

**USER'S MANUAL**

# CS-80V



**ARTURIA®**  
YOUR EXPERIENCE • YOUR SOUND

**Programming:**

Robert Bocquier (Lead Developer V2)  
Nicolas Bronnec (Lead Developer V1)  
Pierre-Jean Camilieri  
Thomas Diligent  
Sylvain Gubian  
Xavier Oudin

**Graphics:**

Thomas & Wolfgang Merkle [Bitplant]

**Manual:**

Antoine Back (V2)  
Sylvère Letellier (V2)  
Houston Haynes (V2)  
Tomoya Fukuchi (V2)  
Yasu Tanaka (V2)  
Jean-Michel Blanchet  
Yuji Sano

**Sound**

Jean-Michel Blanchet  
Sylvère Letellier  
A. Gonzales  
Christian Giudicelli  
Howard Scarr  
Jaime Newman  
Ludovic Llorca  
M. Fabio

Scott Solida  
Glen Darcey  
Darrell Diaz  
Chris Laurence  
Mateo Lupo  
Jamie Muhoberac  
Chris Pittman  
Katsunori

Ujiie

**Designers:**

**Thanks to:**

Pascal Blin, Elsa Chal-Debeauvais, Randy Fuchs, Mr Tohyama, Akira Naito, Houston Haynes, Fabrice Paumier, Laurent Falla and the numerous beta testers.

**Very special thanks to:**

Yamaha Corporation<sup>™</sup>

© ARTURIA S.A. – 1999-2014 – All rights reserved.  
30, Chemin du Vieux Chêne  
38240 Meylan  
FRANCE  
<http://www.arturia.com>

Information contained in this manual is subject to change without notice and does not represent a commitment on the part of Arturia. The software described in this manual is provided under the terms of a license agreement or non-disclosure agreement. The software license agreement specifies the terms and conditions for its lawful use. No part of this manual may be produced or transmitted in any form or by any purpose other than purchaser's personal use, without the express written permission of ARTURIA S.A.

Other products, logos or company names quoted in this manual are trademarks or registered trademarks of their respective owners.

**November 2014 edition**

# TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>5</b>
1.1	THE BIRTH OF THE YAMAHA™ CS-80.....	5
1.2	WHY A VIRTUAL CS-80? .....	7
1.3	A BETTER EMULATION THANKS TO TAE®.....	8
1.3.1	<i>Aliasing-free oscillators</i> .....	8
1.3.2	<i>A better reproduction of analog oscillator waveforms</i> .....	9
1.3.3	<i>A better reproduction of analog filters</i> .....	10
1.3.4	<i>Ring modulator</i> .....	10
1.1.1	NO END IN SIGHT.....	11
<b>2</b>	<b>ACTIVATION &amp; FIRST START.....</b>	<b>12</b>
2.1	REGISTER & ACTIVATE .....	12
<b>3</b>	<b>QUICK START .....</b>	<b>13</b>
3.1	USE OF PRESETS .....	13
3.2	METHODS OF PLAYING .....	14
3.3	OVERVIEW OF THE SINGLE MODE (CS-80) .....	16
3.4	OVERVIEW OF THE MULTI MODE .....	18
3.5	THE REAL TIME CONTROLLERS AND MIDI ASSIGNATION.....	20
3.6	THE EFFECTS SECTION .....	21
3.7	THE MODULATION MATRIX.....	21
<b>4</b>	<b>THE INTERFACE.....</b>	<b>23</b>
4.1	USE OF PRESETS .....	23
4.1.1	<i>Choice of a bank, sub-bank, preset</i> .....	23
4.1.2	<i>Creation of a bank, sub-bank, preset</i> .....	24
4.1.3	<i>Saving a user preset</i> .....	24
4.1.4	<i>Import/ Export of a bank of presets</i> .....	24
4.2	USING CONTROLLERS .....	25
4.2.1	<i>Sliders</i> .....	25
4.2.2	<i>Knobs</i> .....	25
4.2.3	<i>Switches</i> .....	26
4.2.4	<i>Ribbon</i> .....	26
4.2.5	<i>Setting keyboard zones</i> .....	26
4.2.6	<i>Virtual Keyboard</i> .....	27
4.2.7	<i>MIDI control</i> .....	27
4.3	THE SOUND MAP .....	29
4.3.1	<i>The MAP main interface</i> .....	30
4.3.2	<i>The LIST preset manager</i> .....	34
4.3.3	<i>The COMPASS morphing interface</i> .....	36
<b>5</b>	<b>USING THE CS-80V .....</b>	<b>38</b>
5.1	SINGLE MODE .....	38
5.2	TWO LINES OF SYNTHESIS .....	38
5.3	THE MODULATION MATRIX.....	41
5.4	THE SUB-OSCILLATOR .....	42
5.5	THE KEYBOARD MODULATIONS .....	43
5.6	THE RING MODULATOR .....	43
5.7	CHORUS/TREMOLO .....	44
5.8	STEREO DELAY.....	44
5.9	THE PEDALS.....	44
5.10	THE ARPEGGIATOR .....	45
5.11	THE ORIGINAL PRESET BUTTONS .....	46
5.12	THE RIBBON.....	46
5.13	GENERAL SETTINGS .....	46
5.14	THE MULTI MODE .....	47
<b>6</b>	<b>THE BASICS OF SUBTRACTIVE SYNTHESIS .....</b>	<b>50</b>

6.1	THE THREE MAIN ELEMENTS .....	50
6.1.1	<i>The oscillator (VCO).....</i>	50
6.1.2	<i>The filter or VCF.....</i>	53
6.1.3	<i>The amplifier or VCA.....</i>	55
6.2	OTHER MODULES .....	56
6.2.1	<i>The keyboard.....</i>	56
6.2.2	<i>The envelope generator.....</i>	56
6.2.3	<i>The low frequency oscillator.....</i>	57
<b>7</b>	<b>A FEW ELEMENTS OF SOUND DESIGN .....</b>	<b>60</b>
7.1	SUBTRACTIVE SOUND SYNTHESIS .....	60
7.1.1	<i>A basic sound .....</i>	60
7.1.2	<i>The modulation matrix.....</i>	61
7.1.3	<i>Use of real time controllers.....</i>	62
7.2	MULTI MODE.....	63
7.2.1	<i>Four different sounds on the keyboard.....</i>	64
7.2.2	<i>A composite sonority in unison mode.....</i>	64
7.2.3	<i>Introduction of the arpeggiator in a Multi preset.....</i>	65
7.3	OTHER SIDES OF THE CS-80V .....	66
7.3.1	<i>A step sequencer.....</i>	66
7.3.2	<i>Stereo sound without the effects .....</i>	67
<b>8</b>	<b>MODES OF OPERATION.....</b>	<b>68</b>
8.1	STANDALONE.....	68
8.1.1	<i>Launch the application.....</i>	68
8.1.2	<i>Configuration of the instrument.....</i>	68
8.2	VST 2 .....	69
8.3	VST 3 .....	69
8.4	RTAS.....	69
8.5	AU.....	69
8.6	64 BIT COMPATIBILITY .....	69
8.7	USE IN CUBASE/NUENDO (VST).....	70
8.7.1	<i>Instrument use in VST mode.....</i>	70
8.7.2	<i>Rescan the plug-in directory in Cubase .....</i>	70
8.7.3	<i>Saving of presets .....</i>	71
8.8	USING IN PRO TOOLS (RTAS) .....	71
8.8.1	<i>Opening of the plug-in .....</i>	71
8.8.2	<i>Saving the presets.....</i>	72
8.8.3	<i>Automation under Pro Tools .....</i>	72
8.9	USING IN LOGIC, MAC OS X (AU) .....	72
8.10	USING IN ABLETON LIVE (AU AND VST).....	73
<b>9</b>	<b>APPENDICES.....</b>	<b>75</b>
9.1	GENERAL PARAMETERS FOR ALL POLYPHONIC VOICES .....	75
9.2	PARAMETERS APPLIED TO A PARTICULAR TONE.....	76
<b>10</b>	<b>CS-80V END USER LICENSE AGREEMENT .....</b>	<b>78</b>

# 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 costed \$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 (83 kg 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*

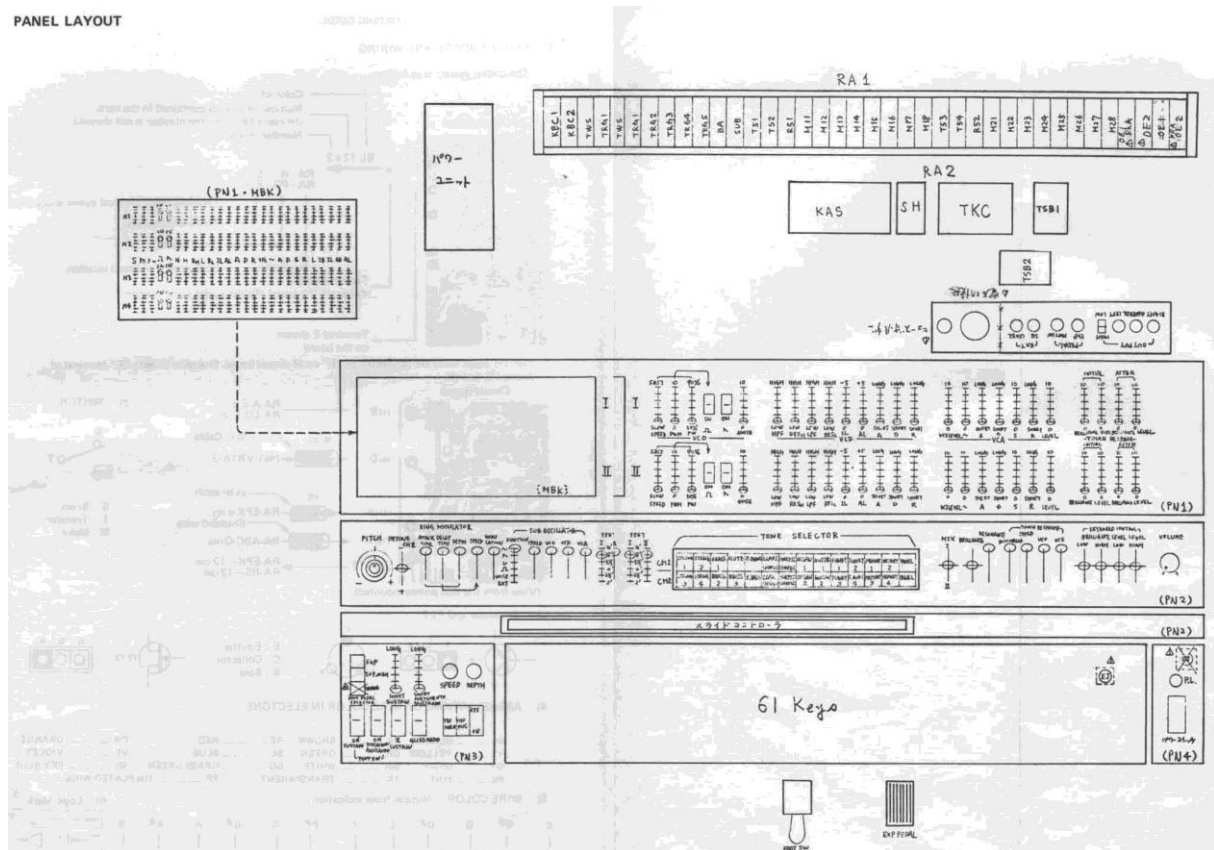
The CS-80 was made popular in the late 70's and early 80's by a number of pop groups, including Electric Light Orchestra, Toto, Paul McCartney and Wings. Other artists and bands like Vangelis, Bon Jovi, Jean-Michel Jarre, Geoffrey Down, Stevie Wonder and some others managed to turn the CS-80 into a real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

