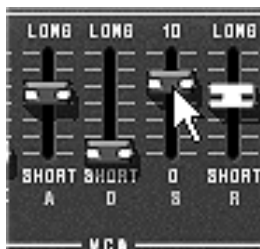
- ▶ To really hear the effect from the ADR envelope on the filter cut-off frequency, increase the value for the resonance («ResL»). This will amplify the filtering effect and the sound will start to make the cutoff frequency more pronounced, producing a «whistle» effect.
- ▶ Change the length of attack for this envelope («A») so that the brilliance increases slower or faster when a note is played.
- ▶ In the same manner, change the value for the decay («D»). The brilliance will also decrease faster or slower while you are holding the note.



*The parameters of the filter envelope*

You have probably noticed that a different envelope can also modulate the amplitude of the sound (VCA)

- ▶ Increase the attack time («A») so that the volume of the sound progressively increases.
- ▶ Do the same thing with the Release («R»); the volume will progressively decrease when you release the note.



*The ADSR envelope controllers*



### 3.4 THE MODULATION MATRIX

On the left of the synthesis parameters is a second hatch, smaller than the one for Multi mode. This contains an extension of the possibilities for modulation when compared to the original CS-80. It is presented in the form of a modulation matrix in which we choose 10 sources (sub osc., envelopes, etc...) which will modulate 10 destinations (freq. Osc., freq. VCF, etc....).



*The modulation matrix*

The choice of source and destination is done by clicking on LCD screens. The individual matrix positions will offer 12 modulation sources and 38 destinations, with an attenuation control in between.

Let's apply 2 supplementary types of modulation to the preset «1\_voice»:

- ▶ Open the hatch of the matrix to access the parameters.
- ▶ Among the modulation sources, choose the oscillator low frequency1 («Sub1» or LFO).
- ▶ Choose the cut-off frequency for the low pass1 filter among the destinations



*Modulate the frequency of the low-pass filter (LPF1) with the LFO (Sub 1)*

- ▶ Between the LCD screens is a knob («Amt»). It allows you to set the level of modulation by applying positive values (by turning to the right) or negative values (by turning to the left).



*Turn the knob to the right for a positive value*

After this modulation is set, the cut-off frequency will vary in a cyclic manner, to the frequency of LFO1.

### 3.5 OVERVIEW OF MULTI MODE

The CS-80V allows the creation of 8 parallel voices and thus, in theory, 8 different sounds played at the same time.

---

*On the original CS-80, a note was controlled by a card that was filled with electronic circuits that represented the complete synthesis architecture. It is for this reason that we could, for example, obtain notable differences in the settings of a sound between the notes played and the tuning of the oscillator.*

*The CS-80V conserves this ideal: you can program eight different sounds (eight voices), which are assignable in a multitude of applications.*

---

With Multi mode, it is possible for you to assign each of these 8 voices to 4 keyboard zones and to 4 different MIDI channels. These 8 voices can also be superimposed across the entire keyboard in order to create a composite sound that is very rich and expressive («Unison»).

Let's use an example:

- ▶ Choose the preset «split1» in the «Templates» bank and «Multi1» sub-bank. In this example, the 8 voices all have the same settings.

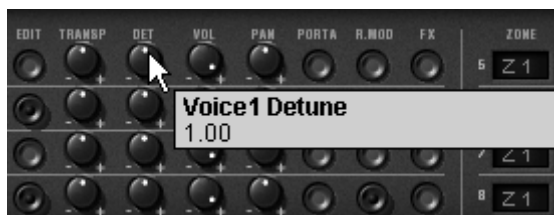
The first 4 voices will occupy zone1 (C1 to C3), the fifth will occupy zone2 (C#3 to C5), the sixth will occupy zone 3 (C#5 to C6) and finally the seventh and eighth will occupy zone 4 (C#6 to C7).

Each of the 4 zones receives one different single sound (the «singles» named 1,2,3 and 4).



*Allocation of voices to the different zones on the keyboard*

- ▶ Start by changing the pan position of the first voice. Place the sound on the right (turn the knob «Pan» fully to the right – value of 1.00).
- ▶ Detune this voice by lightly turning the knob «Detune» to the right (value of +1.00)



*Multi mode voice settings*

- ▶ Now change the pan position of the second single (fully to the left - value 1.00L)
- ▶ Detune the third (put the knob «Detune» to a value of 0.96)
- ▶ Lightly change the pan position of this single to the right - value 0.78R)
- ▶ Detune the fourth (put the knob «Detune» to a value of +1.00)
- ▶ Place these 4 voices to «Unison» mode by selecting the «UniLast» function in the «play mode» menu in the edit zone.

The sound of single 1 is «deeper» as a result of the detuning of the 4 voices and «widened» as a result of the pan position settings between all of the voices. The result is a very rich bass sound.

The fifth Single placed in zone 2 doesn't change. It will play a polyphonic accompaniment sound. Let's go directly to the sixth:

- ▶ Activate the ring modulator on this Single to obtain a bell sound that will be played on the third zone.



Activation of the Ring Modulator

- ▶ Next lower the «Modulation» knob in order to mix the level of the ring modulator with the «raw» sound of the Single.



Setting the Ring Modulator

- ▶ After this, place the fourth zone to unison «UniLast» to obtain a monophonic lead sound.
- ▶ Lightly detune voices 7 and 8.
- ▶ «Separate» the pan position of these 2 voices to the right and to the left.



The Multi mode settings for preset «split1»

---

To quickly «isolate» a voice (where the «edit» button is lit) and play it across the whole keyboard, use the «solo/close» button above and to the left of the Multi panel.  
 If you wish to preserve CPU power, avoid using the «rotate» mode, place the zone on «ReAssign» mode.

---

For each of the 8 voices, you can set:

- ▶ The choice of zone (from 1 to 4 or no zone)
- ▶ Transposition (in semitones)
- ▶ Fine tuning
- ▶ Volume
- ▶ Pan position
- ▶ Portamento/Glissando
- ▶ Ring modulator
- ▶ Chorus and delay effects

For the 4 zones:

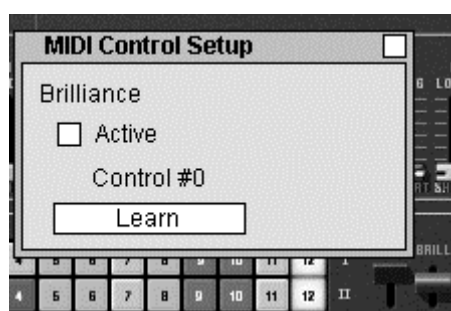
- ▶ The MIDI channel (from 1 to 16 and omni)
- ▶ The low and high notes (from C-2 to C8)
- ▶ The playing mode (rotating polyphonic trigger, reassigned, reinitialized, monophonic unison)
- ▶ Arpeggio activity

### **3.6 THE REAL TIME CONTROLLERS AND MIDI ASSIGN**

Like its excellent ancestor, the CS-80V is adapted in particular to real time play. One of the major points of evolution when compared to the original is the possibility to assign any CS-80V knob to an external MIDI controller.

Let's look at an example:

- ▶ Click on the «Brilliance» knob while holding the Ctrl key down. A MIDI assign dialog appears.
- ▶ Click on «Learn» and move the MIDI controller of your choice (the modulation wheel for example). The CS-80V knob will move at the same time.
- ▶ You can then record the movement of your MIDI controller on your MIDI sequencer or simply make it evolve on the fly during a «live» presentation.



*MIDI assigning of the «Brilliance» knob*

As you have previously read, the CS-80V has a large number of controllers acting on the tuning, tone (brilliance) or the volume of a sound:

- ▶ The keyboard receives velocity and polyphonic «after touch» information
- ▶ A ribbon controller lets you continuously control any synthesizer parameter through a modulation matrix, the base assignment being oscillator frequency.

### **3.7 THE EFFECTS SECTION**

The effects section lets you add Chorus, Stereo Delay or even a Ring Modulator to your sound. You can also impose a portamento/glissando to what you play on the keyboard.

Settings concerning sustain and expression pedals are also available in this section.

Let's keep the «split1» example and see how to use the effects within Multi mode:

- ▶ Deactivate the «FX» button for single1. We won't place effects on the base sound.



*Sending sound to the effects*

- ▶ Leave the «FX» button activated on the other singles.

---

*It is important to know that effect settings are the same for all singles!*

---

- ▶ Activate the «ON/OFF» button for Chorus and Delay in the effects section, on the left of the virtual keyboard.
- ▶ Set the «Mix» knob for Delay in order to counterbalance the «raw» of the Singles and the return of the delay.
- ▶ Next turn the «Speed» knob of the delay to set the speed of the repetitions.
- ▶ Finally, set the chorus depth by turning the «Depth» knob.
- ▶ You can choose between two types of chorus: Chorus and Tremolo. The Tremolo oscillations are slower than those of the Chorus. This effect is ideal for auto pan effects.



*The effects section*

Of course, all of the settings that we have modified during these chapters will be saved in the preset that you have created.

## 4 THE INTERFACE

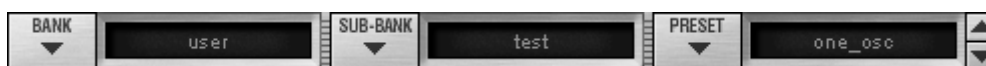
### 4.1 USE OF PRESETS

Presets let you memorize the sounds of the CS-80V. A preset contains all of the information pertaining to the reproduction of a sound. In the program, the presets are classed in «banks» and «sub-banks». Each bank contains a certain number of sub-banks, which generally determine a type of sound: sub-bank «basses», sub-bank «sound effects», etc. Each sub-bank contains within itself a certain number of presets.


The CS-80V is shipped with several «factory» banks. But it is possible to create new «user» banks of sounds, each containing a number of sub-banks and presets. For security, the «factory» banks cannot be directly modified. It is nonetheless possible to create a sound based on a factory preset by saving it as a «user» preset.

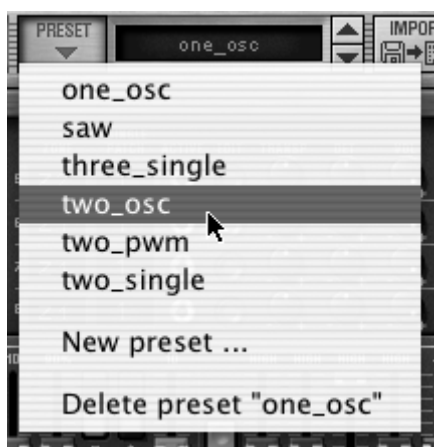
#### 4.1.1 Choice of a bank, sub-bank, preset

The bank, sub-bank and preset in use by the CS-80V are permanently displayed in the synthesizer tool bar.




*Display of current bank, sub-bank and preset*

To choose a preset in the current sub-bank, click on the button , and a dropdown menu appears with a list of the presets of the same sub-bank. You can choose another preset by selecting the corresponding line 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.




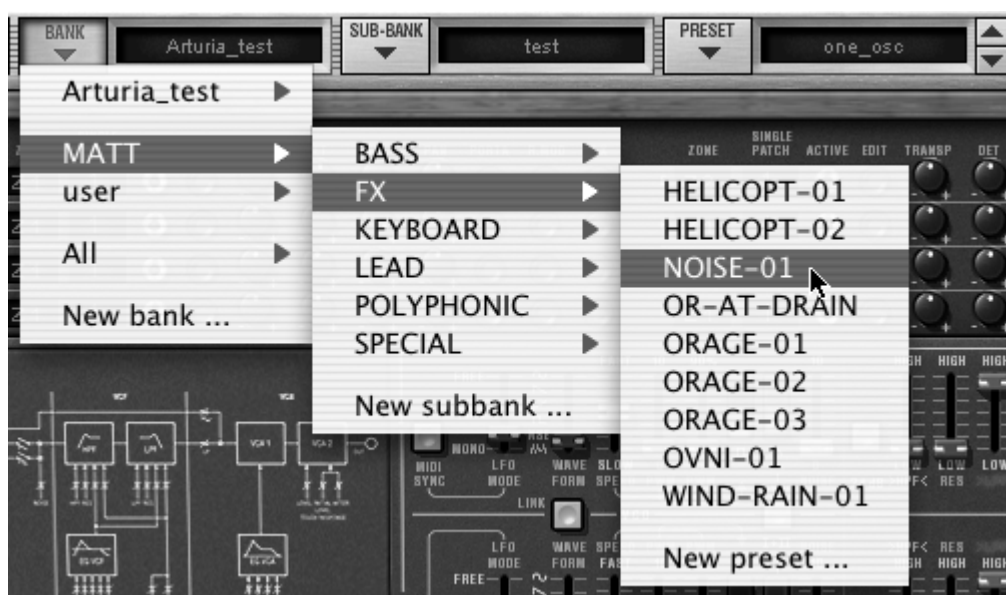
*Choice of a preset in the same sub-bank*

To choose a preset in the same main bank, but a different sub-bank, click on the button , and a dropdown menu appears with a list of the sub-banks contained in the same main bank. Each sub-bank listed in the menu allows you to open a sub-menu containing its presets. A click on a preset allows you to directly choose a preset in the new sub-bank.



*Choice of a preset in another sub-bank*

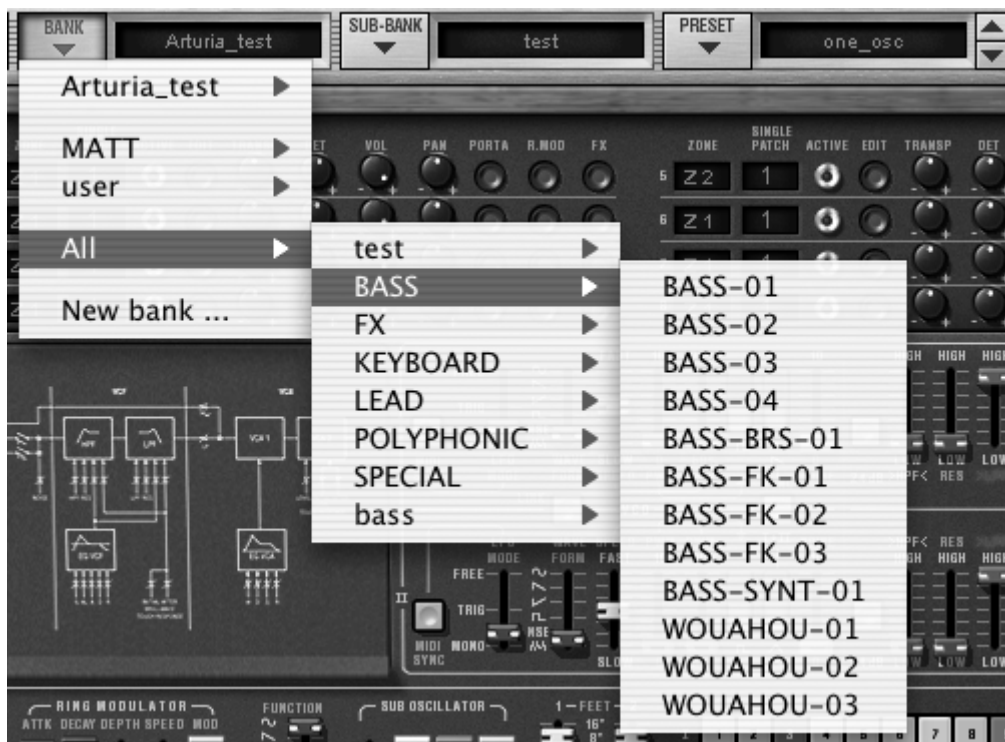
To choose a preset in another main bank, click on the button  and a dropdown menu appears with a list of the main banks available with the sub-banks corresponding to the sub-banks defined in each main bank and to the presets contained in each sub-bank. You can thus freely choose a preset by clicking on its name.