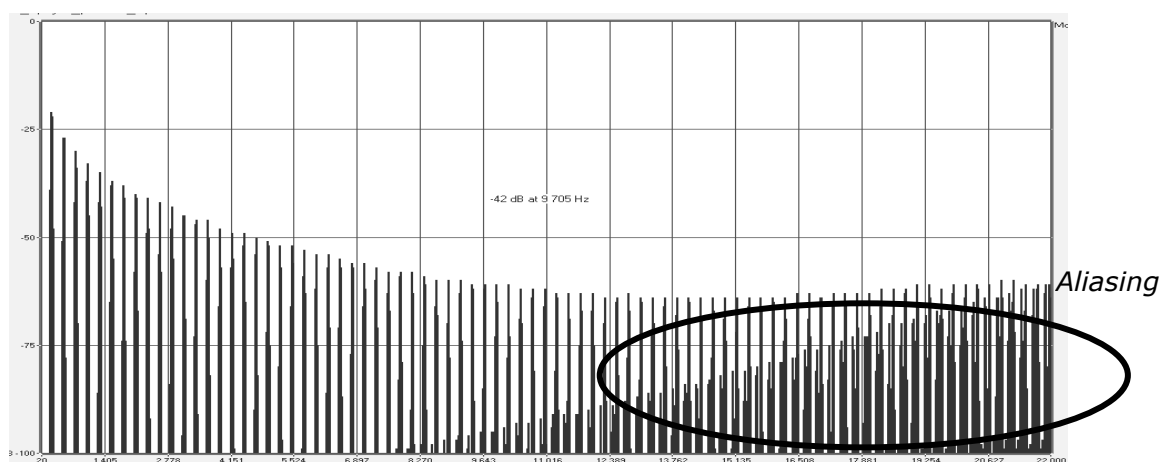
When implemented in software code, TAE® algorithms guarantee the respect of hardware specifications. This is why your CS-80V offers an unparalleled quality of sound.

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

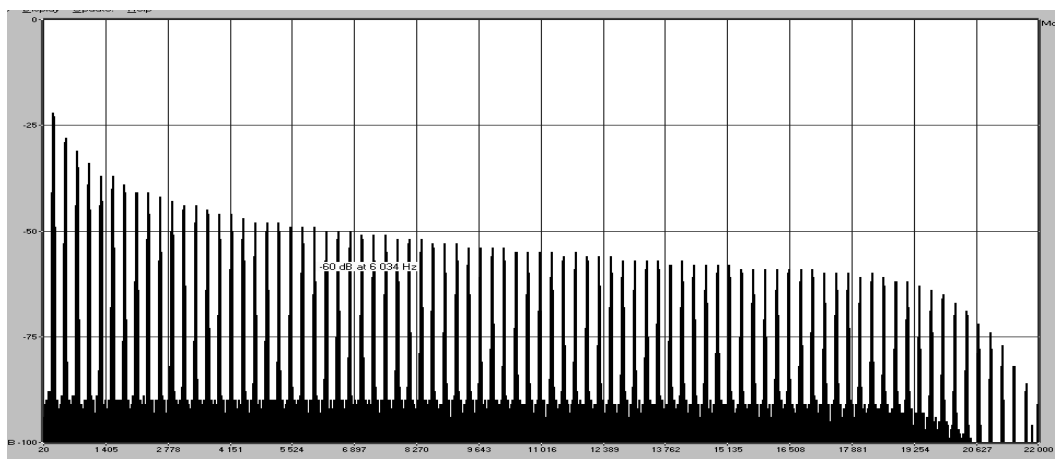
#### **1.3.1 Aliasing-free oscillators**

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, etc.), and at no CPU extra cost.



*Linear frequency spectrum of an existing well-known software synthesizer*



*Linear frequency spectrum of the CS-80V oscillator made with TAE®*

### 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 sawtooth, 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 sawtooth waveform, deformed by high-pass and low-pass filtering, of the original CS-80*



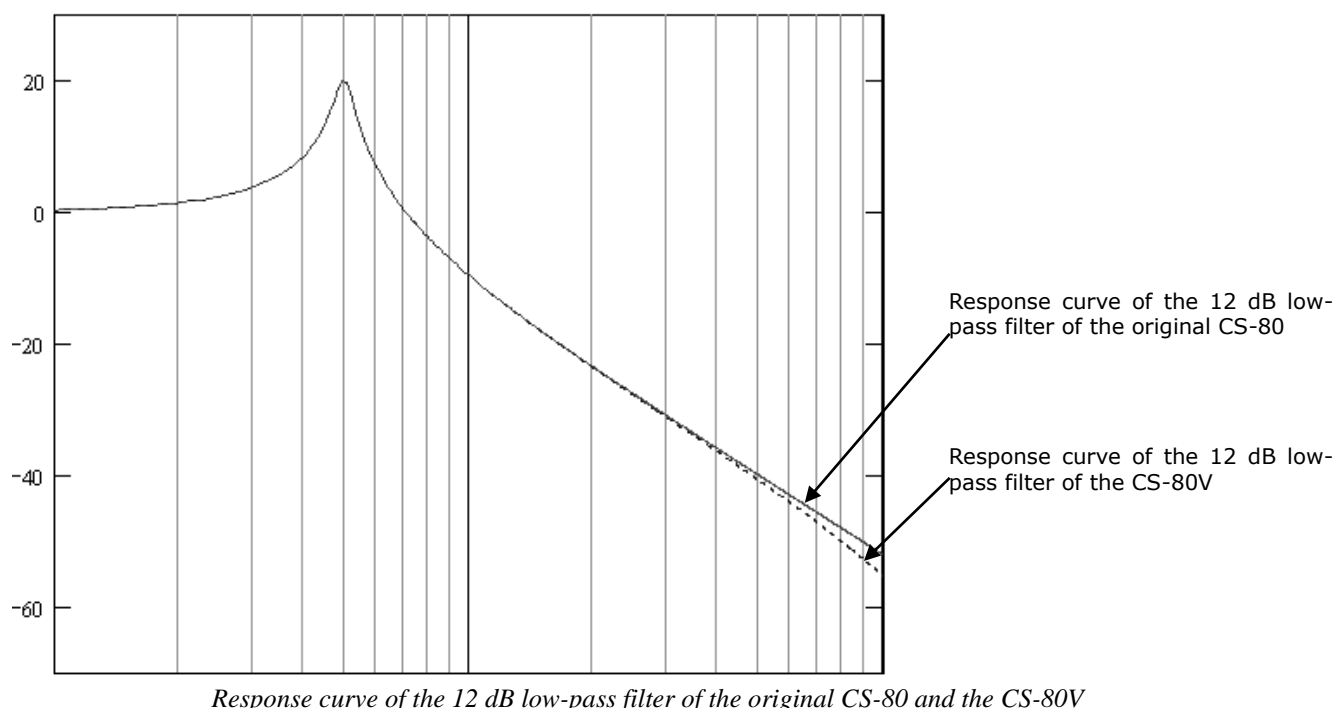
*Temporal representation of a sawtooth waveform, deformed by high-pass and low-pass filtering, reproduced by TAE®*

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. These curves show 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 sine wave) 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.

- 
- The ancillary and perhaps lingering response of additional components, such as the snares under a snare drum.

Similar complexities can be found in instruments such as an acoustic guitar. A few years ago, a French scientist finally completed a comprehensive modeling of all acoustic guitar parameters. The calculations to produce the sound took three days!

The second-biggest challenge of physical modeling synthesis is to simplify the algorithms wherever possible without sacrificing the essential nature of the instrument being modeled. The goal is to achieve an efficient model which can be used interactively, in real time, without limiting the spontaneous paths a musician may take during a rush of creativity.

### **1.1.1 No END IN SIGHT**

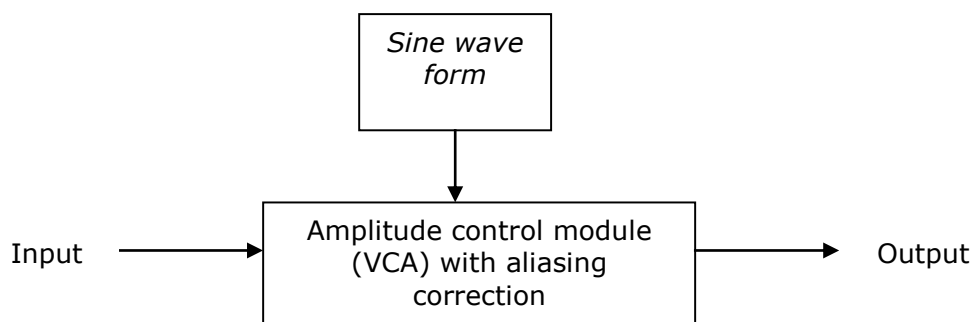
There are several methods of physical modeling synthesis, including Karplus-Strong algorithms, digital waveguide synthesis, and formant synthesis. Each one uses a different paradigm to bring a modeled sound to its musical fruition.

The main point here is that physical modeling synthesis is capable of recreating the character of a “real” instrument during performance, including its subtle nuances of expression, while using a thousand times less hard drive space than the “sampling” method would take to produce an inferior result.

If that were not amazing enough, it should be mentioned that physical modeling algorithms have the ability to combine parameters into instruments that have never existed. There is no limit to the types of sounds that can be produced!

And when you bring together a bunch of music lovers who also have a tremendous grasp of the applicable laws of physics and the characteristics of electronic circuits, you wind up with Arturia. And Arturia now offers you our latest marriage of math and music, the Solina V.

May it help you weave the music of your dreams!



## 2 ACTIVATION & FIRST START

**CS-80 V** works on computers equipped with Windows 7 or 8 and Mac OS X 10.7 or later. You can use the stand-alone version or use **CS-80 V** as an Audio Units, AAX, VST2 or VST3 instrument.



### 2.1 REGISTER & ACTIVATE

---

Once the CS-80 V has been installed, the next step is to register the software.

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

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

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

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

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

## 3 QUICK START

This chapter will help you 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 8 *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 front panel

### 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, the original CS-80 only allowed 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 *J.M.B\_4Vces\_unis*.

- ▶ 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 *JM.Blanchet*.  
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 *Basses* and finally select *J.M.B\_4Vces\_unis* among the presets.



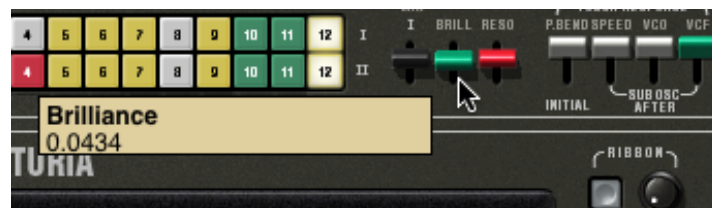
Select a preset

The CS-80V is shipped with about 800 presets, which will allow you to get to know the sounds of the synthesizer. A bank called *Templates* proposes a selection of presets which allow you to work from a basic template when programming a sound.

⚠ It is also possible to view sounds by 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*.

Let's modify this preset. For this, we'll begin with a simple modification.

- Modify the brilliance of the preset 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.



Change the brilliance of the sound

- In the same manner, you can change the range of the oscillator by decreasing the linear *FEET* 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')

With these first settings, you have already modified the preset *J.M.B\_4Vces\_unis*. 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 (similar to 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 monophonic) 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 only 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 area. You can activate this reduced mode by clicking on the *KBD* icon, which is on the right of the tool bar.



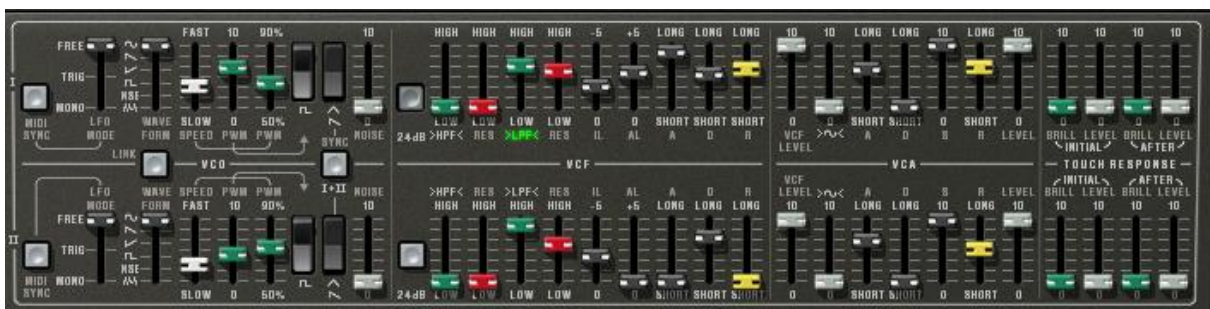
*The reduced mode*

### 3.3 OVERVIEW OF THE 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, sawtooth 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 aftertouch 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 *2VCO\_1VCF\_Link* from the *Templates / Filters* sub-bank.

- First, set the mix output to first voice as the image below:



- 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 (*RES*). 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 OVERVIEW OF THE 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 the 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 mode).

Let's follow this example:

- ▶ Choose the preset *Tremolo* in the *Templates low frequency* bank and *Effects* sub-bank. In this example, the 8 voices all have the same settings.
- ▶ First, open the Multi mode to access the parameters.
- ▶ Now, set the different zones as follows:
  - 1.1 The first 4 voices will occupy zone1 (C1 to B3);
  - 1.2 The fifth voice will occupy zone2 (C4 to C5);
  - 1.3 The sixth voice will occupy zone 3 (C5 to C6)
  - 1.4 The seventh & eighth voices will occupy the zone 4 (C6 to C7).
  - 1.5 All these zones must be configured on all MIDI channels by selecting *Omni*, close to the Keyboard range.
- ▶ The voice modes allow you to play differently according the voice:
  - 1.6 Set the *UniLast* for each voice
  - 1.7 Deactivate the *PORTA*, *R.MOD* and *FX* buttons for each voice
  - 1.8 Set the *FEET* voice to 16", this will create a bass for the low part of the keyboard.



*Keyboard and MIDI configuration*



*Feet configuration*

- ▶ In order to get a polyphonic voice you have to set number of polyphonic voices in the tool bar, x3 is enough for our sound:



*Set the polyphony*

- ▶ Here you can see the zone assignment:



*The keyboard zone assignment*

- ▶ Before changing the different mode parameters, please deactivate the tremolo effect (*TREM*) in the effect zone.

Now let's apply some change to our sound:

- ▶ 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 1.00R).
- ▶ Detune this voice by slightly turning the detune knob (*DET*) to the right (value of +1.40).
- ▶ Now change the pan position of the second single fully to the left (value 1.00L).
- ▶ Detune this voice by turning the knob *DET* to the left (value of +0.9945).
- ▶ Apply the same changes to the third and fourth voice.
- ▶ Place these 4 voices to unison mode by selecting the *UniLast* setting in the *VOICE MODE* menu in the edit zone. The sound of the first 4 voices 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 fifth Single placed in zone 2 must now be configured as a *Random* voice mode. It will play a polyphonic accompaniment sound.



*Random mode*

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



*Ring mode activation*

Your keyboard now contains 4 different zones: first is a bass, second is a polyphonic keyboard, and third and fourth are leads.


You can change the parameters of all the voices as you want, for example, you can change the patch of each voice. Then you can play up to 8 different sounds on 4 zones. To do that, just click on the patch number close to the zone number. Select your patch and edit it by clicking on the red *Edit* button.

It's also possible to define various parameters like arpeggio or the MIDI channel of the zone. Below you will find a list of these parameters:

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

---


 To quickly isolate a voice (where the EDIT button is lit) and play it across the whole keyboard, just close the Multi panel.

---

For the 4 zones:

- The MIDI channel (from 1 to 16 and Omni)
- The low and high notes (from C2 to C8)
- The playing mode (rotating polyphonic trigger, reassigned, reinitialized, monophonic unison)
- Arpeggio activity

---

 If you wish to preserve CPU power, avoid using the Rotate mode, rather place the zone on ReAssign mode.

---

### 3.5 THE REAL TIME CONTROLLERS AND MIDI ASSIGNATION

Like its excellent ancestor, the CS-80V is particularly adapted to real time playing. 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 "MIDI Learn" button of the toolbar
- ▶ Click on the brilliance knob (*BRILL*). A MIDI assign dialog then appears.
- ▶ Move the MIDI controller of your choice (the modulation wheel for example). The CS-80V knob will move with it.
- ▶ Next, you can automate the movements of your MIDI controller in your MIDI sequencer or simply make it evolve in real time when you are playing live.



*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 aftertouch information
- A ribbon controller lets you continuously control any synthesizer parameter through a modulation matrix, the base assignment being oscillator frequency.



### 3.6 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 *Tremolo* example and see how to use the effects within Multi mode:

- ▶ Deactivate the FX button for Single1. We won't place effects on the bass sound.



*Sending sound to the effects*

- ▶ Leave the FX button activated on the singles you want.

---

⚠ It is important to know that effect settings are the same for all singles with the same patch.

---

- ▶ Activate the ON/OFF switch for Chorus and Delay in the effects section, on the left of the virtual keyboard.
- ▶ Set the Delay *MIX* knob to counterbalance the dry sound of the Singles and the return of the delay.
- ▶ Next turn the Delay *SPEED* knob 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 faster 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 can be saved in the preset that you have created.

### 3.7 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 (*SubOsc*, *EG*, etc.) which will modulate 10 destinations (*VCO 1 Freq*, *LP 2 res*, 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.

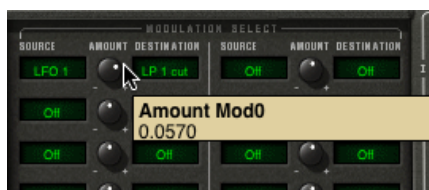
Let's apply 2 supplementary types of modulation to the preset *2VCO\_1VCF\_Link*:

- ▶ Open the hatch of the matrix to access the parameters.
- ▶ Among the modulation sources, choose the first low frequency oscillator (*LFO 1*).
- ▶ Choose the cut-off frequency for the low-pass filter among the destinations by selecting *LP 1 cut*.



*Modulate the frequency of the low-pass filter (LP 1 cut) with the LFO (LFO 1)*

- ▶ Between the LCD screens is a knob (*AMOUNT*). 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. You can also set the speed of the Sub Oscillator by changing the value of the *SPEED* button.

## 4 THE INTERFACE

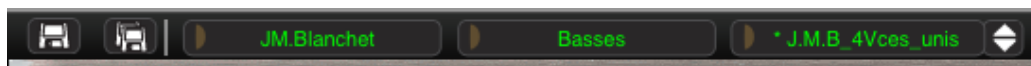
### 4.1 USE OF PRESETS

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 *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.

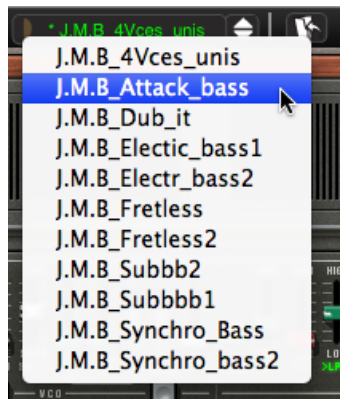
#### 4.1.1 Choice of a bank, sub-bank, preset

The bank, sub-bank and preset currently in use by the CS-80V are each 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 on the left of the field, 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*

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.

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 left sided arrow 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 middle sided button, and select *New sub-bank...* You can also change the name of the new sub-bank.

Finally, to create a new preset, click on the right sided arrow 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.

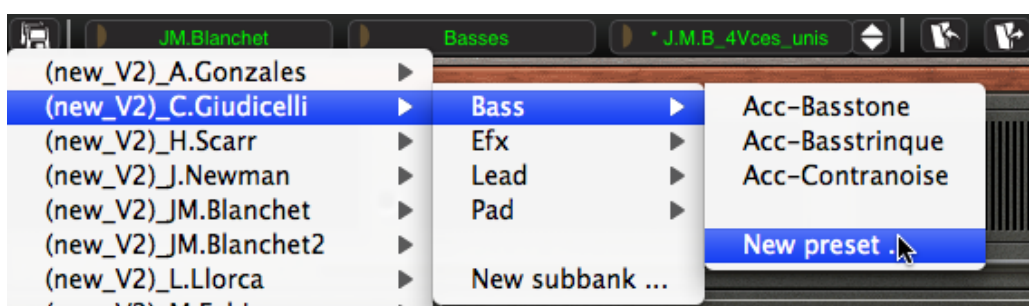
### 4.1.3 Saving a user preset

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 allows 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:



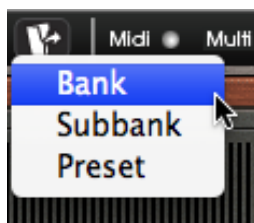
*Preset bank import button on the tool bar*

When you click on this button, a window appears allowing you to choose the preset bank file for the CS-80V (as AYS file format). 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:



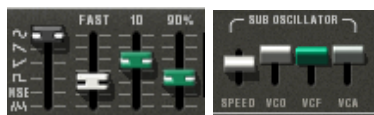
*Current preset bank export button in the tool bar*

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 Windows, or [Shift]+click on Mac OS X.



*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.



*Switches*

---

⚠ The rocker type switch is On when in the lowered position.

---

### 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 allows defining a zone on a master keyboard. This presents 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 left 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 allows 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

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.

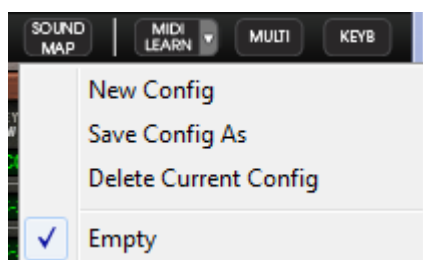
Most of the knobs, sliders and switches on the CS-80V can be manipulated with external MIDI controllers. Before anything else, make sure that the MIDI device that you wish to use is correctly connected to the computer, and that the sequencer or the CS-80V application is correctly configured to receive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

### **Learn Menu**

A new button and menu have been introduced in CS-80V. The button and menu provide access to MIDI assign functionalities.

The left part of the button activates the MIDI learn mode, while the right part (small down arrow) opens the control management menu.