*Choice of a preset in another main bank*

In the dropdown menu concerning the banks, the «All» option allows you to open a sub-list with all of the sub-banks 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 Creation of a bank, sub-bank, preset

To create a new bank, click on the button . The dropdown menu displays the names of all of the existing banks of sounds, and a line called «New bank...». Click on «New bank...» to create a new bank of sounds. You can then change the name of this bank by clicking on its name in the tool bar and entering the new name.

To create a new sub-bank, just click on the button , and select «New subbank...». You can also change the name of the new sub-bank.

Finally, to create a new preset, click on the button , and select «New preset...». The new preset is created, recording the current settings of the CS-80V. You can thus work on the settings of a sound, and save the sound again with the same preset name by clicking on the save button (see the following paragraph). You can also change the name of the new preset by clicking on its name.

#### 4.1.3 Saving a user preset

To save your setting modifications in the current preset, click on the «Save» button in the tool bar of the CS-80V.



*«Save» button in the tool bar*

If you want to save your settings under another preset name, click on the «Save As» button in the tool bar. A dropdown menu appears and lets you choose an existing preset (in this case, the contents of the existing preset will be replaced with the current settings), or to save your settings as a new preset (in this case, click on «New preset...» in the sub-bank of your choice).





«Save As» button and save menu in the tool bar

When you are working from a factory preset, which cannot be deleted, clicking on the «SAVE» button will not replace the current factory preset, but will instead automatically open the «SAVE AS» menu to save the current settings as a user preset.

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

It is possible to import new banks of presets conceived for the CS-80V. To import a new bank of presets, click on the preset bank import button on the tool bar:



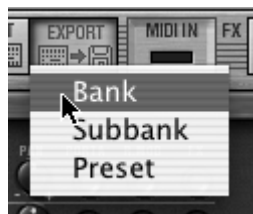
Preset bank import button on the tool bar

When you click on this button, a window will appear allowing you to choose the preset bank file for the CS-80V (.AYS file on PC, Acys file on Mac). Choose the file that you want to import, and click on «Open». The new bank of presets will automatically appear among the available banks.

The CS-80V equally offers the possibility to export your own sounds to save them, to use them on another machine, or to make them available to other users.

It is possible to export a preset, a sub-bank, or a complete bank.

To export the current bank, sub-bank, or preset, click on preset bank 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, sub-bank 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 USING CONTROLLERS

### 4.2.1 Sliders

The sliders are the most frequently used controllers on the CS-80V. They are simple to move with a click on the cursor and a vertical mouse movement. It is also possible to use finer settings with a right click on PC, or Shift+Click on Mac.



*Sliders*

### 4.2.2 Knobs

Generally the sequencers offer several knob control modes.

The default mode of control for knobs with the mouse is the circular mode: click on the knob and turn around it in order to change the value of the controller. The circular mode gives high precision in the manipulation of controls: The further the mouse goes from the knob, the higher the precision of the setting.



*Circular knob*

In linear mode, the knob can be set only by vertically moving the mouse, not going around it. Like the sliders, it is possible to obtain a higher precision by right clicking or Shift+Click on the knob concerned.

The linear mode can sometimes be simpler to use than the circular mode, although we can lose in precision (the precision is limited by the number of vertical pixels on the screen on which the mouse movements are being evaluated). Movement to linear mode is available in the options of your sequencer. In Cubase™, for example, this choice can be found via the «Edit/Preferences» menu, and is found in the «General» tab of the window.

### 4.2.3 Switches

The CS-80V has several types of switches. Simply click on these switches to change their state. (The rocker type switch is «on» in the «lowered» position).



*Switches*

### 4.2.4 Ribbon

The ribbon by default controls the pitch bend of the synthesizer. Simply click on the ribbon while playing a note on the master keyboard or in the sequencer, and move the mouse horizontally to change the pitch. Just like a spring-loaded dial, the ribbon comes back to its initial position once the mouse has been released.



*The ribbon controller*

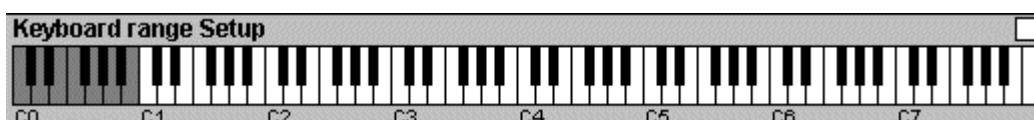
#### 4.2.5 Setting keyboard zones

Setting keyboard zones lets us define a zone on a master keyboard. This will present two displays: one for the minimum limit of the zone and one for the maximum. To modify these values, simply click on the value and vertically move the mouse.



*Keyboard Zone settings*

There is another solution for easier definition of keyboard zones. Just double click on the zone to be modified, and a mini keyboard will appear on the screen.



*The mini keyboard makes zone settings easier*

We can define a zone by simply clicking on the keyboard, a click modifies the minimum limit, and a right click or Shift+Click modifies the maximal limit. The white zone on the keyboard represents the active zone.

#### 4.2.6 Virtual Keyboard

The keyboard lets you listen to the synthesizer sounds without the need for an external master MIDI keyboard, and without programming a melody in the sequencer. Just click on a virtual key to hear the corresponding sound.

#### 4.2.7 MIDI control

Most of the knobs, sliders and switches on the CS-80V can be manipulated with external MIDI controllers. Before anything else, make sure that the MIDI device that you wish to use is correctly connected to the computer, and that the sequencer or the CS-80V application is correctly configured to receive MIDI events coming from the device.

Every instance of the CS-80V receives MIDI events transmitted on a given channel. This reception channel is defined in a global manner for the synthesizer, either in your sequencer, or in the independent CS-80V application (see the corresponding chapters). On the reception channel, the CS-80V can receive up to 120 different MIDI controls. It is possible to choose a reception control for each knob. For this, click on the knob that you wish to control while holding down the Ctrl key. A configuration window appears and will allow you to choose a MIDI control number. You can also click on the «Learn» button and move one of your physical MIDI controllers. In this case, the control number will be detected and configured automatically. To deactivate the MIDI control of a knob, simply uncheck the «Active» option in the MIDI control window.



*MIDI configuration of a knob*

## 5 USING THE CS-80V

### 5.1 SINGLE MODE

When the Multi mode hatch is closed, the CS-80V is in «Single» mode. In this mode, the 8 polyphonic voices available are set with the same sound. The sound that is used corresponds to the settings of the controls apparent in the graphical user interface.

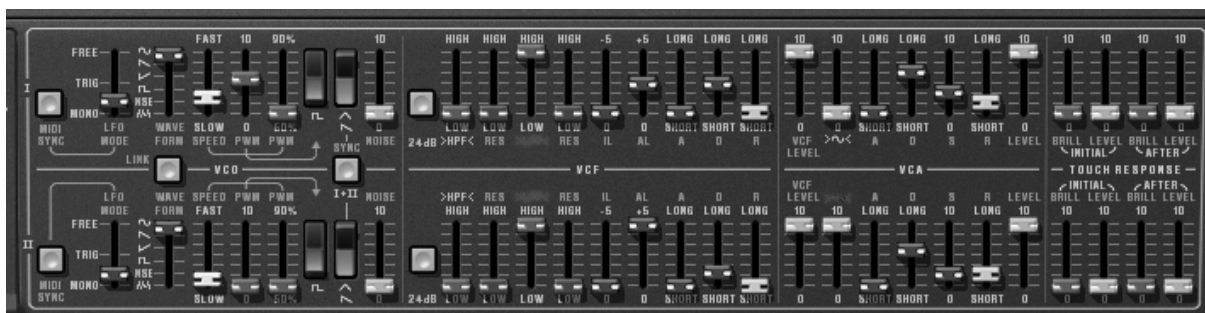


*Multi mode hatch closed*

This mode should be selected if you require the same manner of use as the original CS-80.

### 5.2 TWO LINES OF SYNTHESIS

The original CS-80 has a particular structure. Unlike many synthesizers of that time it used 2 independent generators of subtractive synthesis, each one with an oscillator, a filter and an amplifier. These two lines of synthesis are managed by the central part of the interface in two parallel groups of controls.



*Control of the two lines of synthesis*

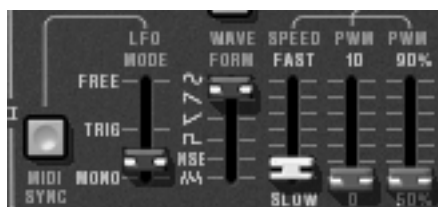
On each line of synthesis, there is an oscillator that can generate square, triangle, saw tooth, and sine signals. The first switch activates the square signal, while the second activates the second waveform, which can be either a triangular signal or a saw tooth.



*Selection of waveform*

To select the sine, first validate that the linear «~» slider (it must light on) and then set its volume with this slider.

The square and triangle signals are affected by the pulse width settings noted «PW». The fader is used to choose a pulse width from 50% to 90%. This pulse width can be modified by a low frequency oscillator (LFO). The modulation rate is set with the «PWM» fader, and the speed with the speed fader.



*PWM Settings*

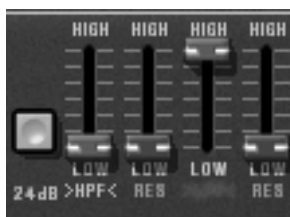
Unlike the original CS-80 LFO where only the sine waveforms were available, the wave can be set with the «WAVE FORM» selector. The waveforms available are sine, saw-up, saw-down, square, noise and random.

This LFO can function in three modes chosen on the «LFO MODE» selector: «FREE», meaning that all LFOs of each of the polyphonic voices function independently of the others; «TRIGG», meaning that the LFO restarts at the beginning of its waveform each time that the polyphonic voice is activated; and finally «MONO», where only the LFO of the first polyphonic voice is used.

The latter allows us to bring a general effect to all of the voices at the same time, like the original CS-80.

It is possible to synchronize the LFO speed with the tempo of the host application with the «MIDI SYNC» button.

The signal from the oscillators then goes through two filters in a series, one high-pass and one low-pass. The cut-off frequency and the resonance of each of these filters can be set with the green and red «HPF» and «LFP» faders (above or below the labels).



*Setting the filters*

By clicking on these labels, it is possible to activate or deactivate a filter in order to save on calculation power.

The «24dB» button lets us go from a 12dB filter to a 24dB filter. The two low-pass and high-pass filters are simultaneously modified.



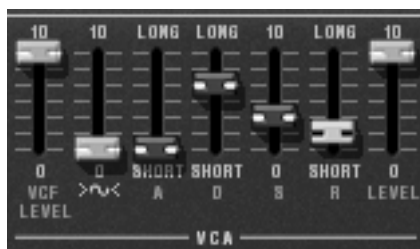
*Filter envelope settings*

The filters are modulated by an envelope where the «IL» (Initial Level), «AL» (Attack Level), «A»(Attack), «D»(Decay) and «R»(Release) settings function in the following manner:

«IL» represents the start of the envelope relative to the frequency of the filter. The filter frequency will be modulated starting with a frequency inferior to the frequency setting. The more «IL» is increased, the lower the starting frequency will be.

«AL» represents the maximum level attained by the envelope, «A» the attack time, meaning the time that the envelope takes to go from the «IL» level to the «AL» level, «D» the decay time, meaning the time that the envelope takes to go from the «AL» level to zero and finally «R», the release time, meaning the time that the envelope takes to go from the zero level to the «IL» level.

The output of the filters is controlled by a volume «VCF LEVEL» before being added to a sine wave «>~<». The signal can thus be treated by the output amplifier (VCA) controlled by an envelope. A «LEVEL» control sets the volume at the end of line of the synthesis.



*Setting the VCA envelope*

The envelope controlling the VCA is a standard «A», «D», «S» and «R» envelope, respectively attack time (the time for the volume to go from silent to full volume), decay time (the time to go from the end of «A» to «S»), sustain level (level reached after the decay period) and finally the release time (time to come back to 0 once the note has been released).

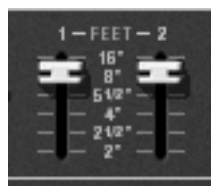
Four faders set the action of the velocity and of the pressure of the keys on the frequency of the filters and the level of the VCA. The green faders for control the frequency, the gray for control the volume.



*Setting the velocity and pressure*

Each of the lines of synthesis can be transposed with the «1-FEET-2» selector: An octave below (16'), default range (8'), a fifth above (5 1/3'), an octave above (4'), a fifth and an octave (2 1/3'), two octaves (2').

The second line can be tuned with the «DETUNE» fader, and finally the mixing between the two lines is controlled with the «MIX» fader.



*Transposition of the lines of synthesis*



*Detuning of the second line*

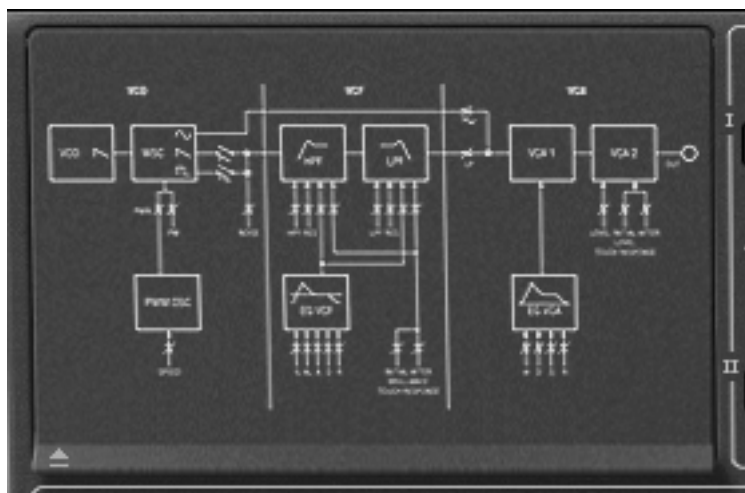


*Mixing of the two lines*

«SYNC» and «LINK» increase your sound design options. The «SYNC» button synchronizes the oscillator of the first line with the oscillator of the second. When activated, it is the frequency of the second oscillator that will be audible, the frequency of the first bringing the harmonics.

The «LINK» button connects the oscillator of the second line towards the filters of the first. The filters and amplifier of the second line are not used and therefore deactivated to conserve calculation power.

### **5.3 THE MODULATION MATRIX**



*Closed modulation hatch*

The original CS-80 possessed no other sources of modulation than those described above. To increase the possibilities of synthesis, a new modulation matrix is available. To activate it, open the left hatch. (On the original CS-80 this hatch held four mechanical preset selectors.)





*Open modulation hatch*

There are ten modulation controls available. For each modulation, the source must be selected from 12 choices, and the destination in a list of 38 choices, by clicking on the «SOURCE» and «DESTINATION» displays. The «AMOUNT» knob sets the rate of modulation.