*“Learn” Menu*



*“Learn Mode” Button*

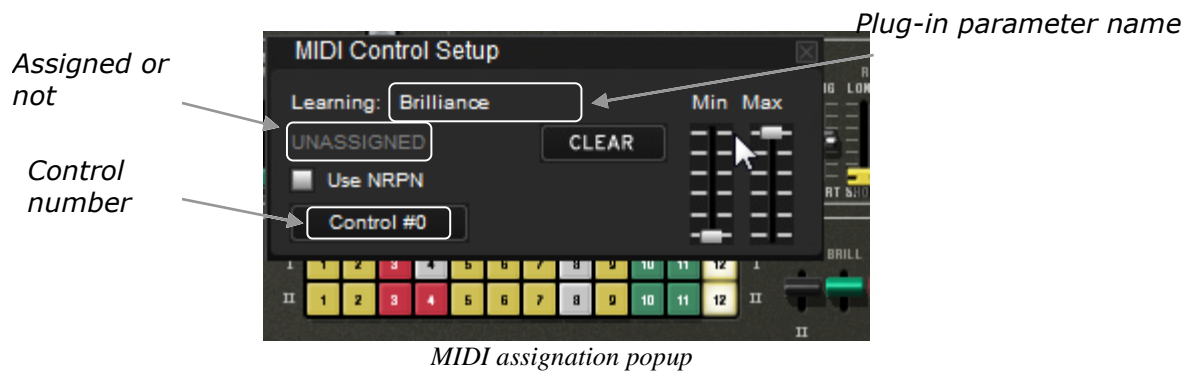
The “Learn” Menu is composed of 2 sections:

- First section provides:
  - “New Config” creates a new controller set
  - “Save Config As” saves current configuration to a new one
  - “Delete Current Config” removes current configuration from list
- The second section contains the list of existing configurations:
  - The checked one is the currently selected MIDI map
  - Click on a configuration to load it

### **Assigning MIDI Controls**

In order to start assigning MIDI controls, click the “Midi Learn” button (left part). The button remains highlighted to indicate that the “learn mode” is ON.

Click on a knob or button in the GUI to open the MIDI assignment popup.



- Learn assignment

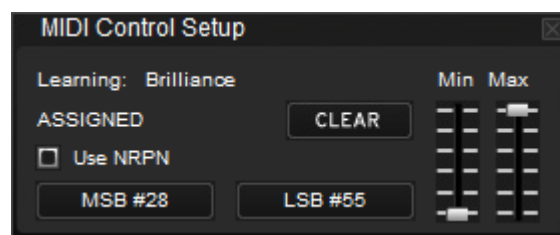
The fastest and easiest way to assign a control is to move the fader, knob or button for it to be recognized by CS-80V.

- Manual assignment

It is also possible to change the assigned MIDI control number by clicking on Control#xx and select a specific value.

- Support for NRPN

In addition to MIDI Control Change messages, NRPN messages are now supported: either send NRPN MIDI control messages to CS-80V, or check NRPN, then manually select LSB# and MSB# numbers:



- Remove assignment

Assignments can be removed by clicking the "Clear" button. The message "Unassigned" will then be displayed.

Continue selecting the parameters you want to map to create a complete configuration.

### **Manages Configurations**

New in CS-80V: the possibility to maintain multiple configurations.

- Default configuration

By default, CS-80V loads the configuration for Arturia Analog Experience keyboards.

- Select one configuration

A configuration is loaded by clicking the corresponding entry in bottom part of "Learn menu".

- Create a new configuration

A new configuration can be created by clicking on the "Learn menu", "New Config" entry. This will open a popup: enter the name you want to call your configuration and click on the "SAVE" button. A new entry for your configuration now exists in the list of available configurations. You may now fill in this initially empty configuration by performing the assignment operations described in the previous section.

- Copy a configuration

It is possible to copy a configuration by loading it and then clicking on "Save Config As".

A popup opens: enter the name of your configuration. A new entry for your configuration now exists in the list of available configurations.

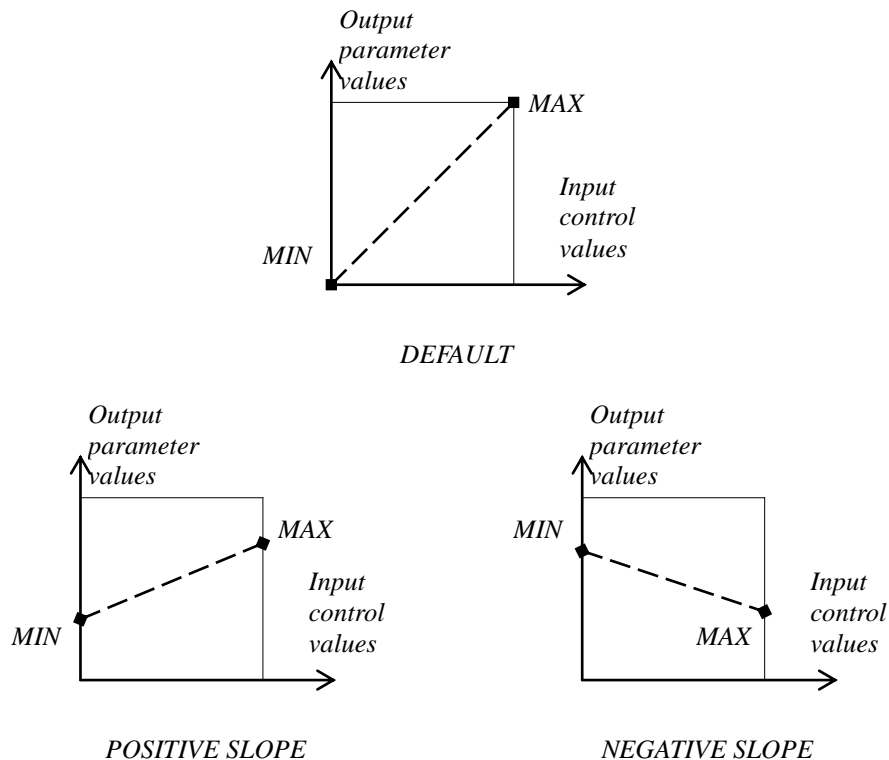
- Remove a configuration

It is possible to remove a configuration by first loading it and then clicking on "Delete Current Config".

### **Minimum and Maximum Ranges**

For each assignment, a minimum range value and a maximum range value can be set. This allows you to limit how much the controller will affect the parameter on CS-80V.

- The assigned parameter will have the configured minimum value when the controller will be at its lowest position
- The assigned parameter will only reach the configured maximum value when the controller will be at its highest position
- You can invert (Negative Slope) the Min and Max so that parameter will have minimum value when control has the highest value, and parameter will have maximum value when control has the lowest value



$$parameter\_value = MIN + (MAX - MIN) * control\_value$$

### **Multiple Assigned Parameters**

It is possible to assign multiple parameters to a single control. This allows you to change many parameters with one fader or knob.

- Activate "Learn" mode, select a parameter (GUI control)
- Tweak control to assign it (optionally setup minimum and maximum)
- Select a second parameter
- And tweak the same control
- Deactivate "Learn" mode

Tweaking assigned control should modify both parameters with regards to assignment setup (Min, Max).

### **THE SOUND MAP**

The sound map is an innovative preset explorer which offers an easy and funky way to locate and choose a preset on a map area to simplify the preset management and to quickly find the appropriate sounds.

The sound map also offers brand new interface for creating new sounds thanks to a morphing feature between four presets.

The Sound Map offers three views:

- The **MAP** main interface: the sound map classifies the presets thanks to statistic methods in order to organize the sounds on a map from their own audio characteristics.
  - The **LIST** presets list: this page offers a more classical interface to classify the presets using lists and filters to find the desired sound.
  - The **COMPASS** morphing interface: this page allows creating new sounds in real time thanks to a morphing result with up to 4 presets.
- To open the main Sound Map interface, click on the *SOUND MAP* button located on the tool bar. A new window appears over the CS-80V main interface.



*Open the main Sound Map interface*

- To open the preset list page, click on the *LIST* button, on the top right of the sound map interface



*Open the List interface*

- To open the preset morphing page, click on the *COMPASS* button.



*Open the Morphing interface*

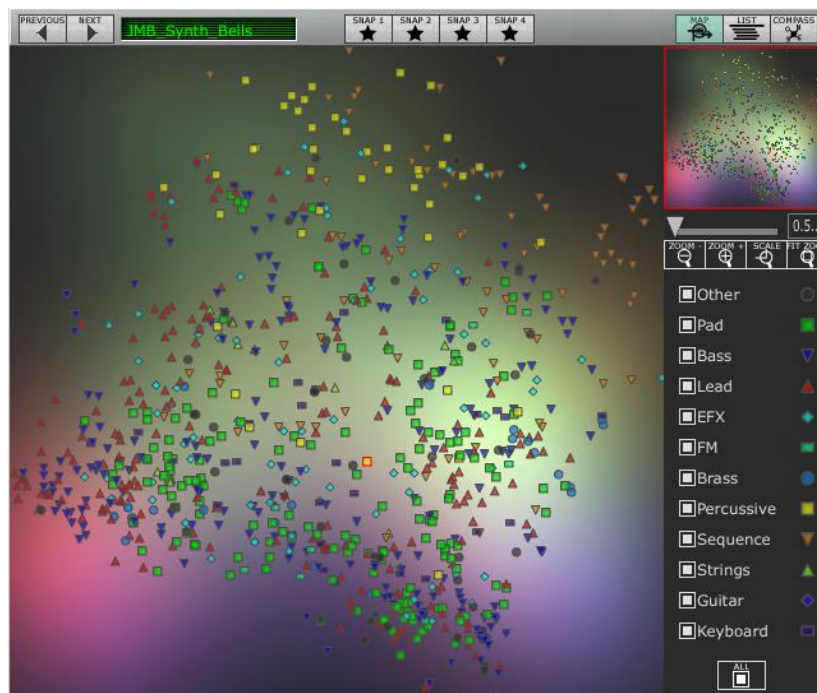
- To return back on the main sound map interface, click on the *MAP* button



*Return back on the map interface*

#### 4.2.8 The **MAP** main interface

The sound map interface shows a map where are shared out all the presets of the CS-80V organized for their types of sound and their own audio characteristics.



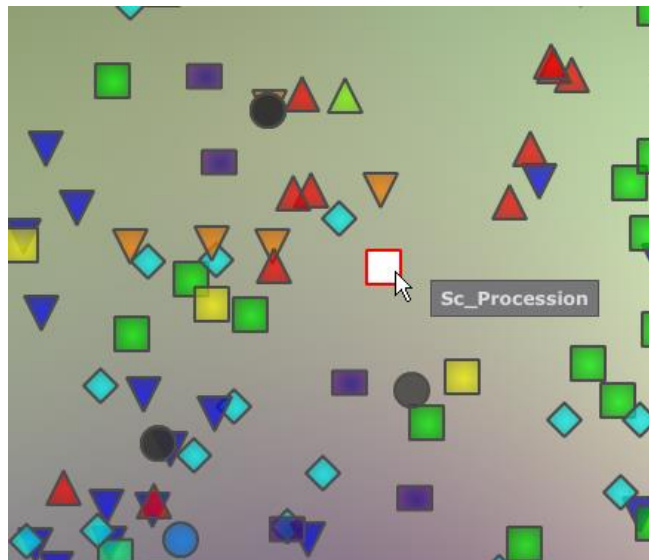
*The Map interface*

The types of presets are represented by different geometrical characters and colors for an easy way to locate them:

- ▼ "Bass" sounds
- "Brass" sounds
- ◊ "EFX" sounds
- "FM" sounds
- ◆ "Guitar" sounds
- "Keyboard" sounds
- ▲ "Lead" sounds
- "Pad" sounds
- "Percussive" sounds
- ▼ "Sequence" sounds
- ▲ "Strings" sounds
- "Others" sounds

- ▶ To select and to listen a preset, directly click on one of the icons, anywhere you want on the map area. The icon is now highlighted in red. If you hold a few seconds on the selected preset, a popup appears and indicates the name of the preset.

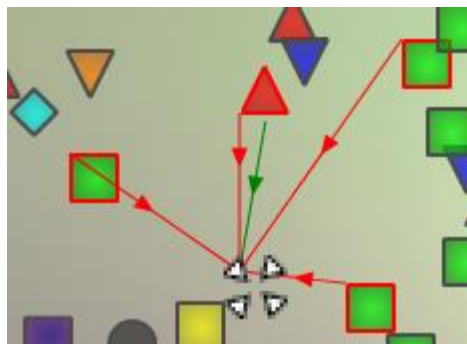




*Select a preset*

You can create new presets thanks to an exclusive real time morphing feature:

- ▶ Click between a group of presets and hold the left button of the mouse on this point. Four red arrows drawing a cross appear linking the group of four presets.



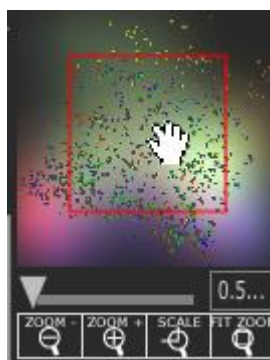
*Morphing between a group of presets*

- ▶ You can now drag your mouse between those presets. The green arrow shows you the starting point of your motion.
- ▶ When you release the left mouse button, you can play the resulted sound and, if you wish, you can save it on a CS-80V user bank.

By this way it is very easy to quickly get some new and exiting sounds without programming anything on the synthesizer interface.

### ***The Sound Map overview***

On the top right of the Sound Map main interface, you can see an overview of this map. You can use the map overview for navigating into the map and to zoom in or out inside of the map area.



*The map overview interface*

- ▶ To navigate into the map, click inside of the red square and drag it on the map area to view other sections of the Sound map.
- ▶ To zoom in the view on the sound map, click on the *Zoom* slider, under the overview window, and drag it on the right to increase the size of the map.
- ▶ To zoom out the view on the sound map, click on the *Zoom* slider, and drag it on the left to decrease the size of the map.



*The zoom slider*

---

⚠ You can also use the "ZOOM +" or "ZOOM -" buttons, under the slider, to increase or decrease the map size step by step (by factor 1).

---

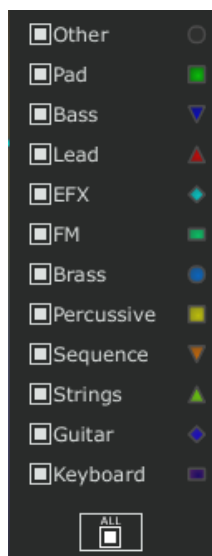
- ▶ Click on the *FIT ZOOM* button allows resizing the map to its global size.



*The FIT ZOOM button*

### **The instrument type filter window**

On the right of the map main interface, an instrument type filter window allows you to choose which type of preset you want to see (or to hide) on the map. By default, all types of presets are selected.



*The instrument type filter*

To select an individual or a group of instrument types:

- ▶ First click on the *All* button, on the bottom of the type filter window: this will hide all the instrument types from the sound map.



*The ALL button*

- ▶ Then, select the type(s) you want to see by clicking on the corresponding square box(es). A nock appears on the selected box(es) and the type(s) of presets appears on the map interface.



*Show pad presets*

This is a good way to simplify and to refine the preset search.

- ▶ If you click again on the *All* button, all types of presets will be displayed on the map.

### **Preset snap shot memories**

You can select up to four presets, anywhere on the map interface, and save them on up to four snap shot memories. You will be able to use those four presets on the *COMPASS* view to create new sounds by morphing feature (see below for more details on this feature). Of course, you can save any kind of type of presets on these four snap memories.



*Select a snap memory*

To save a preset on a snap memory:

- ▶ Select a preset on the sound map main interface.
- ▶ Hold the [Shift] key and select one of the four snap memory button. The snap memory button is now highlighted in red.
- ▶ Repeat the same actions if you wish to save presets on the three other snap memories.
- ▶ When all memories already contain a saved preset, you can replace them with other presets.
- ▶ Select another preset anywhere on the Sound Map interface, click on any of the 4 snapshot buttons while pressing the [Ctrl] key.

### **4.2.9 The LIST preset manager**

The list preset manager offers a more classical way to explore the presets using a list interface in which the presets are classified and filtered in order to simplify preset management.

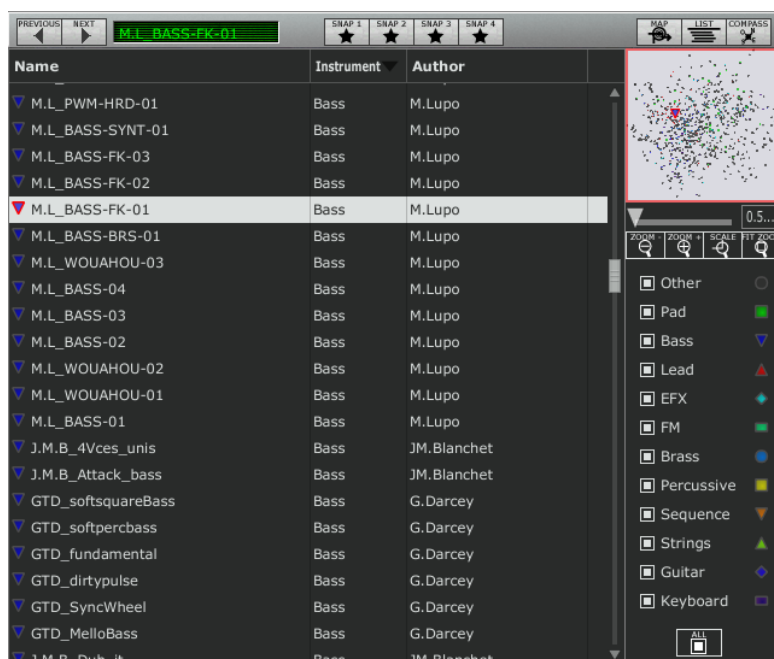
- ▶ To open the list interface, click on the *LIST* button located on the toolbar of the Sound Map.



*Click on the LIST button*

The list preset interface is very simple, you can see three columns showing, from left to right:

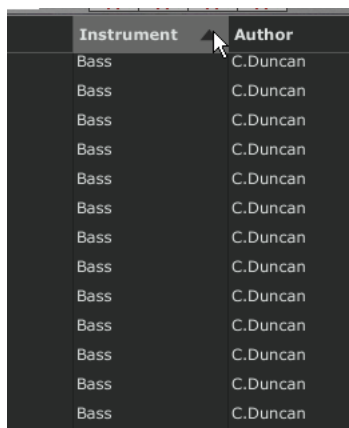
- The preset names
- The instrument type
- The name of the sound designers



*Preset list interface*

All those data are classified by alphabetical order.

- ▶ To select a preset, simply browse the list and click on the name of a desired preset.
- ▶ You can inverse the order (from A to Z or from Z to A) by clicking on the column title: an ascendant or descendant arrow shows you the order type.

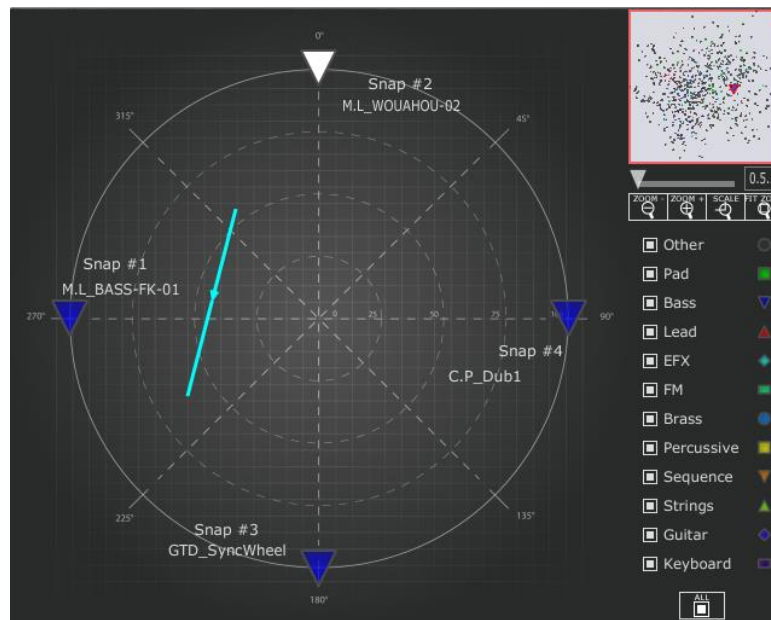


*Inverse the order of the instrument types*

#### 4.2.10 The **COMPASS** morphing interface

The Morphing page is an independent module allowing you to quickly create some new sounds thanks to a real time morphing from the four selected presets saved on the snap memories.

The four presets are placed on the four cardinal points of the compass.

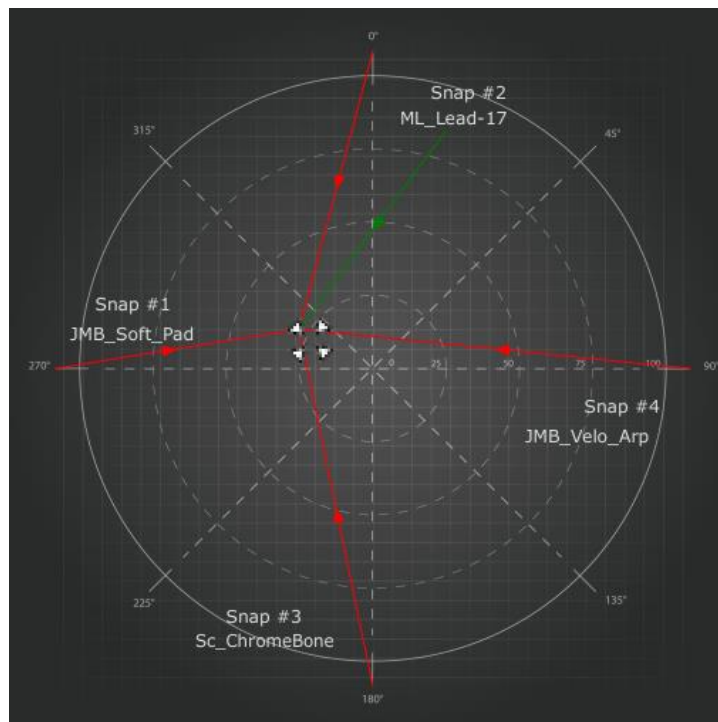


*The Morphing interface*

- To open the Morphing page, click on the **COMPASS** button, situated on the toolbar of the Sound map.

To create a new morphed sound from those presets:

- Click anywhere on the center of the compass area (four red arrows appear converging to the group of presets)
- Hold the left button of your mouse and drag the convergence point until having the good sound. The green arrow shows you the starting point of your motion.