The sources of modulation are as follows:

- ▶ LFO1 : low frequency oscillator of the first line
- ▶ LFO2 : low frequency oscillator of the second line
- ▶ SubOsc : general low frequency oscillator
- ▶ EG Filter1 : envelope of the filters of the first line
- ▶ EG Amp1 : envelope of the VCA of the first line
- ▶ EG Filter2 : envelope of the filters of the second line
- ▶ EG Amp2 : envelope of the VCA of the second line
- ▶ Velocity : Velocity of the MIDI note
- ▶ AfterT : Pressure of the MIDI note (After Touch)
- ▶ Ribbon : ribbon
- ▶ Wheel : modulation wheel
- ▶ FootExp : Expression pedal
- ▶ Off : no modulation

The modulation destinations are as follows:

- ▶ VCO 1 Freq : frequency of the oscillator of the first line
- ▶ VCO 1 PW : pulse width of the oscillator of the first line
- ▶ Noise level1 : noise level of the first line
- ▶ Noise level2 : noise level of the second line
- ▶ VCO 2 Freq : frequency of the oscillator of the second line
- ▶ VCO 2 PW : pulse width of the oscillator of the second line
- ▶ HP 1 cutoff : high pass filter cut-off frequency of the first line
- ▶ HP 1 res : resonance of the high pass filter of the first line
- ▶ LP 1 cutoff : low pass filter cut-off frequency of the first line
- ▶ LP 1 res : resonance of the low pass filter of the first line
- ▶ HP 2 cutoff : high pass filter cut-off frequency of the second line
- ▶ HP 2 res : resonance of the high pass filter of the second line
- ▶ LP 2 cutoff : low pass filter cut-off frequency of the second line
- ▶ LP 2 res : resonance of the low pass filter of the second line
- ▶ VCA 1 Level : VCA level of the first line
- ▶ VCA 2 Level : VCA level of the second line
- ▶ SIN 1 Level : level of the sine of the first line
- ▶ SIN 2 Level : level of the sine of the second line
- ▶ LFO 1 Speed : frequency of the LFO of the first line

- ▶ LFO 1 Level : level of LFO output for the first line
- ▶ LFO 2 Speed : frequency of the LFO of the second line
- ▶ LFO 2 Level : level of LFO output for the second line
- ▶ EG VCF1 IL : starting level for the filter envelope of the first line
- ▶ EG VCF1 AL : attack level of the filter envelope of the first line
- ▶ EG VCF1 A : attack time of the filter envelope of the first line
- ▶ EG VCF1 D : decay time of the filter envelope of the first line
- ▶ EG VCF1 R : release time of the filter envelope of the first line
- ▶ EG VCF2 IL : starting level for the filter envelope of the second line
- ▶ EG VCF2 AL : attack level of the filter envelope of the second line
- ▶ EG VCF2 A : attack time of the filter envelope of the second line
- ▶ EG VCF2 D : decay time of the filter envelope of the second line
- ▶ EG VCF2 R : release time of the filter envelope of the second line
- ▶ EG VCA 1 A : attack time of the VCA envelope of the first line
- ▶ EG VCA 1 D : decay time of the VCA envelope of the first line
- ▶ EG VCA 1 S : sustain level of the VCA envelope of the first line
- ▶ EG VCA 1 R : release time of the VCA envelope of the first line
- ▶ EG VCA 2 A : attack time of the VCA envelope of the second line
- ▶ EG VCA 2 D : decay time of the VCA envelope of the second line
- ▶ EG VCA 2 S : sustain level of the VCA envelope of the second line
- ▶ EG VCA 2 R : release time of the VCA envelope of the second line
- ▶ Off : no destination

To remove a modulation, select «off» in input and output. You can set the level to zero but the calculation is still carried out, thus using CPU power.

A destination can only accept six sources of modulation. Above this the modulation is ignored.

## 5.4 THE SUB-OSCILLATOR

The sub-oscillator is a low frequency oscillator (LFO) that affects all of the polyphonic voices. The «SPEED» fader sets the speed and «FUNCTION» sets the waveform: sine, saw-up, saw-down, square, noise and random.



*Setting the sub-oscillator*

The action of this LFO is determined through the «VCO», «VCF», and «VCA» faders which sets the modulation rate of the oscillator frequency, filter frequency and output level for both lines of synthesis.



*Setting the modulation through after-touch*

The «VCO» and «VCF» modulation rate can also be modified through after-touch with the faders under the «TOUCH RESPONSE» label. The «SPEED» control also modulates the speed of the sub-oscillator through after-touch.

## 5.5 THE KEYBOARD MODULATIONS



*Initial tuning*

The «INITIAL» fader performs a slight frequency modulation on the oscillators. This modulation is a linear ramp that depends at the same time on the fader setting (at the top, there is no modulation, at the bottom, the modulation is set to the maximum) and the velocity.

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*About the sense of these faders, the CS-80 original operates in that way which can be confusing. But we chose to reflect the original character of the machine.*

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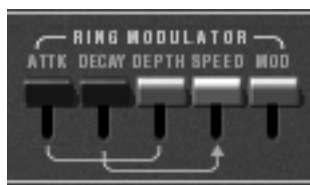
*Key follows*

The faders under the «KEYB. CONTROL» label set the key follow rate. The faders under the «BRILLIANCE» label set the key follow of the filters, and those under the «LEVEL» label set key follows for the amplifiers.

The first fader sets the key follow slope for the lower part of the keyboard (below C3) while the second sets the slope for the higher part. The slope can be positive or negative.

## 5.6 THE RING MODULATOR

The ring modulator is an effect that creates a number of harmonics in the sound through the multiplication of the output signal with a sine wave.



*Setting the ring modulator*

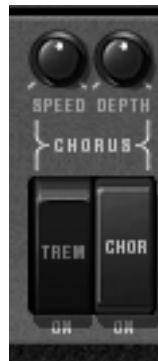
Dry and wet mixing is set with the «MOD» fader. Dry sound is maximum in the high position. The frequency of the multiplying sine is set with the «SPEED» fader. The lower

the fader is positioned, the higher the sine frequency. The generated harmonics will then move away from harmonics of the treated sound.

Three other faders modulate this effect. These set an envelope applied to the frequency of the sine. «ATTK» gives the time taken for the sine to go from the initial frequency set by «SPEED», to the frequency set by «DEPTH», while «DECAY» sets the time for the return to the initial frequency.

## 5.7 CHORUS/TREMOLO

Chorus/tremolo is an effect that allows a variety of effects, from simulation of an ensemble to that of a rotary speaker. It is activated with the «CHOR» switch.



*Setting chorus/tremolo*

The «TREM» switch takes us from chorus mode to tremolo mode. While the rotary «SPEED» and «DEPTH» knobs respectively set the speed of rotation and depth of the effect

## 5.8 STEREO DELAY

Delay is an effect that simulates an echo. It is activated with the «DEL» switch.



*Setting Delay*

The rotary «SPEED», «DEPTH» and «MIX» knobs set the time between each echo, the echo decay time and finally the output level for the effect.

The «SYNC» button is used to obtain echo times as a multiple or sub-multiple of the host application tempo. You choose the multiple or sub-multiple with the «SPEED» knob.

## 5.9 THE PEDALS

The original CS-80 was a synthesizer possessing all of the functions of a real playing surface. A number of settings and possibilities of expression and sustain are explained below.



*Expression pedal*

The «EXP» and «WAH» buttons, when activated, allow the use of a pedal expression MIDI message (Control number n°4) either on the amplification of the volume (expression), or on a sweeping filter (wha-wha).



*Portamento and sustain pedal settings*

The «PORTA» fader allows the control of a portamento on notes. This means that for a given polyphonic voice, when a new note is activated, the frequency of the VCO will gradually move from the frequency of the previous note to the frequency of the currently held note.

When the «GLISS» switch is at the high position (Off), the passage will be done continuously, at the low position (On) it will be done by semi-tone.

When the play mode of the zone is «CSASSIGN» (see §5.14), then the portamento transitions from note played at least 200 ms before.

It is possible to enable or disable the portamento for each voice ( see §5.14).

When the «PORTA/GLISS» switch is at the low position (On), the choice between the portamento (continual variation) and the glissando (variation by semi-tone) is controlled by MIDI messages corresponding to the sustain pedal.

The fader above the «SUST MOD» switch sets the sustain time. When the «SUST» switch is at the top (Off), sustain time is given by the fader setting. When it is set to the bottom (On), sustain time depends on the MIDI messages from the sustain pedal. When the pedal is off, there is no sustain, when it is on, sustain follows the fader setting.

The two positions of the «SUST MOD» switch allow standard functioning (switch off, towards the top), or mode where the sustain is interrupted when a new note arrives (switch on, towards the bottom).

## 5.10 THE ARPEGGIATOR

The arpeggiator is used to transform a chord into a succession of individual notes.

The «SPEED» knob sets the speed for the arpeggio; the «SYNC» button allows us to obtain a multiple or sub-multiple tempo of the host application. The «PLAY» button triggers the arpeggiator, which when a note is played activates the notes one after the other, but stops when there are no active notes held on the keyboard. The «HOLD» button memorizes the notes played as long as it is active. The arpeggiator in «HOLD» mode is stopped through the use of the «PLAY» button.

The «MODE» selector chooses the arpeggio mode: increasing, decreasing, back and forth, random, and in the order that the notes appear.

The «Octave» selector presents the choice of the number of octaves that the arpeggiator will traverse for each cycle. The «REPEAT» selector is to choose the number of cycles repeated for each octave.



*Arpeggiator settings*

## 5.11 THE PRESELECTION BUTTONS



*Pre-selections*

The pre-selection buttons, like on the original CS-80 allow the selection of pre-set sounds. These selections work like a help system, and as soon as a control is modified, we find the «12» selection (panel) indicates that the audible sound corresponds to the settings modified by the user.

Each pre-selection line corresponds to the control of each line of synthesis.

## 5.12 THE RIBBON



*Ribbon*

The ribbon works like a frequency variation wheel when the «PITCH» button is triggered. The «COARSE» knob sets the amplitude for the frequency variation.

It responds to the Pitch bend MIDI message.

## 5.13 GENERAL SETTINGS

Three supplementary settings control the synthesizers general brilliance, resonance and volume. They all effect polyphonic voices in the same way.



*Brilliance and Resonance*



*General volume*

## 5.14 THE MULTI MODE

When the Multi mode hatch is open, the playing mode is called «multiple». In this mode, each of the eight polyphonic voices available can take a different sound and can be commanded by four zones of MIDI control.



*Open Multi mode hatch*

Under the Multi mode hatch are two identical groups of four lines of settings and a supplementary group of four lines. The two first groups set each of the eight voices, while the last set the MIDI message control zones.



*Control zones*

The zones allow the independent control of the polyphonic voices. Each zone responds to a MIDI channel, which can be assigned to the same or a differing channel. When a note comes through the selected channel, it is only taken into account if it is between the limits of the «KEYB RANGE» display. The zone will therefore activate the polyphonic voices associated with it depending on the choice in the «VOICE MODE» display.

To modify the «KEYB RANGE» limits, double-click on the display and choose the low note with a left click and the high note with a right click (Shift click for Mac)

There are 6 polyphonic voice modes possible:

**CsAssign:** This mode of voice control is identical to the original CS-80. The zone plays a voice randomly among the voices that have been affected to it. The portamento (or the glissando) is reinitialized when the time between the arrival of this note and the release of the previous note exceeds a certain value (in the area of 170 ms). Thus, in the case of chords, all of the voices will start their portamento (or glissando) from the same note.

**Rotate:** The polyphonic voices are used in a rotating assignment. The zone uses the next free available voice. When the last voice is reached, then the zone takes the newest note played by releasing the first one.

**Reset:** The polyphonic voices are played in order by their number. The zone uses the first free available voice, beginning with the lowest one.

**ReAssign:** When a new polyphonic voice is chosen, the zone uses the voice which has just played the same note.

**UniLow:** Unison with priority to the lowest note. This means that if two notes are presented at the same time it is the lowest note that is played.

**UniHigh:** Unison with priority to the high note. This means that if two notes are presented at the same time it is the highest note that is played.

**UniLast:** Unison with priority to the last note played. The newest note is prioritized.

The «VOICE ARP» button allows you to accept or not accept the use of the arpeggiator on this zone, independently of the others.

The arpeggiator possesses one setting for all zones, but each zone uses the arpeggiator independently. This means that each zone can choose to activate the arpeggiator (or not), and when a note is present in two zones, the arpeggios remain independent.



*Control of polyphonic voices*

For each voice, you need to choose the zone by clicking on the «ZONE» display. The «OFF» position lets you deactivate a particular voice (it is possible to limit the polyphony).

Once the zone has been chosen, the sound (or single) that the voice will use needs to be selected. By clicking on the «SINGLE PATCH» display, we can select one of the singles of the current preset or a new single. For a given preset, there can be up to 8 singles (one per voice).

It is important to note that the choice of zones and the choice of sounds are independent. Two zones can manage cards using the same sound, and one zone can manage voices with different sounds.

The «ACTIVE» indicator shows the polyphonic voices that are currently active.

Four knobs set (for each voice) the range (+/- two octaves, by semi-tone), fine tune (+/- a semi-tone), volume and the position in the stereo field (pan).

In this section it is also possible for each voice to use or not to use the portamento (or glissando), the ring modulator or the effects (chorus and delay) with the «PORTA», «R.MOD» or «FX» buttons.



The «EDIT» button is to edit the sound (or single) assigned to the polyphonic voice. This updates the graphical interface controls so that they display the single settings.

The Multi mode possibilities are extremely varied. It is possible to separate the keyboard into different zones, each zone with a different sound, to widen an accompaniment sound with the stereo image or fine tuning for a large chorused effect. Another example would be to use the ring modulator only on one voice in order to limit intermodulation effects, and so forth.

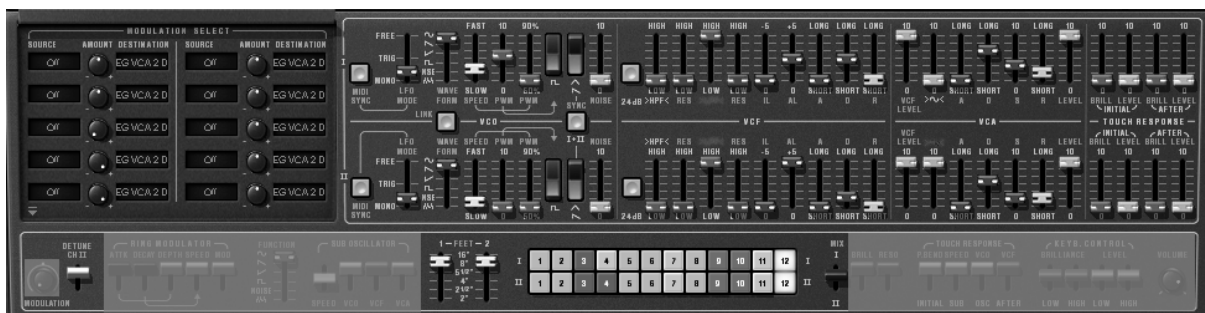
In order to listen to a particular sound, just close the Multi hatch. The sound used is thus the sound being currently edited. The closing of the hatch corresponds to solo mode with a voice control using the «CsAssign» mode on the entire of the keyboard.

Certain settings are the same for all voices. This is the case for settings that control the effects (chorus, delay, ring modulator), pedals, sustain and portamento. It is also the case for the settings controlling the sub-oscillator, the pressure on the keys that affect the sub-oscillator, the key follows and finally the general brilliance and resonance of the synthesizer.



*General settings*

The other settings affect each sound independently of the others, setting the different parameters of a single voice.



*Polyphonic Settings*

## 6 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 toward the end of the 60's on analog synthesizers like the Moog, ARP, Yamaha, Buchla, Oberheim, Sequential Circuits (Prophet series), Roland, Korg (MS and PS series) and many others. This concept of synthesis is still used on most current digital synthesizers, complementing sample reading or wave tables, which have progressively replaced the analog oscillators of the first synthesizers in the 80's. The Yamaha CS-80, or even your own CS-80V constitutes the best illustration of the enormous possibilities of subtractive synthesis.

### 6.1 THE THREE MAIN ELEMENTS

#### 6.1.1 The oscillator or VCO

The oscillator (**Voltage Controlled Oscillator**) is the starting module (with the noise module 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 main oscillator settings are:

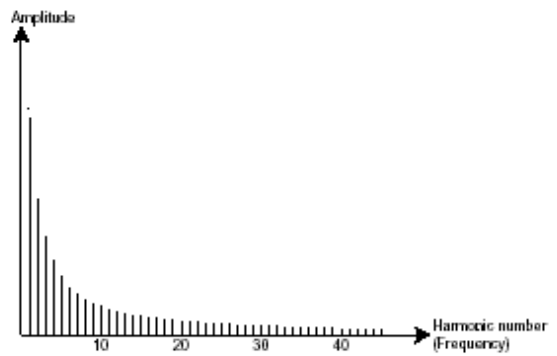
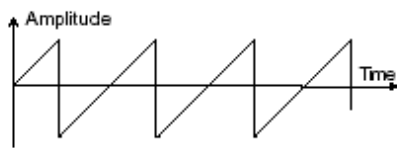
- ▶ **The pitch** determined by the oscillation frequency. You can set the frequency of the oscillator with 2 controllers: first, the «Feet» selector (or «range» on other synthesizers) which determines the fundamental frequency – it is expressed in feet it contains all of the harmonics at decreasing volume levels in high frequencies): 32,16,8,4,2 ; the highest number (32) brings the deepest tone, inversely, the smallest number (2) brings the highest tone. – Secondly, the detune setting (*detune* or *fine tune*) lets you tune the oscillator more precisely.

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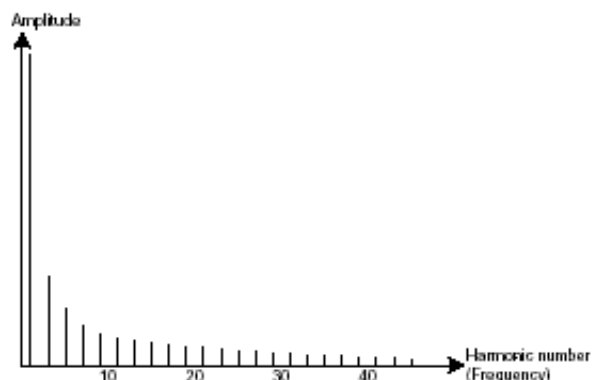
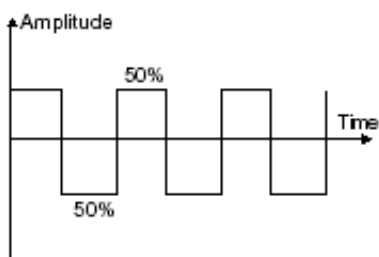
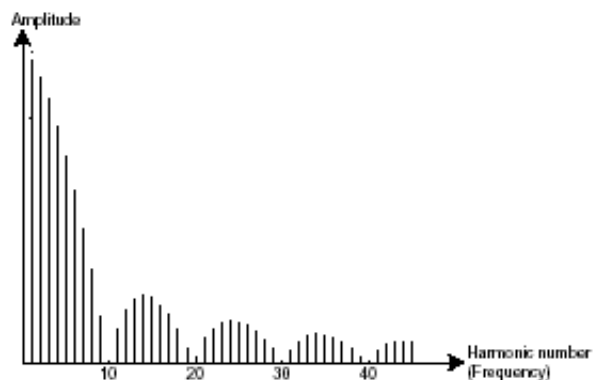
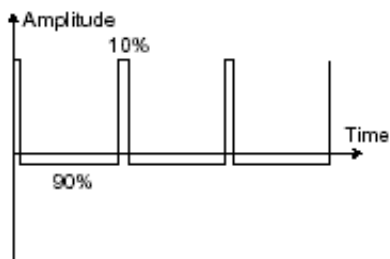
*On the CS-80V, the height settings (Feet) and detune (detune) are found among the real time controllers above the keyboard.*

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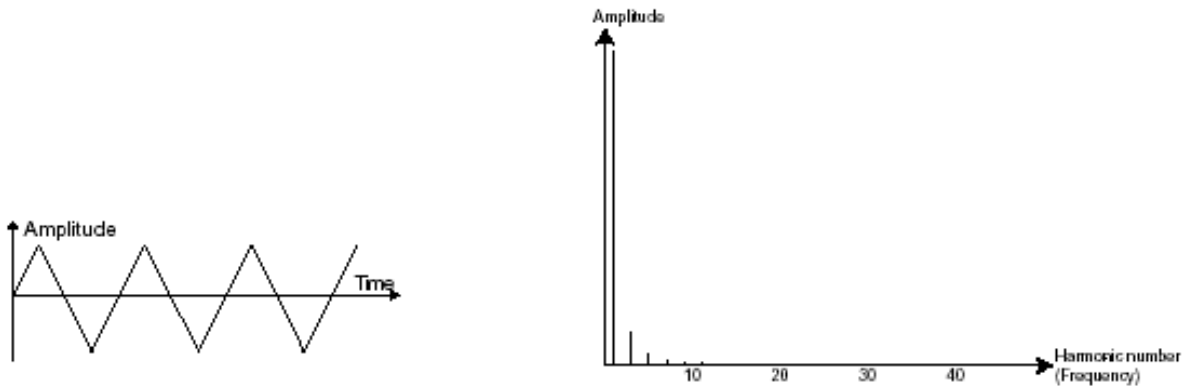
- ▶ **The waveform** which determines the harmonic richness of the audio signal. On the CS-80V, 4 waveforms are available:
- ▶ The **saw tooth** presents the richest audio signal of the 4 waveforms (it contains all of the harmonics at decreasing volume levels in high frequencies). Its sound is ideal for brass sounds, percussive bass sounds or rich accompaniments.



- ▶ The **square** possesses a more «hollow» sound than the sawtooth (it only contains odd harmonics) but none the less, its rich sound (notably in low frequencies) can be used for sub-bass sounds that will come out well in the mix (the square oscillator is often set an octave below that of the sawtooth), wood sounds (clarinet, if the square signal is a little filtered), etc....

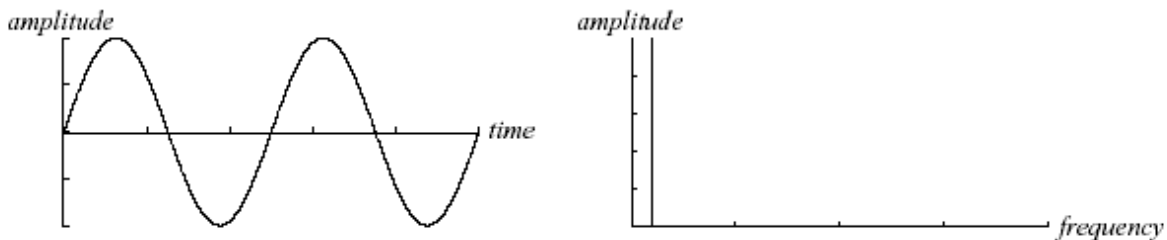


- ▶ The **triangle** can be considered like a very filtered (and so soft) square signal. It is very low in harmonics (odd only) and will be very useful for creating sub basses, flute sounds, etc....



- ▶ The **sinusoid** is the purest of all. It is a unique harmonic and produced a very «damped» sound. It can be used to reinforce the low frequencies of a bass sound or as a frequency modulator in order to create harmonics that don't exist in the original waveforms.

**sine**

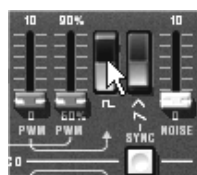


**PWM (Pulse Width Modulation)** is a setting that allows you to modify the waveform cycle (or wave length). This can be done manually with the help of a knob «**PW**» or by modulation (with an envelope or LFO). This impulse width variation translates to a spectrum modification, resembling a waveform change.

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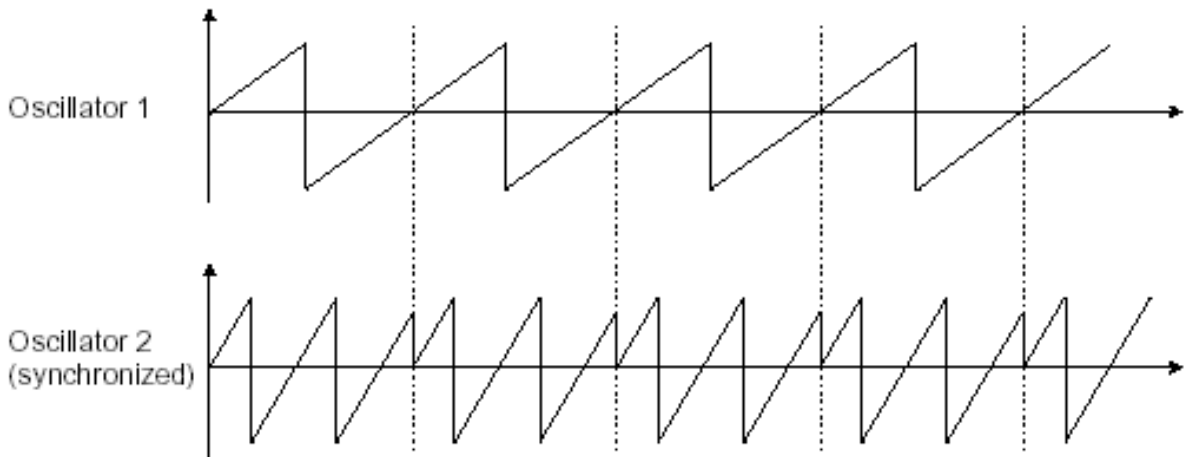
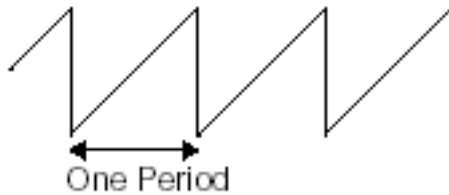
*Unlike many other classic analog synthesizers, the CS-80V lets you change the impulse width not only for the square waveform but also for the triangle.*  
*This brings a large number of additional sound possibilities to compliment the base signal.*

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*The CS-80V waveform*

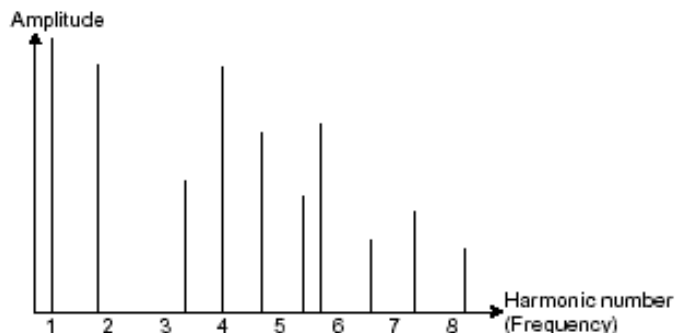
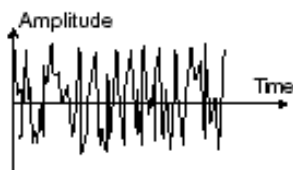
The **synchronization** of an oscillator with another creates more complex waveforms. If for example, you synchronize oscillator2 with oscillator1, oscillator2 will restart a new period every time the first oscillator completes a period, even if oscillator2 has not completed a complete period (this signifies 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 and tuned to with double the tonality. The resulting waveform is unique in that it cannot be created by standard synthesis techniques such as layering or filtering.*

A **ring modulator** can be created when an oscillator modulates another oscillator. On the CS-80V, you can find the «Ring Mod» module above and to the left of the ribbon controller. By lowering the linear «Modulator» slider/lever while increasing «Speed», the sound will become more and more rich in harmonics. The result can quickly become distorted but interesting for inharmonic sounds like special effects or bells for example.

#### RING MODULATOR



#### ► The noise module

The noise signal spectrum has all frequencies at an equal volume level, often referred to a «white noise». For this reason, the noise module is used to create different noises like the imitation of wind or special effects. White noise is the richest of noises. Pink noise is also regularly present on synthesizers. It is less rich in the high frequencies than white noise.

Also note that the audio output of noise can also be used as a modulation signal (especially when strongly filtered) to create random cyclic variations.

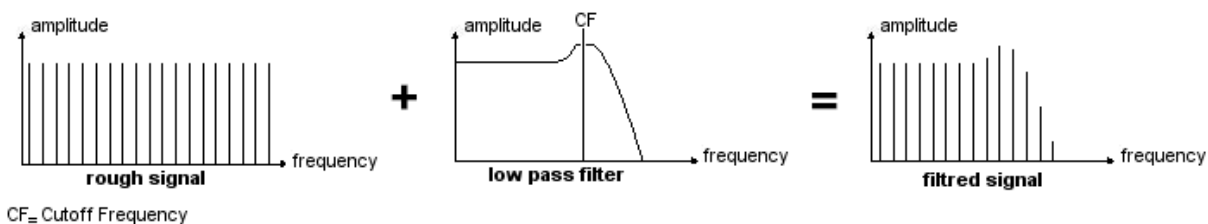
On pre-cabled synthesizers, the noise module is either integrated into the oscillator (its audio output being placed to compliment the waveform outputs), or within the mixer directing the signals towards the filter. On the other hand, on modular synthesizers, it is an independent module.

### 6.1.2 The filter or VCF

The audio signal generated by an oscillator (the waveform) is next generally directed to a filter module (**Voltage Controlled Filter**). It is this module that we use to model 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 considered like a sophisticated equalizer that reduces, depending on the case, the high or low frequencies of a sound.

The removal of undesirable frequencies, with a **cut-off frequency** is not done suddenly but progressively, this, 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.

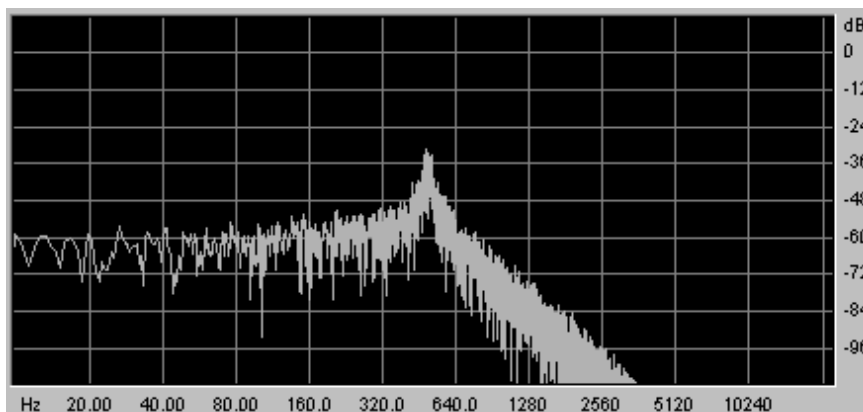
The CS-80V offers 2 types of slope (where the CS-80 had only the 12 dB/Oct slope).