*Create a new sound*

- If you wish, you can save it on a User bank of the CS-80V memory.

## 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, sawtooth, 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 sawtooth.



*Selection of waveform*

To select the sine, first validate that the linear ~ slider is lit 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*: all LFOs of each of the polyphonic voices function independently of the others;
- *TRIG*: the LFO restarts at the beginning of its waveform each time that the polyphonic voice is activated;
- *MONO*: 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 *LPF* 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 allows us to go from a 12 dB filter to a 24 dB filter. The two low-pass and high-pass filters are simultaneously modified.

The filters are modulated by an envelope where the Initial Level (*IL*), Attack Level (*AL*), Attack (*A*), Decay (*D*) and Release (*R*) 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 level (no modulation);
- *R* the release time, meaning the time that the envelope takes to go from the zero level (no modulation) to the *IL* level.





*Setting the filter envelope*

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. The *LEVEL* control sets the volume at the end of line of the synthesis.

The envelope controlling the VCA is a standard ADSR envelope:

- *A* attack time, the time for the volume to go from silent to full volume;
- *D* decay time, the time to go from the end of *A* to *S*;
- *S* sustain level, reached after the decay period;
- *R* release time, to come back to 0 once the note has been released.



*Setting the VCA envelope*

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 to control the frequency, the gray ones to control the volume.



*Setting the filter frequency and the amplifier volume modulations*

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 above (2 1/3'), two octaves above (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*

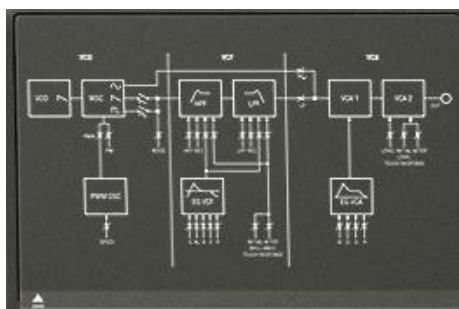
Additional buttons *SYNC* and *LINK* increase your sound design options:

- 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 being imposed on the second in order to create new harmonics.

- The *LINK* button connects the oscillator of the second line toward 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

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.)



*Closed modulation hatch*



*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 (Aftertouch)
- Ribbon : Ribbon controller
- 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 could set the level to zero but the calculation would still be carried out, thus using CPU power (which is always preferable to avoid).

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 aftertouch*

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

## 5.5 THE KEYBOARD MODULATIONS


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 and the velocity.



*Initial tuning*

Fader at the top, there is no modulation; at the bottom, the modulation is set to the maximum.

---

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

---

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 amplifier:

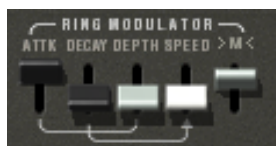
- The *LOW* faders set the key follow slope for the lower part of the keyboard (below C3);
- The *HIGH* faders set the slope for the higher part;
- The slopes can be positive or negative.



*Key follows*

## 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 input signal with a sine wave.



*Setting the ring modulator*

Dry and wet mixing is set with the *>M<* fader. Dry sound is at 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 *MIDI 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 (0x04) 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 to 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 §6.14), 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 §6.14).

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 MODE* 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 MODE* switch allow standard functioning (switch off, towards the top), or a 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 ORIGINAL PRESET BUTTONS

These 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.



*Pre-selections*

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

### 5.12 THE RIBBON

The ribbon works like a pitch wheel when the *PITCH* button is triggered. The *COARSE* knob sets the upper range of frequency variation. It also responds to the pitch bend MIDI message. It should be noted that the original CS-80 had an unusual behavior when using the pitch ribbon to control downward pitch shifts. When sliding the pitch range up, the *COURSE* knob limits the amount of pitch shifting, but when bending the frequency down, the range goes all the way down to 0 Hz. This is a feature that's unique to the CS-80, and is faithfully reproduced in the CS-80V, allowing this emulation to create truly unique performances, just like its hardware predecessor.



*The ribbon*

### 5.13 GENERAL SETTINGS

Three supplementary settings control the synthesizer's general brilliance, resonance and volume. They each effect polyphonic voices in the same way.



*Brilliance and Resonance*



*General volume*

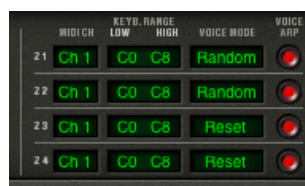
## 5.14 THE MULTI MODE

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.



*Opened 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 (or [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 allows you to 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 Bob Moog's ones, ARP<sup>tm</sup>, Yamaha<sup>tm</sup>, Buchla<sup>tm</sup>, Oberheim<sup>tm</sup>, Sequential Circuits<sup>tm</sup> (Prophet series), Roland<sup>tm</sup>, Korg<sup>tm</sup> (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<sup>tm</sup> 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 (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:

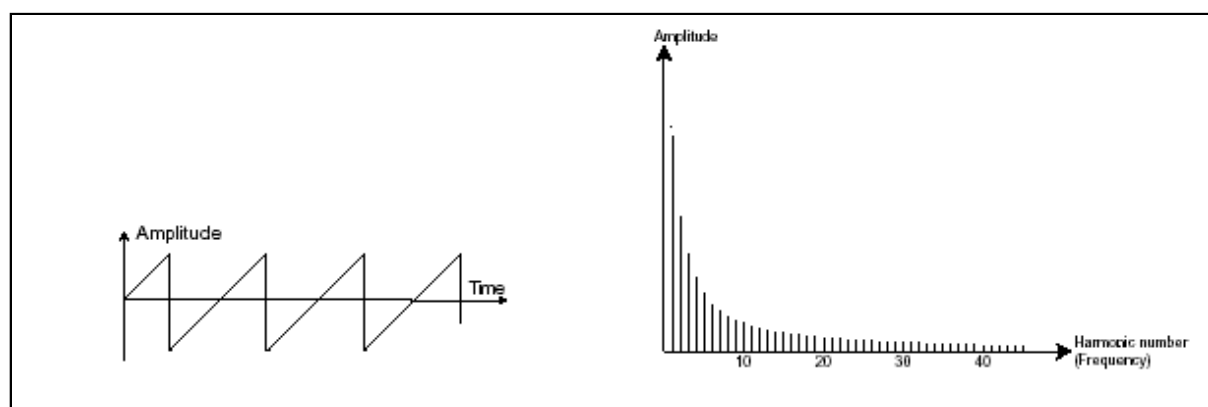
- The **pitch** determined by the oscillation frequency. You can set the frequency of the oscillator with 2 controllers: first, the *FEET* selector (or "range" on other synthesizers) which determines the fundamental frequency – it is expressed in feet it contains all of the harmonics at decreasing volume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

---

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

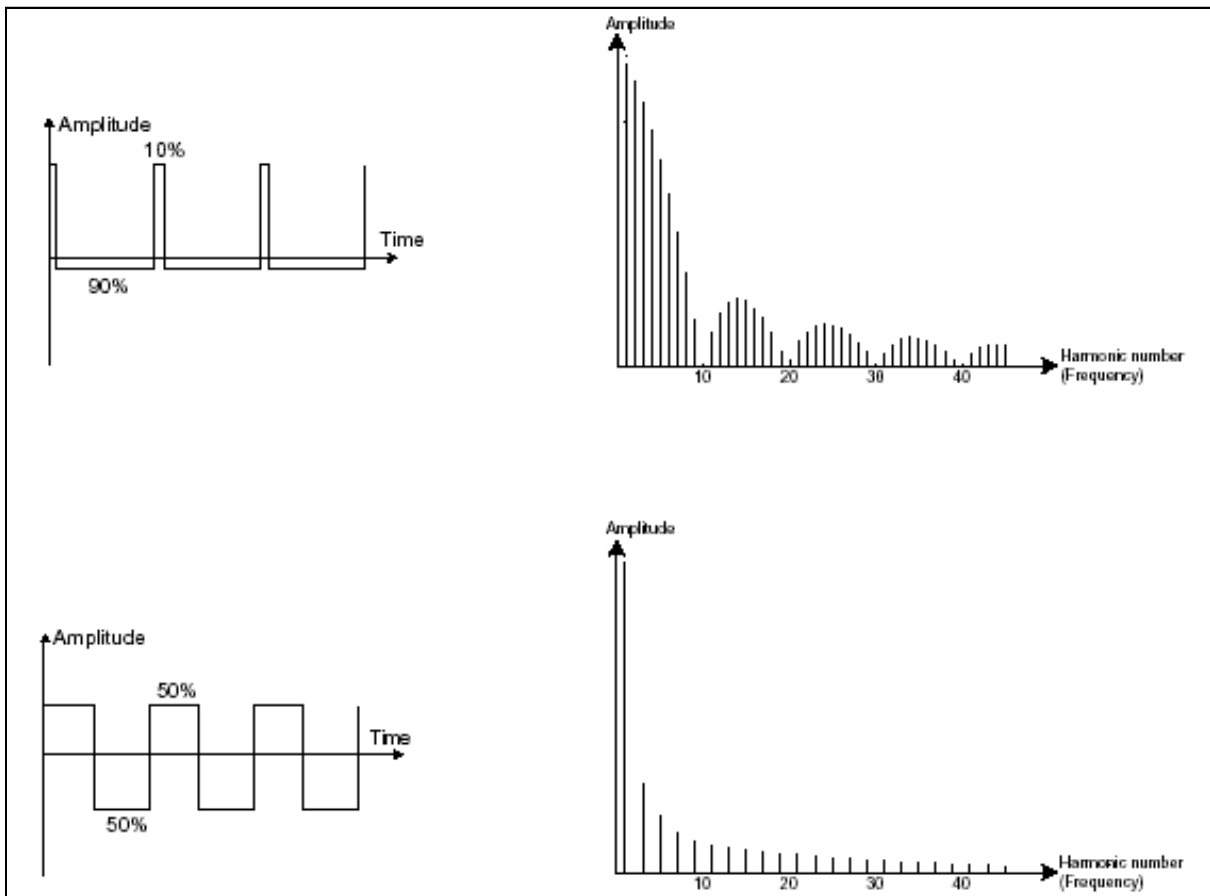
---

- The **waveform** which determines the harmonic richness of the audio signal. On the CS-80V, 4 waveforms are available:
  - The **sawtooth** 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.



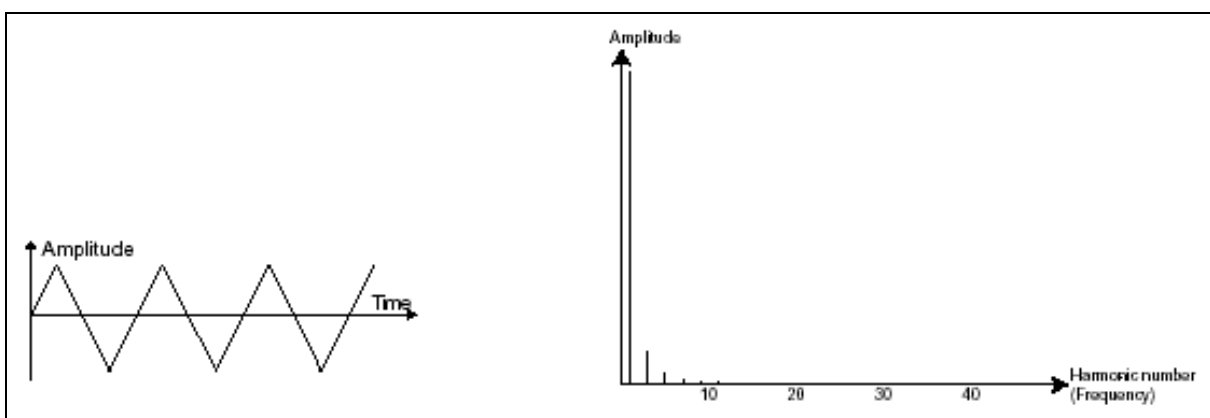
*Time and spectral representations of a sawtooth signal*

- 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.