On the CS-80V, you have access to 3 different types of filtering. Let's have a look at some of their properties:

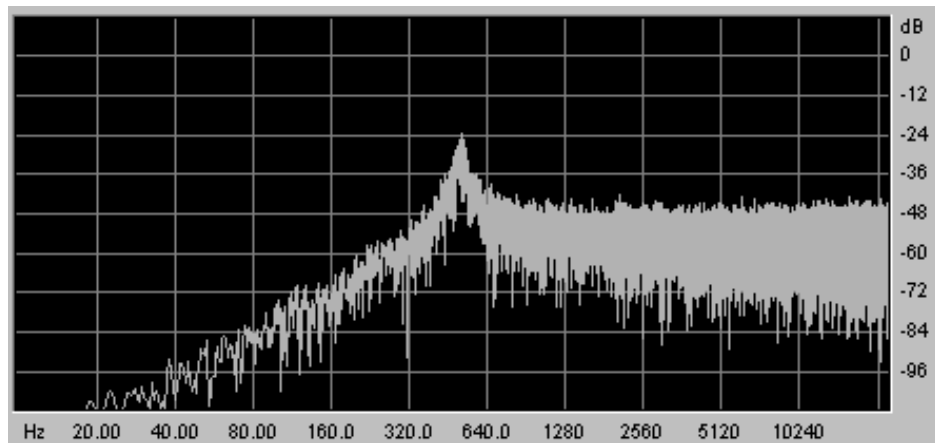
- ▶ The **low-pass** (*LPF*) deletes high frequencies going from a frequency limit (the famous cut-off frequency) and only lets low frequencies through. Depending on the setting we will here the sound becoming more or less «brilliant», more or less «dampened».

This is the type of filtering that you will find more often than not on synthesizers that use subtractive synthesis. It can be found on most of the recent analog and digital synthesizers.



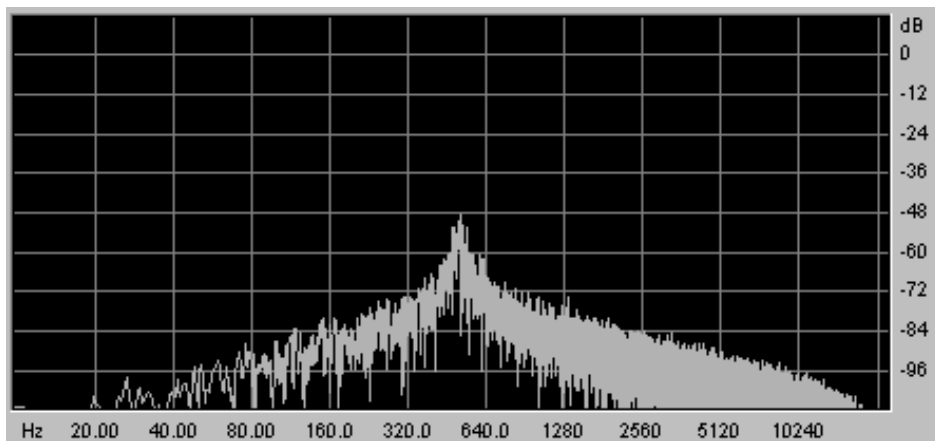
The low-pass filter

- The **high-pass** (*HPF*), unlike the low-pass, eliminates low frequencies and only lets high frequencies through. The sound will become «finer». It is very useful for removing redundant low frequencies with a bass sound for example.



*The high-pass filter*

- ▶ The **band-pass** (*BPF*) eliminates frequencies situated on either side of the cut-off frequency. It is in fact the addition of a low-pass and a high-pass filter. Use it to focus on a particular band of frequencies that you wish to emphasize. This will make the sound more «pinched». On the CS-80V, you obtain this type of filtering by combining the actions of a high pass filter and a low pass filter as there is technically speaking no separate band-pass filter.



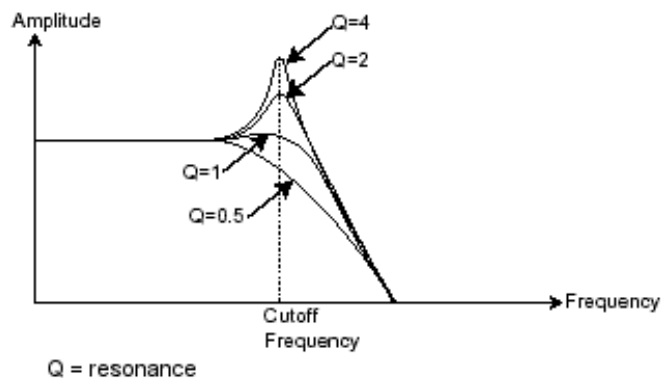
*The band-pass filter*

A second setting to compliment the cut-off frequency: the **resonance** (you will also find it called «emphasis» or «Q» – for Quality of filtering)

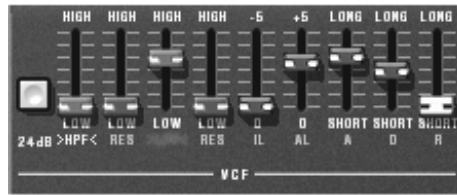
The resonance amplifies frequencies close to the cut-off frequency; the other frequencies remaining are either unchanged (before the cut-off frequency) or reduced (after the cut-off frequency).

You can increase the rate of resonance through the resonance slider.

When you increase the resonance, the filter becomes more selective, the cut-off frequency is amplified, and the sound begins to «whistle».



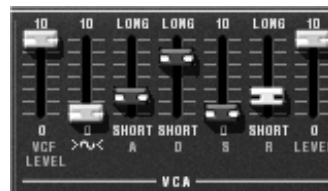
With a high resonance level, the filter will begin to produce a sound close to a sine waveform. At this stage, the use of a key follow is very important as you can create a melody by tuning the cut-off frequency of the filter with the frequency of the oscillators.



*The filter settings of the CS-80V*

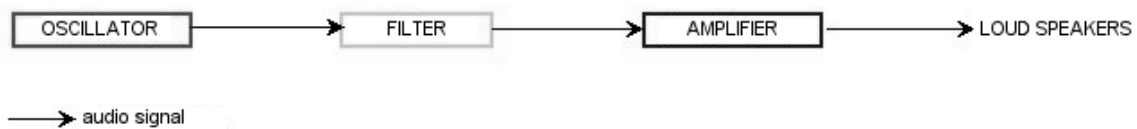
### 6.1.3 The amplifier or VCA

The amplifier (**Voltage Controlled Amplifier**) receives the audio signal coming from the filter (or directly from the oscillator if it is not being filtered) to adjust the before the volume is sent to the outputs.



*The CS-80V VCA*

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



## 6.2 OTHER MODULES

### 6.2.1 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 disagreeable 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, and this at the tone that we require, we use a keyboard that is connected to the oscillator. 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). On analog synthesizers, the key provides a gate which is often used to open and close the volume of the amplifier (gate). The key position provides a control voltage that tells the oscillator what pitch level to play when the gate opens.

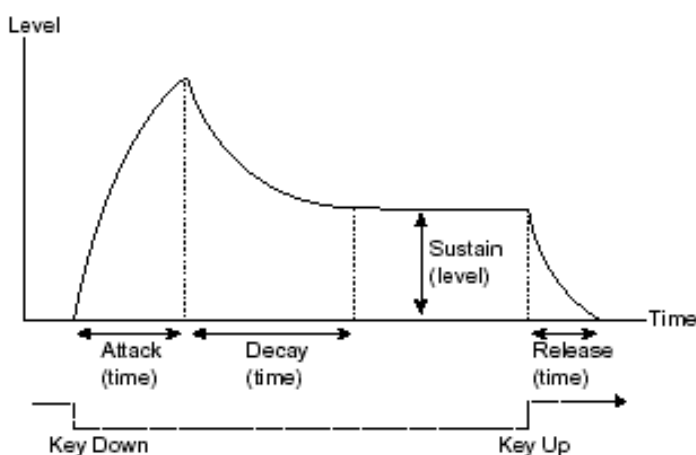


## 6.2.2 The envelope generator.

The envelope generator, connected to the amplifier, is used to «sculpt» the volume of the sound when we press a key on the keyboard and ends after the note is released.

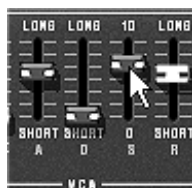
The most common modules developed use 4 settings that we can vary:

- ▶ The Attack is the sound that the sound will take to reach its maximum volume once we have pressed a key on the keyboard.
- ▶ The Decay (fall) is the time that the sound will take to diminish when a note is pressed.
- ▶ The Sustain (hold) is the maximum volume level that the sound will reach when a key is pressed.
- ▶ The Release is the time that the sound will take to diminish once the key has been released.



On the VCF of the CS-80V, the envelopes include 2 additional settings:

- ▶ The «initial level» (IL) is the **initial level** of the filter opening that we obtain when a key is pressed.
- ▶ The «Attack Level» is the **attack level** of the filter opening that we obtain when a key is pressed.



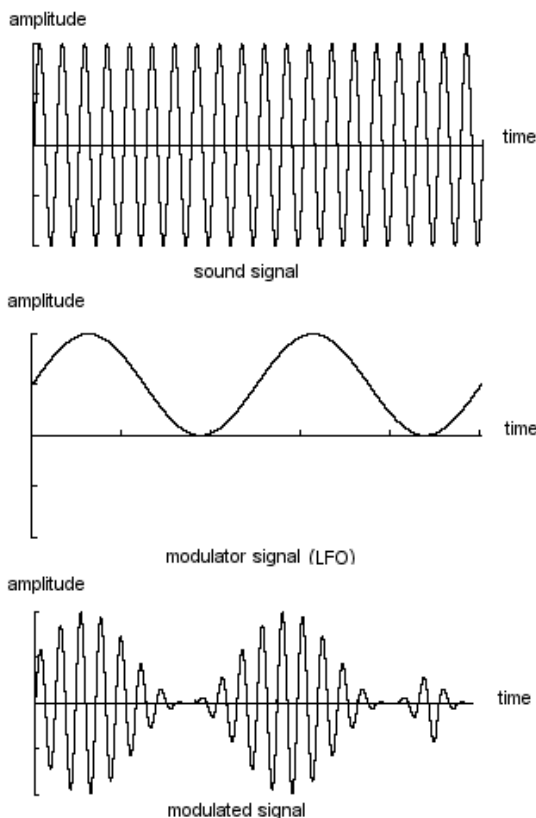
*The CS-80V ADSR envelope*

## 6.2.3 The low frequency oscillator.

The LFO (*Low Frequency Oscillator – or Sub oscillator on the CS-80V*) 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 pitch of its sound. It will create a cyclic modulation on the setting to which it is connected.

For example:

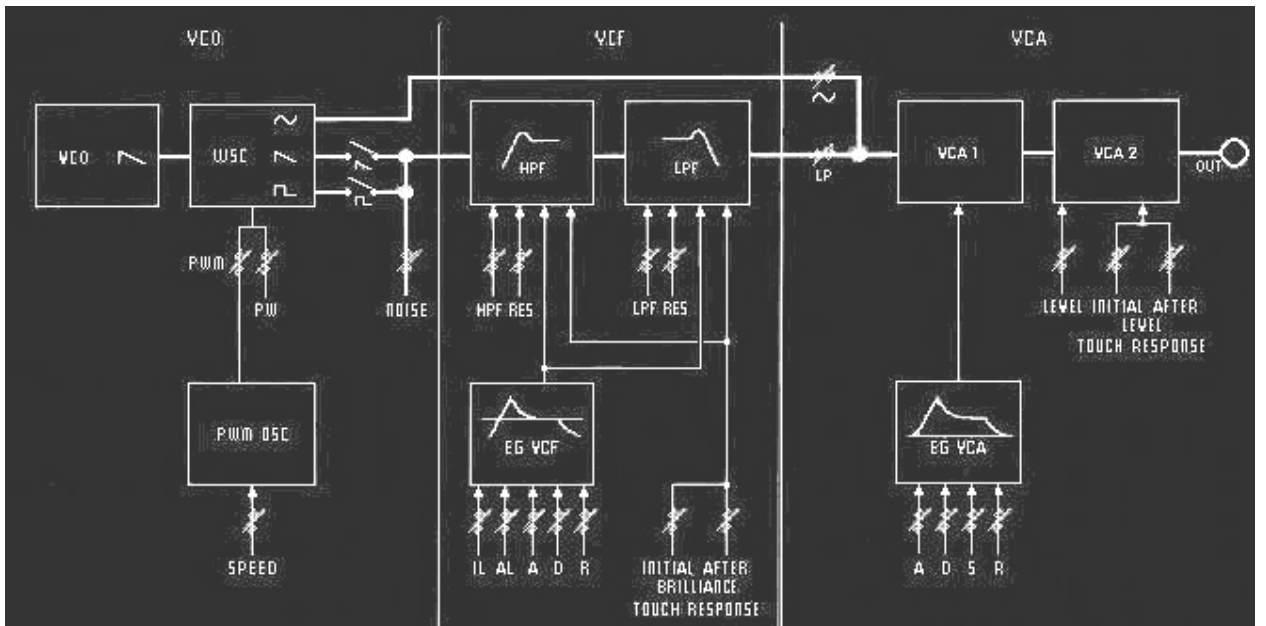
- ▶ If the sinusoid waveform of an LFO modulates the volume of an amplifier, the sound will increase in volume then disappear in a varying manner following the speed (the frequency) of this LFO. This will produce a **tremolo** effect.
- ▶ A sinusoid waveform on an LFO modulating the frequency of an oscillator would produce a **vibrato** effect. The frequency of this oscillator will thus be modulated up and down.
- ▶ With an LFO sinusoid wave modulating the cut-off frequency of a lightly resonant low-pass filter, you will obtain a «**wah wah**» effect.



*The sub section of the CS-80V*

Now to finish, here is the diagram of a complete synthesis voice on the CS-80V containing:

- ▶ 1 oscillator (VCO)
- ▶ 1 noise module
- ▶ 1 mixer (mixing of the 2 VCO and the noise module towards the low-pass and high-pass filters)
- ▶ 2 filters (VCF) high-pass and low-pass
- ▶ 1 amplifier (VCA)
- ▶ 2 envelopes (one for the filters and the other for the VCA)
- ▶ 1 LFO



*A complete CS-80V synthesis voice*

## 7 SOME ELEMENTS OF SOUND DESIGN

Here is a series of examples designed to guide you through the creation of various sounds as well as a vintage analog styled note sequence. They progress in order of difficulty going from the easiest to the most difficult and are organized into 3 parts:

- ▶ The first part will help you to grasp subtractive sound synthesis. You will start with the most basic patch (make a VCO oscillator «ring» in an output VCA amp), to finish by touching on the programming of a more rich sound (several VCO sources, VCF filters, VCA envelopes...)
- ▶ The second will help you to use the Multi mode and the arpeggiator.
- ▶ The third will give you tips on creative use of key follows, and creating a stereo sound without the use of additional chorus and delay effects.

### 7.1 SUBTRACTIVE SOUND SYNTHESIS

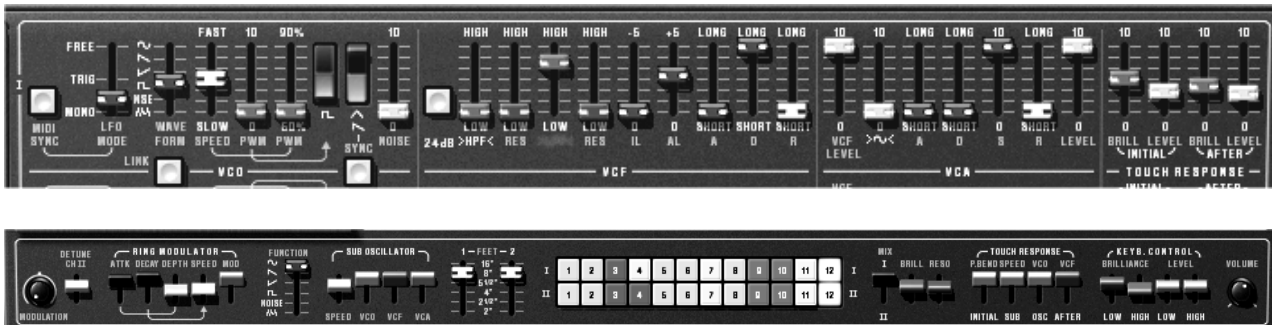
#### 7.1.1 A basic sound

To begin we will see how to program a basic sound. As we saw in chapter 3 (Quick Start), the CS-80V uses two identical and independent lines of synthesis. We will only use the first (the one above) for this example. It will be simply composed of:

- ▶ an oscillator
- ▶ a low pass filter
- ▶ an output VCA
- ▶ the envelope corresponding to the output VCA.

You will thus obtain the base patch for subtractive synthesis.

The following image shows the different slider/lever positions:



- ▶ Choose the preset «1\_line» in the «templates» bank, sub bank «temp\_syn». This sound uses a saw tooth waveform, the high pass filter is «closed» (but not deactivated), while the low pass is completely «open». The amplifier envelope has a minimum attack time («A») as well as a short release time («R»).

This minimalist configuration will let you easily perform some simple experiments with this basic sound.

- ▶ Start by progressively lowering the cut-off frequency of the low pass filter. The sound becomes more and more «soft».
- ▶ Increase the frequency of the high pass filter. You will hear the sound lose its low frequencies (to clearly hear this effect, make sure not to set the cut-off frequency of the low pass filter too low as the sound will be too soft !)



*Increase the frequency of the low pass filter*

- ▶ Change the range of the oscillator with the «Feet I» potentiometer (for the moment set to 8')



*Change the range of the oscillator*

- ▶ Now increase the release time («R») of the VCA1 so that the sound persists after the release of the keys. Be sure to set the level of the general Sustain fader to 0, so that the changes on the release time can be effective.



*Increase the Release time of the VCA*

### 7.1.2 The modulation matrix

We will discover one of the many additions to the CS-80V: the modulation matrix. For this, load the «pad1» preset from the «templates» bank, sub bank «temp\_syn». We will program synthesis lines I and II as well as 6 modulations active on the sound:

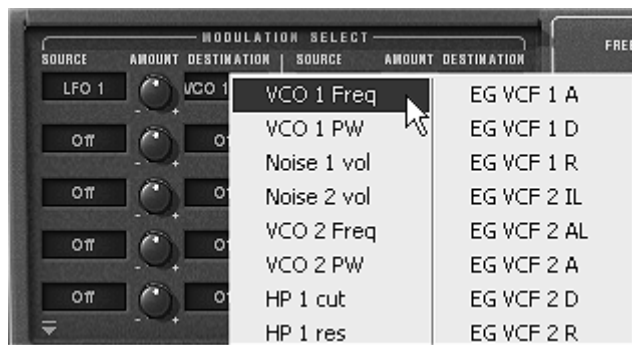
- ▶ 2 oscillators
- ▶ 2 lightly resonant high pass and low pass filters
- ▶ 2 output VCAs
- ▶ The filter and VCA envelopes are active

The modulation matrix will be active for:

- ▶ Sub oscillator1 (LFO1) modulates the frequency of Oscillateur1
- ▶ Sub oscillator2 (LFO2) modulates the cut-off frequency of low pass filter1
- ▶ Sub oscillator2 (LFO2) modulates the cut-off frequency of low pass filter2
- ▶ Velocity modulates the attack of VCA1 envelope
- ▶ Velocity modulates the attack of VCA2 envelope
- ▶ After touch modulates the cut-off frequency of high pas filters 1 and 2

The settings concerning the 2 lines of synthesis having already been programmed, we will concentrate on the use of the modulation matrix.

- ▶ On the matrix, begin by choosing the first source of modulation: «LFO1» (for low frequency oscillator1).
- ▶ Repeat for the first destination, choose «VCO1 Freq» (pour «Voltage Controlled Oscillator1 Frequency»).



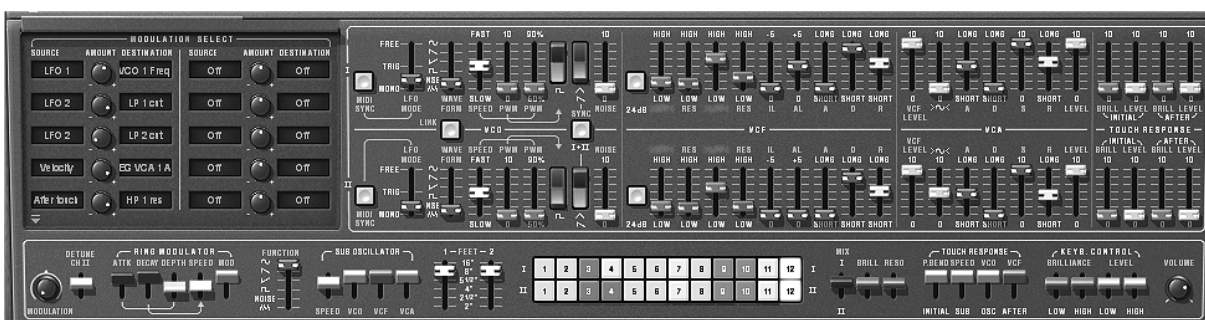
Choose destination «WCO1 Freq»

- ▶ Slightly turn the modulation rate potentiometer «Amt» towards the right (use a value around 0.01). The oscillator frequency lightly varies up and down to create a gap in tuning between the 2 oscillators.



Turn the modulation rate potentiometer «Amt»

- ▶ For the 2nd source of modulation, choose «LFO2» to modulate the «LP1 Cutoff» (for «Low Pass filter1 cutoff»)
- ▶ Turn the «Amt» potentiometer to 0.20 to have a positive modulation on the frequency of filter LP 1.
- ▶ For the 3rd source of modulation, choose «Sub2» to modulate the «LP2 Cutoff»
- ▶ Turn the «Amt» potentiometer to a value of -0.20 to have a negative modulation on the frequency of filter LP 2. These 2 modulations will cross paths.
- ▶ Next, add the velocity to modulate the attack time of the VCA1 envelope (EG VCA1 A).
- ▶ Turn the «Amt» potentiometer to a value of 0.40
- ▶ Do the same for the attack time of the VCA2 envelope.
- ▶ Turn the «Amt» potentiometer to the same value as previously.
- ▶ To finish this sound, add after touch to the frequencies of high pass filters 1 and 2.
- ▶ Set the «Amt» potentiometer to 0.20.



The settings of preset «Pad1»

- ▶ By varying the playing force put on the keys of your MIDI keyboard (velocity), you will vary the attack time (A) of the 2 VCA envelopes. The amplitude of the volume of the sound takes more or less time before reaching its maximum.
- ▶ The after touch acts, following the pressure that you apply to the keys of the MIDI keyboard, on the frequency of the 2 high pass filters. In other words, the low frequencies are weakened.

The 2 examples that we have looked at allow you to have the basics necessary for more profound research. Don't hesitate in trying other settings, the possibilities offered by the CS-80V are quite numerous.

### 7.1.3 Use of real time controllers

As we have previously seen, the use of real time controllers is one of the strong points of the CS-80V. They will allow you to apply a large variety of simple and quick modulations to the sound all while playing the keyboard.

#### 7.1.3.1 Velocity and after touch

These 2 controllers are directly linked to the playing on the keyboard. Velocity controls the cutoff frequency («brilliance») and the VCA volume. After Touch controls the speed of the vibrato modulation, and the VCA volume. This was the configuration of the original CS-80.

But you will be able to go further, thanks to the modulation matrix, these controls are among the sources of modulation.

- ▶ For example try to lightly vary the frequency of oscillator1 in relation to the second by applying the velocity. You will obtain a different detuning at each note. This will accentuate the «vintage» side of the synthesizer as each note corresponded to an electronic card where the components could become unsettled with time.



*Apply the velocity on the frequency of oscillator1*

The after touch can be employed to accentuate one of the 2 voices of synthesis:

- ▶ Apply the after touch on the VCA volume. When you press harder on a note on the keyboard, the volume of voice 2 will progressively appear, this will create a morphing effect between these 2 voices.



*Apply the after touch on the VCA volume*

#### 7.1.3.2 The ring modulator

The ring modulator is essentially used to add harmonics that don't originally exist in the sound:

Lets use the example of the sound from a bell:

- ▶ Load the preset «1\_voice» which is, as we have previously seen, a very simple sound.
- ▶ Increase the release time («R») on the envelope of VCA1 (towards 440 ms)

The «Speed» setting of the ring modulator allows you to very quickly increase the number of secondary harmonics in order to create a bell sound (around 150 Hz – around the halfway mark for the potentiometer) a simple beating identical to a tremolo (around 2 Hz).

- ▶ To get a bell sound, the oscillation frequency must be high, set this potentiometer around 2,000 Hz



*The «Speed» setting*

- ▶ Lightly lower the «MOD» lever (around 0.20) to mix the volume of the «raw» sound with the one coming from the ring modulator.
- ▶ If you wish, you can control the speed of the ring modulator in a progressive manner with an attack envelope («A»), decay envelope («D») or even through an external MIDI controller. This helps you to easily make special effects.



*Using the ring modulator for a bell sound*

## 7.2 **MULTI MODE**

The Multi mode allows the creation of a combination of different sounds (up to 8) spread across keyboard zones (up to 4) within an individual preset. They bring very different results which directly influence how a sound or sequence is played !

### 7.2.1 **Four different sounds on the keyboard.**

- ▶ Choose the preset «split1» in the bank «Templates» sub-bank «Multi1»

The first 4 voices occupy zone1 (C0 to B2), the fifth, zone2 (C3 to B4), the sixth zone 3 (C5 to B5) and finally the seventh and eighth for zone 4 (C6 to C7).

Each of the 4 zones has a different «single» sonority (the «singles» named 1,2,3 and 4). These singles can be detuned, given panoramic and mixed.

In this example, the 8 voices all have the same settings.

- ▶ Change the panoramic of the first voice. Place the sound to the right of stereo space (turn the «Pan» potentiometer fully to the right – value 1.00R)
- ▶ Also detune it by lightly turning the «Detune» potentiometer to the right (value of 1.00)
- ▶ Now change the panoramic of the second single (fully to the left - value 1.00L)
- ▶ Detune the third (set the «Detune» potentiometer to a value of 0.99)
- ▶ Use pan to position this single lightly to the right (value 0.78R)
- ▶ Detune the fourth (put the «Detune» potentiometer to a value of 1.00)
- ▶ Place these 4 voices to «Unison» play mode by selecting the «UniLast» function in the «play mode» menu of the edit zone.



The sound of single 1 will be «fattened» thanks to the detuning of the 4 voices and «widened» thanks to the panoramic settings between all of the voices.

By performing these first settings, you have modified the «Multi1» preset. You can now save it in your own bank.

- ▶ After this, put the fourth zone to «UniLast» unison mode
- ▶ Lightly detune voices 7 and 8 to fatten the sound.
- ▶ «Separate» the stereo position of these 2 voices to the right and to the left.
- ▶ Finally, activate the ring modulator on voice 5 to obtain a bell sound that will be played on the third zone.

Your end result will be: a very rich sound on zone 1, a violin solo sonority on the second, a bell on the third and a lead sound on the fourth zone.



*The finished «Multi1» preset*

- ▶ If you wish to use this configuration with a MIDI sequencer playing each single on a different MIDI channel, choose a channel for each zone.

---

*Don't forget that the notes that are not included within the limits of each of the 4 zones will not be played!*

---

### 7.2.2 A composite sonority in unison mode

Now lets see a different use of the unison mode: layering several singles on the same note (remember you can go as far as 8 simultaneous)

Load the preset «Wizd\_Multi2».

This preset contains 8 different singles but they are played successively to each note played. They are all assigned to zone 1 which covers the whole of the keyboard.

- ▶ Begin by placing zone1 to «UniLast» unison mode. All of the singles should be played by the same note.



*Placing zone1 to «UniLast» unison mode*

- ▶ Detune them with the «detune» potentiometers. The global sound will get another layer.
- ▶ Also change the panoramic of each of the singles in order to form a very large stereo sound.
- ▶ It is also possible to select which singles will be sent to delay and chorus effects. The ring modulator will not be used for this sound. Deactivate the «Rmod» button on all of the singles.
- ▶ It is also possible to change the tone range of certain singles by detuning them by an octave or a fifth below.

You will thus obtain a rich and powerful lead sound !



*Unison mode settings*

### 7.2.3 Introduction of the arpeggiator in a Multi preset

Now let's program a Multi preset using the arpeggiator on one of the 4 zones.

Take the preset «Wizd\_Multi3». 3 split zones on the keyboard are already in place:

- ▶ A single bass sound on zone 1 (from C0 to B1) which will be played in unison mode («UniLast»), thus monophonic
- ▶ A polyphonic accompaniment single on 4 notes on zone 2 (from C2 to B3)
- ▶ A lead single on zone 3 (from C5 to C7) also in unison mode «UniLast».

The arpeggiator will act on zone3.

- ▶ Click on the «VOICE ARP» button on the right of the play mode selection.



*Click on the «Arp» button of the 3<sup>rd</sup> zone*

- ▶ Next click on the arpeggiator «PLAY» button.



*The arpeggiator «Play» button*

- ▶ Play a note between C4 and C6, the notes one after the other on the order that you placed them.
- ▶ It is possible to change the playing order by clicking on the «mode» slider.



*The linear «mode» setting*

- ▶ If you wish, you can hold the chord by clicking on the «Hold» switch.
- ▶ To remove one or several notes, click again on the «Hold» button and play the note to be removed.

It is now possible to simultaneously play (or record) a bass part on the first octave of your keyboard, accompaniments on the next 2 octaves while having the arpeggio on the last.



*The arpeggiator settings*

## **7.3 OTHER SIDES OF THE CS-80V**

When we move away from the conventional methods of play, the CS-80V offers programming tips that help you to go further.