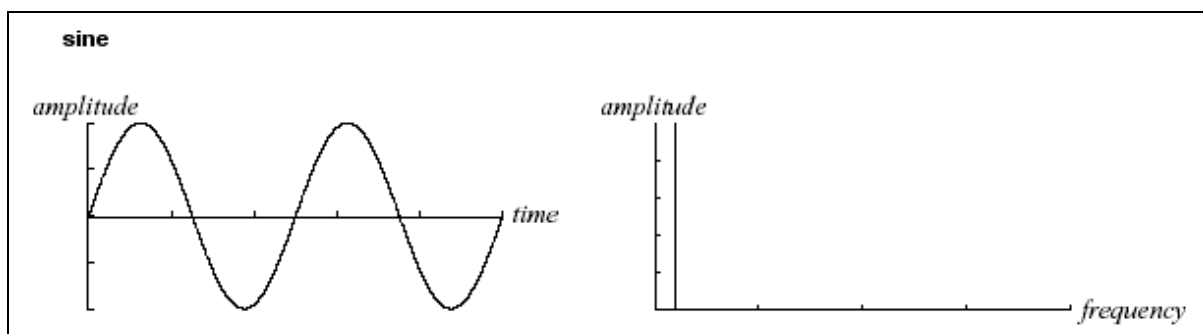
*Time and spectral representations of a square signal, and with modulated pulse width.*

- The **triangle** can be considered like a highly 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.



*Time and spectral representations of a triangle signal*

- The **sinusoid** is the purest of all. It is a unique harmonic and produces a much "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.



*Time and spectral representations of a sinusoid signal*

- **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.

---

⚠ Unlike many other classic analog synthesizers, the CS-80V allows you change the impulse width not only for the square waveform but also for the triangle.

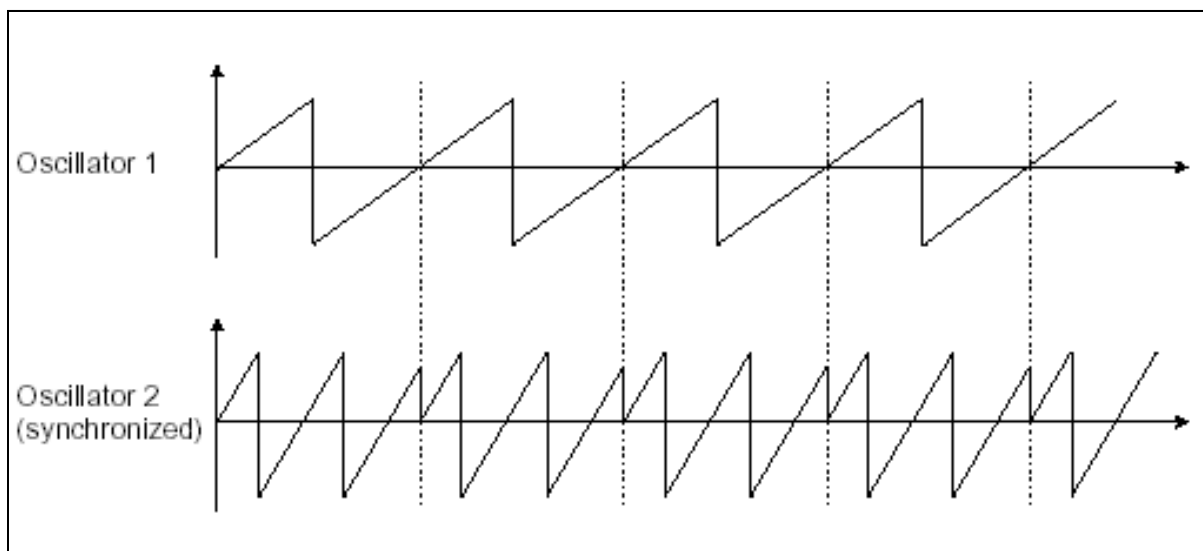
*This brings a large number of additional sound possibilities to compliment the base signal.*

---



*The CS-80V waveform*

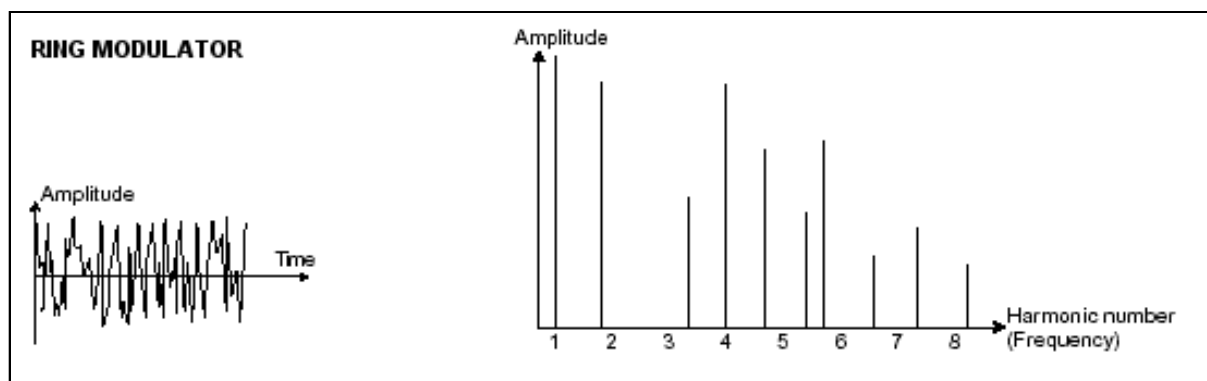
- The **synchronization** of an oscillator with another creates more complex waveforms. If for example, you synchronize oscillator2 with oscillator1, oscillator2 will restart a new period every time the first oscillator completes a period, even if oscillator2 has not completed a complete period (this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



*Synchronization: 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 MODULATOR* module above and to the left of the ribbon controller. By lowering the linear *>M<* slider/lever while increasing *SPEED*, the sound will become richer

in harmonics. The result can quickly become distorted but interesting for inharmonic sounds like special effects or bells for example.



*Ring modulation*

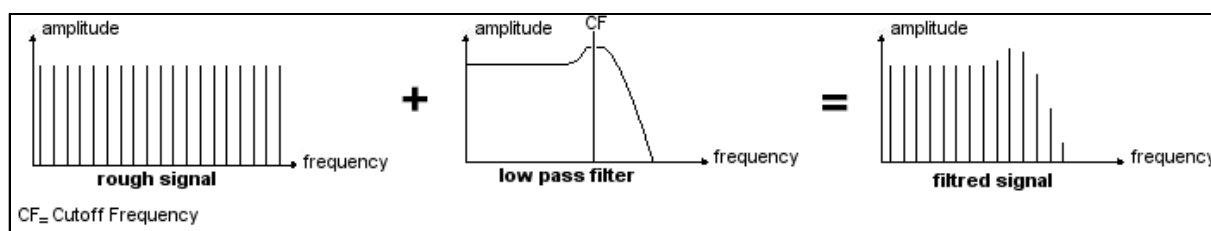
The **noise module**: the noise signal spectrum has all frequencies at an equal volume level, often referred to a "white noise". For this reason, the noise module is used to create different noises like the imitation of wind or special effects. White noise is the richest of noises. Pink noise is also 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 sound source.

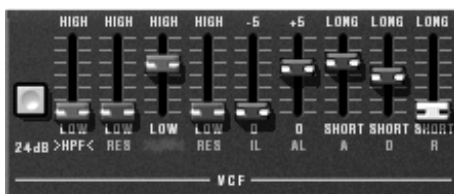
### 6.1.2 The filter or VCF

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.



*Spectral representation of the filtering action*

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.

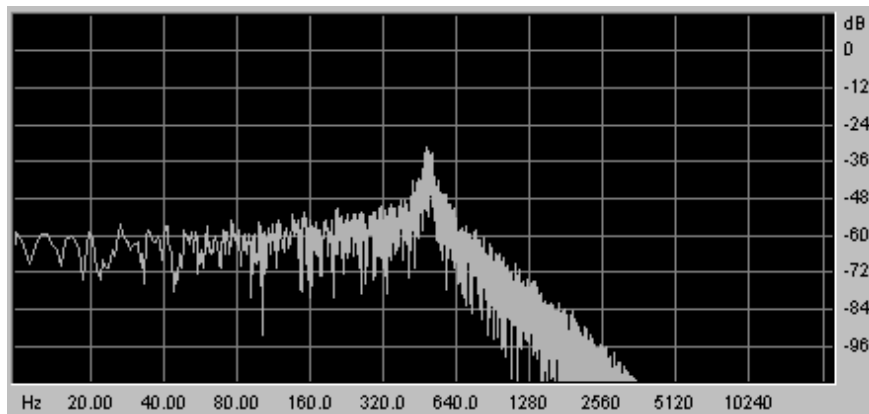


*The filter settings*

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

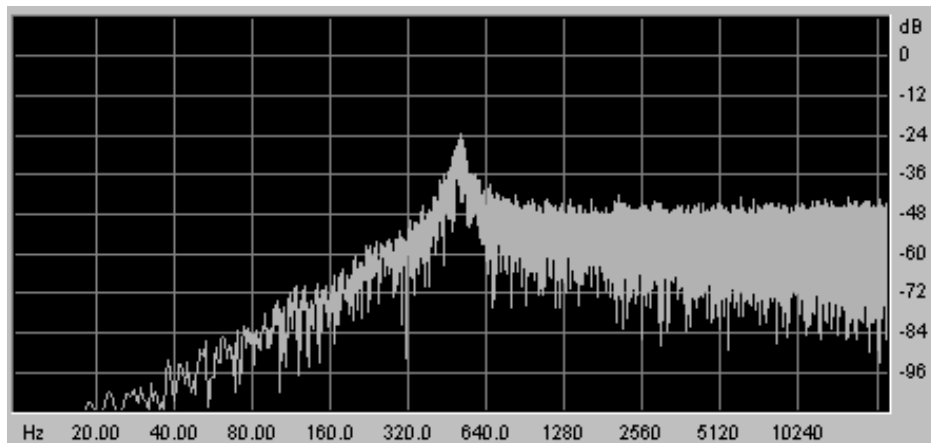
On the CS-80V, you have access to 3 different types of filtering. Let's have a look at some of their properties:

- The **low-pass filter** (*LPF*) deletes high frequencies going from a frequency limit (the famous cut-off frequency) and only allows low frequencies through. Depending on the setting we will hear 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



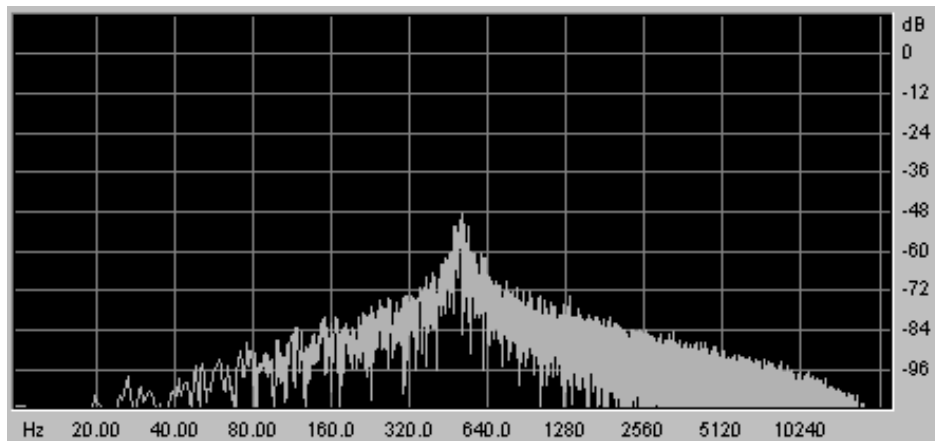
*The low-pass filter*

- The **high-pass filter** (*HPF*), unlike the low-pass, eliminates low frequencies and only allows 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 filter** (*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.