Here are a few of them:

### **7.3.1 A step sequencer**

By conjointly using the arpeggiator and Multi mode settings. It is possible to obtain an 8-note step sequencer !

- ▶ Load the preset «multi\_arp»: the 8 voices are on the same zone (the first) and the same single «1». The «Arp» button is active on the 8 voices.
- ▶ Start by clicking on the «play» button on the arpeggiator and play one note on the keyboard. You can hear that all of the voices play one after the other (zone 1 is set to «rotate» mode) with the same height.

If needed, when the arpeggiator is playing, you can set the «Decay» time on the VCA1 and 2 amplitude envelopes. The shorter the time, the more percussive the sound. Of course the effect produced will only be heard correctly if the «Sustain» level is 0!

- ▶ So that the arpeggio plays alone, click on the «Hold» switch.
- ▶ Set the height of each of the 8 notes by turning the «Trans» transposition potentiometer among the single voice settings. When you turn to the right, the height of the note increases by semi-tone, if you turn to the left, the height diminishes by a semi-tone. Choose the values that suit you to make an 8-note melody.
- ▶ It is also possible to change the note order by moving the «Mode» slider of the arpeggiator.
- ▶ To obtain a better diffusion of the notes in stereo, you can «separate» the stereo position of each voice to the left and to the right through the use of the pan pots.
- ▶ To create silence on one of the 8 voices, lower the «Vol» potentiometer.

---

*By choosing the «UniLast» mode for zone1 you will get a series of notes ! If you wish to transpose the note, make sure that the arpeggiator «Hold» button is deactivated.*

---



The final sequence- note the various knob settings for each voice in the Multi section

### 7.3.2 Stereo sound without the effects

If you use a preset with one of the 3 Unison modes (High, Low, Last), it is possible to make the sound fatter and heavier without using a chorus effect. Remember that in this mode, all of the voices assigned to that zone play at the same time when we press a note.

- ▶ Start by slightly detuning all of the voices used in this sound.
- ▶ Separate the stereo position of each voice.

You will get a sonority that is naturally large and nearly identical to what can come from a chorus effect. It should be noted that the more voices you use, the richer the sound.



Detune all of the singles

## 8 MODES OF USE OF THE CS-80V

### 8.1 STAND-ALONE

The CS-80V application can be used as an instrument independently of a sequencer (*stand alone* mode).

This lets you open one or several instruments, and to play with a master MIDI keyboard.

---

*Attention! The stand-alone application is only available on PC and Mac OSX*

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#### 8.1.1 Launching the application

To launch the CS-80V application on PC, go to the menu **Start > Program Files > Arturia > CS-80V** and choose **CS-80V**.

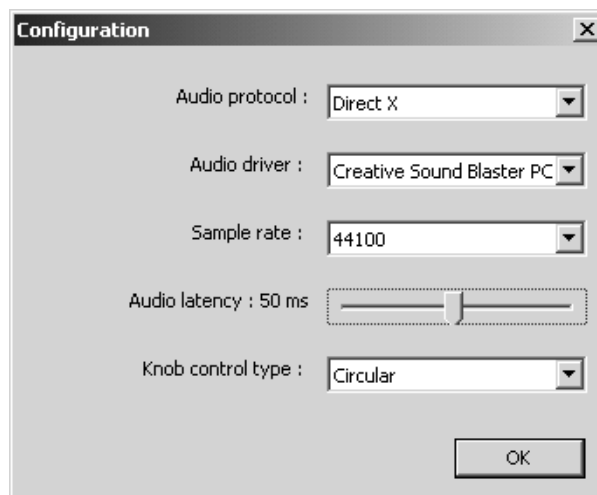
On Macintosh, open the installation folder and double-click on the **CS-80V** application icon.

You can also click on a previously saved document to open the corresponding configuration in the CS-80V application.

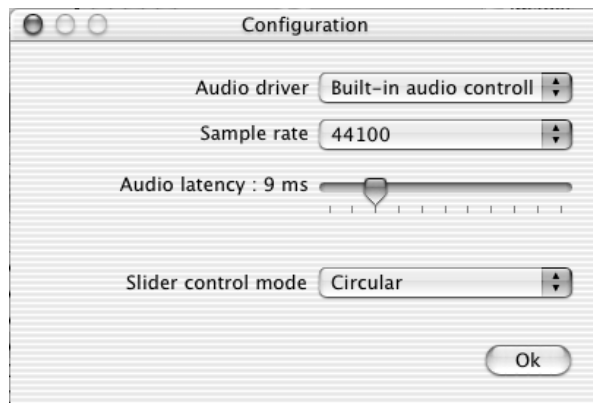
#### 8.1.2 Setting preferences

The preferences window is where you can set the global preferences of the CS-80V application. These preferences are automatically saved.

To display the preferences window: **File > Preferences** on Pc and through the menu **CS-80V > Preferences** on Mac.



*PC preferences window*

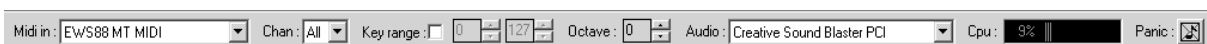


*Mac preference window*

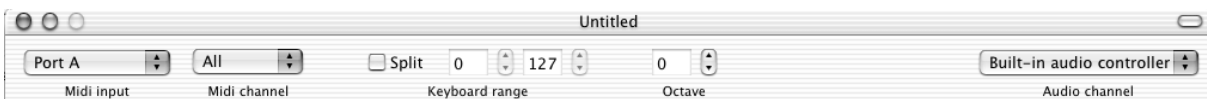
- ▶ *Protocol (Pc only)*: Select the audio protocol that you wish to use. If you have ASIO drivers for your sound card, we recommend that you use this protocol instead of DirectX. The ASIO drivers offer increased performances compared to the DirectX drivers.
- ▶ *Driver*: Select the driver corresponding to the sound card that you want to use.
- ▶ *Frequency*: Here choose the sampling frequency among those offered by your sound card.
- ▶ *Latency*: Here you can set the optimal audio latency depending on the performance of your sound card and your system. Attention, latency too weak can cause the sound to jump.
- ▶ *Knob control type*: Here choose the mode of instrument potentiometer control.

### 8.1.3 Configuration of an instrument: the tool bar

Each instrument has a tool bar allowing the setting of MIDI event input routing, and the output of the sound.



*The PC tool bar*



*The Mac tool bar*

#### 8.1.3.1 Configuring MIDI routing

The first part of the tool bar lets you select the MIDI input that will be applied to the instrument.

Choose the MIDI port to which your keyboard is connected, as well as the channel that you want to use. You can choose to select a particular channel or all of the channels of this port by selecting 'All' in the choice of MIDI channels.

### 8.1.3.2 Configuration of the keyboard zone

The keyboard zone lets you use just one section of your keyboard to command the instrument. In this manner, you can play several instruments on the same keyboard, each one on a different zone.

To activate this function, check the 'zone' option in the tool bar. You can then limit the keyboard zone to be used by setting the lowest and highest notes to be applied to this instrument.

### 8.1.3.3 Configuration on the octave

The octave lets you move the notes of your keyboard by one or several octaves. This function is interesting if your keyboard doesn't cover the octave that you want to play or if you have activated the keyboard zone option.

### 8.1.3.4 Configuration of the audio output

The last part of the tool bar lets you select the audio channel on which you wish to play the instrument.

If the sound card that you have selected offers several audio outputs, you will find a list of available audio outputs. Just choose the pair of outputs that you want to use to play this instrument

## 8.1.4 Information on rate of processor use

The processor usage gage lets you control the processor power dedicated to sound synthesis in real time.

On PC, this gage is directly visible in the instruments tool bar.

On Mac, you can display it from the application menu **Window > Cpu** or through the shortcut **⌘+L**.


---

*Attention: this information only corresponds to the processor rate dedicated to sound synthesis, which is not the same as global system load.*

---

## 8.1.5 Panic

If the notes remain active without reason, it is possible to send a MIDI message to the instruments to cut all of the notes that haven't stopped.

On PC, click on the  icon in the tool bar of the instrument.

On Mac, this command is found in menu **Help > Panic** or with the shortcut **⌘+⌘+P**.

## 8.1.6 Saving an instrument

This allows you to save the state of an instrument, which is to say the sound settings, but also the MIDI and audio configuration.

To save a configuration, simply select the menu **File > save** or **File > Save as ...** to save under a different name.

---

*Attention: Saving a configuration in the CS-80V application saves the sound settings on the instrument, this has nothing to do saving the sound presets of the instrument itself (cf. 4.1.3 Saving a user preset). Saving in the application does not imply saving the current preset.*

---

## 8.2 **VST™**

### 8.2.1 **Installation**

#### 8.2.1.1 For Windows

During the installation, check the «VST» option among the plug-in formats proposed. The installer will automatically detect the VST instrument folder used by your VST host, such as Cubase. In the case of another VST compatible sequencer, like Logic Audio for example, you need to manually copy the plug-in file to the appropriate folder. You can find this file after installation in the folder «C:\Program Files\Arturia\CS-80V\ ». The file is named «CS-80V.dll».

#### 8.2.1.2 For Mac OS 9

During the installation, check the «VST» option among the plug-in formats proposed. Next, the installer will offer to automatically look for the folder containing the virtual instruments used by your sequencer (Cubase or Logic Audio), and may ask you to confirm its choice. It is possible that the installer fails to automatically find your sequencers installation folder. In this case you can still manually copy the plug-in file (which is found after installation in «Applications/Arturia/CS-80V/VSTPlugin») to the appropriate folder of your sequencer.

#### 8.2.1.3 For Mac OS X

During the installation, check the «VST» option among the plug-in formats proposed. The VST plug-in will automatically be installed in the system folder corresponding to VST instruments, allowing it to be used by your VST host applications.

### 8.2.2 **Using the instrument in VST mode**

The opening of the CS-80V VST plug-in is like any other VST plug-in, please consult the host sequencers user manual for more information. For Cubase SX, open the menu «Devices / VST Instruments», and choose the CS-80V in the rack:



*Opening the CS-80V in Cubase SX for PC*

### 8.2.3 **Connection to a MIDI track**

So that the CS-80V can play information coming from a MIDI track, you need to choose a MIDI track and select the CS-80V as MIDI output of this track by using the menu for this in Cubase:





*Connection of a MIDI track to the CS-80V*

The MIDI events played on a MIDI keyboard are then transmitted by your sequencer to the CS-80V. It is of course possible to record these MIDI events, and use the entire MIDI editing options of the sequencer.

#### **8.2.4 Saving presets**

When the session is saved, the state of the CS-80V is saved as is, even if the programming corresponds to no preset. For example, if you were working on a preset «BassOne» on which you had changed settings (without saving them as «BassTwo»), the next time you open the song, the CS-80V will load the preset «BassOne» plus the changes.

The drop down menu offered within the VST sequencer which saves the settings of a plug-ins is of course compatible with the CS-80V. Nonetheless it is strongly recommended that you use the internal menu of the CS-80V: the presets saved in this manner can be used in any other mode (standalone or other sequencer), and can be exported as a separate file.

#### **8.2.5 Automation**

Automation works with the CS-80V like any other VST plug-in (see the VST sequencer documentation for more details on plug-in automation). Preset changes, however cannot be automated.

## 8.3 PRO TOOLS™

### 8.3.1 Installation

During the installation, select the RTAS/HTDM plug-in (RTAS only for PC) among the choice of plug-ins offered. Then, when you are asked, indicate the folder where the other RTAS and HTDM plug-ins are installed. Generally the access is:

- ▶ for Mac OS 9: System Folder/DAE Folder/Plug-Ins
- ▶ for Windows : C:\Program Files\Digidesign\DAE\Plug-Ins

Whether your system can, or cannot use HTDM plug-ins (see next section), the installation is the same.

For Mac OS 9, you need to increase the memory allocated to DAE (see the Pro Tools manual for the procedure) by around 15 megabytes.

### 8.3.2 RTAS and HTDM standards

The CS-80V can function with the Digidesign audio engine (DAE) in two manners:

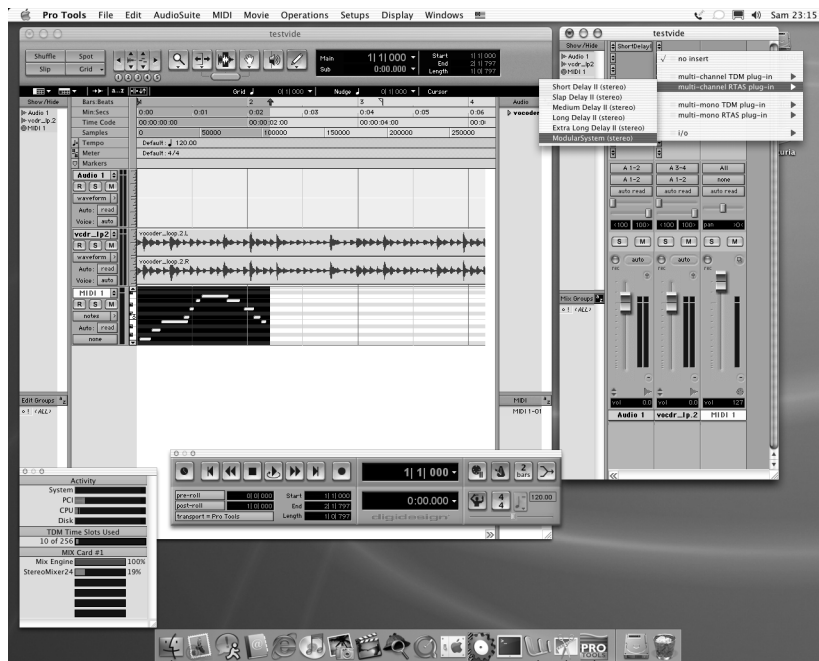
- ▶ As an RTAS plug-in (Real Time Audio Suite).  
All Pro Tool systems are compatible with this standard: the sound treatment is done completely by the central unit, and therefore does not require any specific extension card (TDM type system). On the TDM systems, the RTAS plug-ins can only be loaded on an audio track before the TDM plug-ins. They cannot be loaded to an *Aux Input* or a *Master Fader*.
- ▶ As a HTDM plug-in (Host Time Division Multiplexing).  
Only TDM Systems (so with at least one extension card) for Mac OS 9 and X can use these plug-ins (refer to Digidesign for HTDM compatibility with Windows which is to come). The latter work exactly like TDM plug-ins (no limitations on insertion positions, etc...), with the difference being that the treatment is primarily being done by the central unit, and not by the extension cards.

Recap on the compatibility:

|                                       | Mac OS 9 and X  | Windows 98/2000/XP                                    |
|---------------------------------------|---|---|
| TDM System                            | RTAS and HTDM<br>(stereo in/stereo out)               | RTAS<br>(stereo in/stereo out)                        |
| Other Systems<br>(Pro Tools LE, Free) | RTAS (mono in/stereo out<br>and stereo in/stereo out) | RTAS (mono in/stereo out<br>and stereo in/stereo out) |

### 8.3.3 Opening the instrument

Access to the CS-80V plug-in is like any other plug-in, like for example through the insertion of an audio track:



*Opening the CS-80V in Pro Tools for Mac OS X*

- ▶ TDM systems: the CS-80V should be loaded to a stereo audio track. Opening as HTDM is done through the TDM menu, as a HTDM plug-in is used exactly like a TDM plug-in.
- ▶ Other systems: the CS-80V can be loaded on a mono audio track (which becomes stereo after the insertion) or stereo.

We can now make the CS-80V sound by playing with the mouse on the virtual keyboard.

### 8.3.4 Connection to a MIDI node

So that the CS-80V can play information coming from a MIDI track, it must be associated to a MIDI node through the appropriate menu.

We can so control the CS-80V through a command keyboard (see the Pro Tools manual for the connection of this type of device).

### 8.3.5 Saving presets

When the session is saved, the state of the CS-80V is saved as is, even if the programming corresponds to no preset. For example, if you were working on a preset «BassOne» on which you had changed settings (without saving them as «BassTwo»), the next time you open the song, the CS-80V will load the preset «BassOne» plus the changes.

The «Librarian Menu» in Pro Tools can of course be used with the CS-80V like any other plug-in. Nonetheless, we recommend that you use the internal menu of the CS-80V. This is for several reasons:

- ▶ Presets saved in this manner can be used in any other sequencer, making the exchange between users easier.
- ▶ They will be compatible with the different versions of the CS-80V that will appear later on.

### **8.3.6 Automation in Pro Tools**

Automation works with the CS-80V like any other RTAS/HTDM plug-in (refer to the Pro Tools documentation for more details on plug-in automation).  
Preset changes, however cannot be automated.

## 8.4 **DXI™**

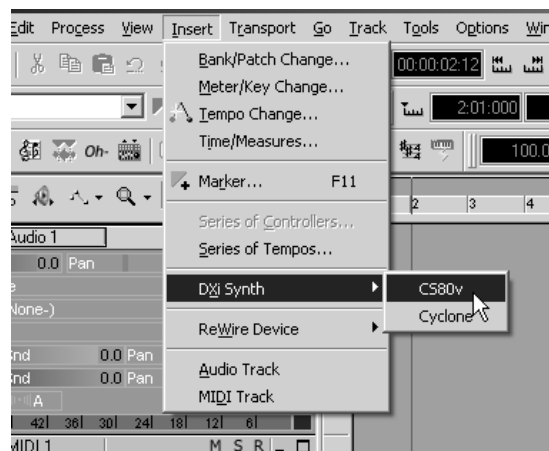
The CS-80V is compatible with the Dxi protocol, and so can be used notably with Sonar, but also with all other sequencers that accept Dxi instruments.

### 8.4.1 **Installation**

During the installation, check the «DXi» option among the list of protocols that you want to activate for the CS-80V on your computer, and follow the onscreen instructions to the end of the installation. As soon as the installation has been completed, the CS-80V can be used as a Dxi instrument.

### 8.4.2 **Opening the instrument (SONAR™ 2.0)**

In the «Insert» menu, open the «DXi Synth» sub-menu and choose the CS-80V.



*Opening DXi instrument*

The «Synth Rack» window will appear. To get to the graphical interface of the CS-80V, double-click on its name in the «Synth Rack» menu.

### 8.4.3 **Connection to a MIDI track**

So that the CS-80V can play information coming from a MIDI track, you need to choose a MIDI track and select the CS-80V as MIDI output for this track by using the menu for this in Sonar:



*Connection of a MIDI track to the CS-80V*

The MIDI events played on a MIDI keyboard are then transmitted by Sonar to the CS-80V. It is of course possible to record these MIDI events, and use the entire MIDI editing options available in Sonar.

#### **8.4.4 Saving presets**

When the session is saved, the state of the CS-80V is saved as is, even if the programming corresponds to no preset. For example, if you were working on a preset «BassOne» on which you had changed settings (without saving them as «BassTwo»), the next time you open the song, the CS-80V will load the preset «BassOne» plus the changes.

#### **8.4.5 Automation**

Automation with Sonar works simply by reception and recording of MIDI messages of the type *Control Change*. You can configure the reception of MIDI events by the CS-80V in the same way as standalone mode. The sequencer takes care of recording the continuous controls transmitted to the CS-80V, and lets you edit them.

## 8.5 DIGITAL PERFORMER™

### 8.5.1 Installation

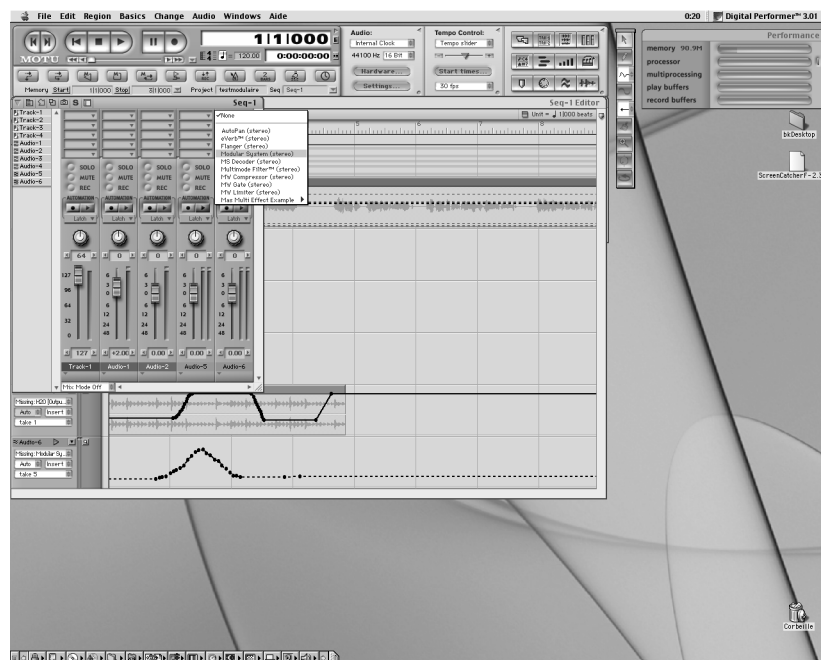
During the installation procedure, check the MAS choice among the plug-in formats offered. The CS-80V will be automatically installed in the MAS plug-in folder:

*System Folder/Extensions/MOTU/Plug-ins*

To use the CS-80V, you will need to increase the tempo memory allotted to Digital Performer by around 15 MB.

### 8.5.2 Opening the instrument

Access to the CS-80V plug-in is the same as for any other plug-in, through the insertion of an audio track:



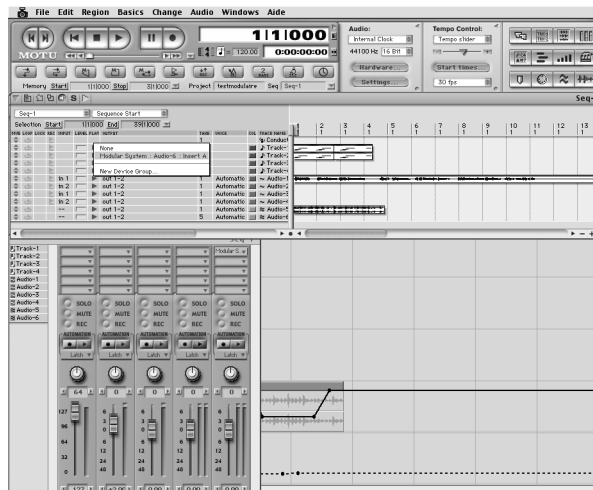
*Opening the CS-80V in Digital Performer*

The CS-80V can be loaded to a mono track (after insertion it becomes a stereo track) or stereo track

We can now make the CS-80V «ring» by playing with the mouse on the virtual keyboard.

### 8.5.3 Connection to a MIDI node

So that the CS-80V can play information coming from a MIDI track, it must be associated to a MIDI node through the appropriate menu:



*Connection of the CS-80V to a MIDI node*

We can thus also control the CS-80V through a command keyboard (see the Digital Performer manual for the connection of this type of device).

### 8.5.4 Saving presets

When the session is saved, the state of the CS-80V is saved as is, even if the programming corresponds to no preset. For example, if you were working on a preset «BassOne» on which you had changed settings (without saving them as «BassTwo»), the next time you open the song, the CS-80V will load the preset «BassOne» plus the changes.

The dropdown menu offered by Digital Performer to save the settings of a plug-in does work with the CS-80V. Nonetheless, we recommend that you use the internal menu of the CS-80V. This is for several reasons:

- ▶ Presets saved in this manner can be used in any other sequencer, making the exchange between users easier.
- ▶ They will be compatible with the different versions of the CS-80V that will appear later on.

### 8.5.5 Automation

Automation works with the CS-80V like any other MAS plug-in (refer to the Digital Performer documentation for more details on the automation of plug-ins). The changes in presets (and so the movement of cables) cannot be automated.



## 9 APPENDICES

### 9.1 LIST OF ABBREVIATIONS FOR GENERAL PARAMETERS FOR ALL POLYPHONIC VOICES:

atavcf : Pressure action setting (after touch) on the amplitude of the sub-oscillator action on the VCF  
atavco : Pressure action setting (after touch) on the amplitude of the sub-oscillator action on the VCO  
atinit : Velocity action setting on the glissando for the start of the note  
atspeed : Pressure action setting (after touch) on the frequency of the sub-oscillator  
bend : Tuning wheel (pitch bend)  
brill : General synthesizer brilliance  
depcho : Chorus depth  
depdel : Delay depth  
drydel : Level of mixing of the part treated by the delay  
exp : Expression pedal  
kbrhi : Key follow setting for the superior section, on the on the filter cut-off frequency  
kbrlo : Key follow setting for the inferior section, on the on the filter cut-off frequency  
kblvhi : Setting for the key follow for the superior section, on the VCA volume  
kblvlo : Setting for the key follow for the inferior section, on the VCA volume  
mod : Modulation wheel  
panv1 : Panoramic of track1  
panv2 : Panoramic of track2  
panv3 : Panoramic of track3  
panv4 : Panoramic of track4  
panv5 : Panoramic of track5  
panv6 : Panoramic of track6  
panv7 : Panoramic of track7  
panv8 : Panoramic of track8  
portam : Portamento time setting  
reson : General synthesizer resonance  
ringAt : Ring modulator attack time  
ringDc : Ring modulator decay time  
ringDp : Ring modulator modulation depth  
ringMo : Amplitude of mixing of the part treated by the ring modulator  
ringSp : Sinusoid frequency of the ring modulator  
specho : Chorus speed  
spedel : Delay speed  
subAvcf : Modulation amplitude of the sub-oscillator on the vcf's  
subAvca : Modulation amplitude of the sub-oscillator on the vca's  
subAvco : Modulation amplitude of the sub-oscillator on the vco's  
subfrq : Sub-oscillator frequency  
tunv1 : Tuning of track1  
tunv2 : Tuning of track2  
tunv3 : Tuning of track3  
tunv4 : Tuning of track4  
tunv5 : Tuning of track5  
tunv6 : Tuning of track6  
tunv7 : Tuning of track7  
tunv8 : Tuning of track8  
volume : General synthesizer volume  
volv1 : Volume of track1  
volv2 : Volume of track2

volv3 : Volume of track3  
volv4 : Volume of track4  
volv5 : Volume of track5  
volv6 : Volume of track6  
volv7 : Volume of track7  
volv8 : Volume of track8

## **9.2 LIST OF ABBREVIATIONS FOR PARAMETERS THAT ARE APPLIED TO A PARTICULAR TONE.**

Each setting begins with « Sx », x being the tone (single) number, from 1 to 8, the following list is in relation to single 1:

S1AfBr1 : Brilliance of line 1, controlled by the pressure (after touch)  
S1AfLe1 : Volume of line 1, controlled by the pressure (after touch)  
S1AfBr2 : Brilliance of line 2, controlled by the pressure (after touch)  
S1AfLe2 : Volume of line 2, controlled by the pressure (after touch)  
S1Detun : Detuning of line 2 in relation to line 1  
S1ev1Al : Attack level for the envelope of the filters on line 1  
S1ev1At : Attack time for the envelope of the filters on line 1  
S1ev1Dc : Decay time envelope of the filters on line 1  
S1ev1In : Initial level for the envelope of the filters on line 1  
S1ev1Re : Release time for the envelope of the filters on line 1  
S1ev2At : Attack time for the envelope of the VCA on line 1  
S1ev2Dc : Decay time for the envelope of the VCA on line 1  
S1ev2Re : Release time for the envelope of the VCA on line 1  
S1ev2Su : Sustain time for the envelope of the VCA on line 1  
S1ev3Al : Attack level for the envelope of the filters on line 2  
S1ev3At : Attack time for the envelope of the filters on line 2  
S1ev3In : Initial level for the envelope of the filters on line 2  
S1ev3Dc : Decay time for the envelope of the filters on line 2  
S1ev3Re : Release time for the envelope of the filters on line 2  
S1ev4At : Attack time for the envelope of the VCA on line 2  
S1ev4Dc : Decay time for the envelope of the VCA on line 2  
S1ev4Re : Release time for the envelope of the VCA on line 2  
S1ev4Su : Sustain level for the envelope of the VCA on line 2  
S1FrHi1 : Line 1 high-pass filter cut-off frequency  
S1FrLo1 : Line 1 low-pass filter cut-off frequency  
S1FrHi2 : Line 2 high-pass filter cut-off frequency  
S1FrLo2 : Line 2 low-pass filter cut-off frequency  
S1InBr1 : Brilliance of line 1, controlled by the velocity  
S1InLe1 : Volume of line 1, controlled by the velocity  
S1InBr2 : Brilliance of line 2, controlled by the velocity  
S1InLe2 : Volume of line 2, controlled by the velocity  
S1Lev1 : Line 1 VCA level  
S1Lev2 : Line 2 VCA level  
S1LevF1 : Line 1 filter output level  
S1LevF2 : Line 2 filter output level  
S1Lf1Sp : Line 1 LFO speed  
S1Lf1Pw : Line 1 impulse width modulation amplitude  
S1Lf2Sp : Line 2 LFO speed  
S1Lf2Pw : Line 2 impulse width modulation amplitude  
S1Mixe : Mixing of line 1 and line 2  
S1M01Am : Modulation amplitude for line 1 of the matrix  
S1M02Am : Modulation amplitude for line 2 of the matrix

S1M03Am : Modulation amplitude for line 3 of the matrix  
S1M04Am : Modulation amplitude for line 4 of the matrix  
S1M05Am : Modulation amplitude for line 5 of the matrix  
S1M06Am : Modulation amplitude for line 6 of the matrix  
S1M07Am : Modulation amplitude for line 7 of the matrix  
S1M08Am : Modulation amplitude for line 8 of the matrix  
S1M09Am : Modulation amplitude for line 9 of the matrix  
S1M10Am : Modulation amplitude for line 10 of the matrix  
S1o1noi : Oscillator 1 noise level  
S1o1sin : Oscillator 1 sinusoid level  
S1o1wid : Oscillator 1 impulse width  
S1o2noi : Oscillator 2 noise level  
S1o2sin : Oscillator 2 sinusoid level  
S1o2wid : Oscillator 2 impulse width  
S1ReHi1 : Resonance of the line 1 high-pass filter  
S1ReLo1 : Resonance of the line 1 low-pass filter 1  
S1ReHi2 : Resonance of the line 2 high-pass filter  
S1ReLo2 : Resonance of the line 2 low-pass filter

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