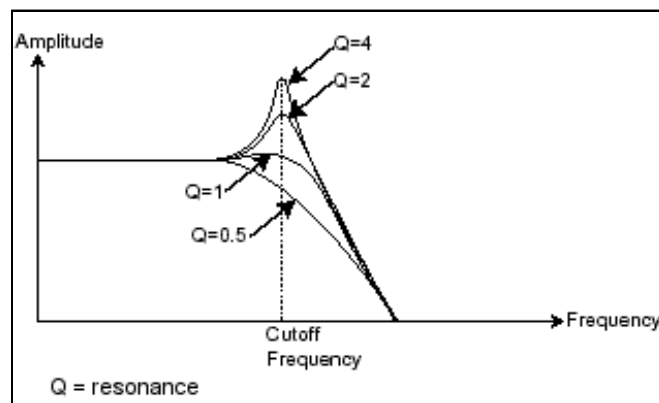
*The band-pass filter*

A second setting to compliment the cut-off frequency: the **resonance**. You will also find it called "Emphasis", or even "Q" – for "Quality of filtering" – on many synthesizers. 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).

On the CS-80V, you can increase the rate of resonance through the *RES* slider.

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

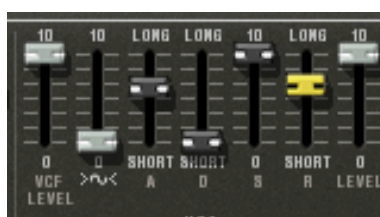
With a high resonance level, the filter will begin to produce a sound close to a sine waveform. At this stage, the use of a key follow is very important as you can create a melody by tuning the cut-off frequency of the filter with the frequency of the oscillators.



*The resonance*

### 6.1.3 The amplifier or VCA

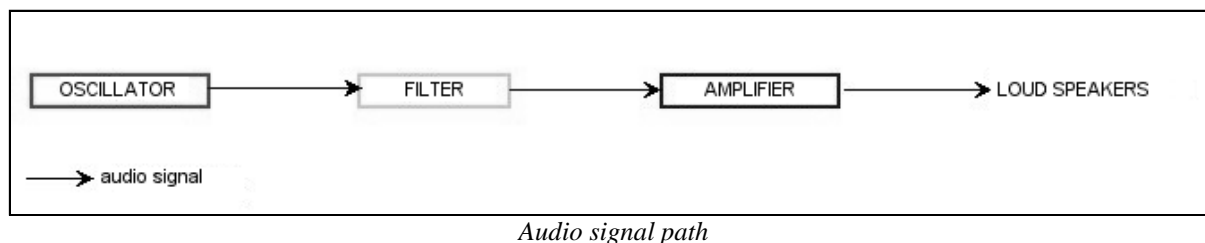
The amplifier (**Voltage Controlled Amplifier**) receives the audio signal coming from the filter (or directly from the oscillator if it is not being filtered) to adjust before the volume is sent to the outputs.



*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.

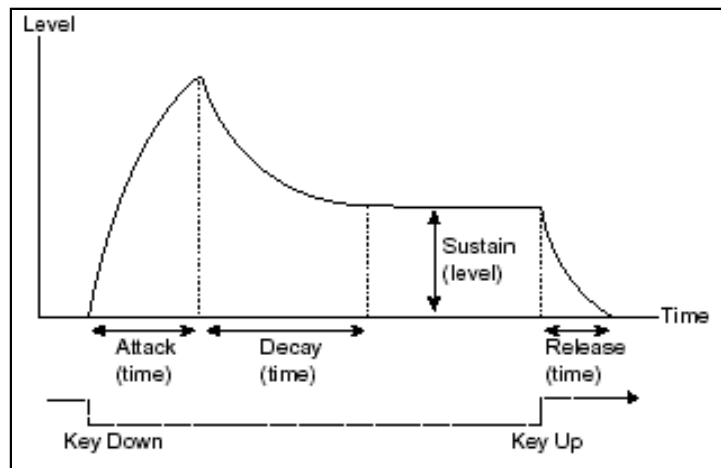
To start and stop the sound, and at the tone that we require, we use a keyboard that is connected to the oscillator. This will play the sound as soon as a key is pressed, and mute it when released. Of course, this connection is made through MIDI (it replaces the "gate" type of connections on analog synthesizers, which triggers 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. 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:

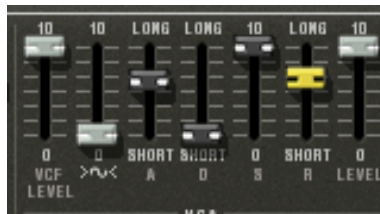
- The *Attack* is the time that the sound will take to reach its maximum volume once we have pressed a key on the keyboard;
- The *Decay* (fall) is the time that the sound will take to diminish when a note is pressed;
- The *Sustain* (hold) is the maximum volume level that the sound will reach when a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



*ADSR envelope*

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

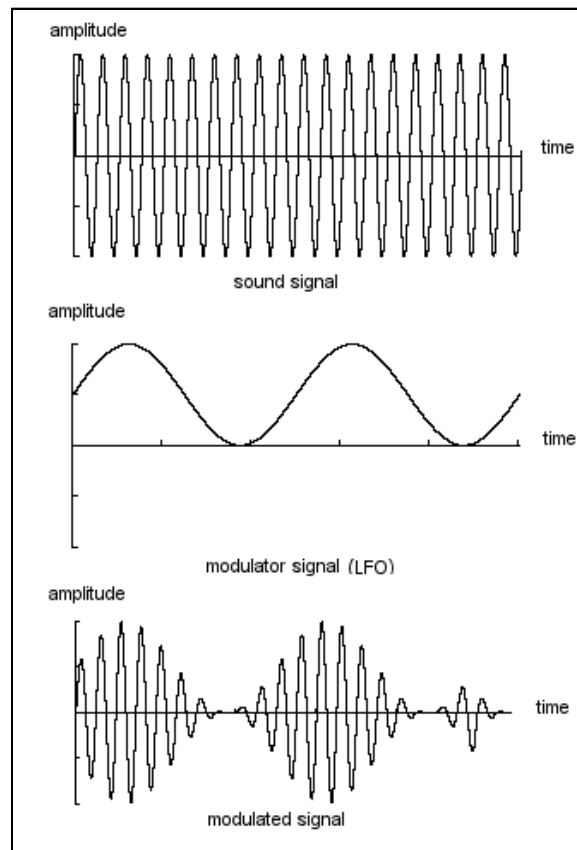
- The **initial level** (*IL*) is the start level of the envelope relative to the frequency of the filter. The filter frequency will be modulated starting with a frequency inferior to the frequency setting.
- The **attack level** (*AL*) is the maximum level of the filter envelope.



*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, but rather use it as a cyclic modulation on the setting to which it is connected.



*Low frequency oscillator modulation*

For example:

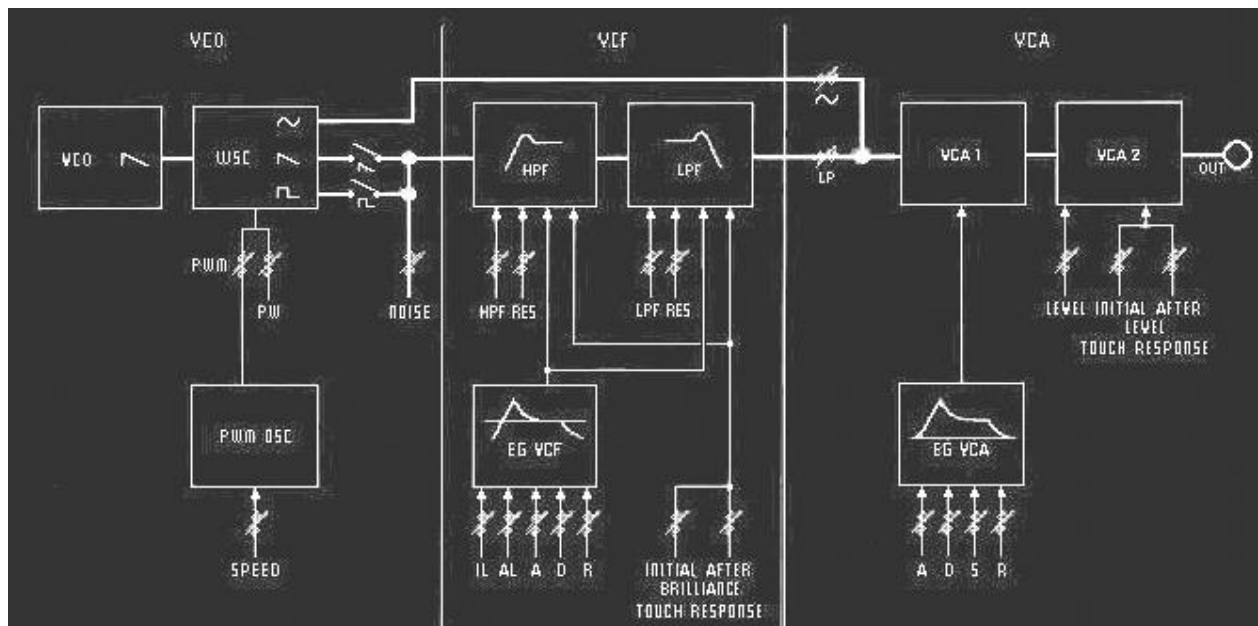
- If the LFO sinusoid waveform modulates the volume of an amplifier, the sound will increase in volume then disappear in a varying manner following the speed (the frequency) of this LFO. This will produce a **tremolo** effect.
- An LFO sinusoid waveform modulating the frequency of an oscillator would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



*The LFO 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-80 synthesis voice*

## 7 A FEW 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 (patch a VCO oscillator through a filter and a VCA amp output), to finish by touching on the programming of a more rich sound (several VCO sources, VCF filters, VCA envelopes, etc.);
- ▶ 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 *Quick Start* chapter 3, 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.
- ▶ Choose the preset *saw* in the *Templates* bank, sub-bank *Waveforms*. This sound uses a sawtooth 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 gets softer and softer.



*Decrease the frequency of the low-pass filter*

- ▶ 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.
- ▶ Change the range of the oscillator from 8" to 16" with the *FEET 1* fader.



*Change the range of the oscillator*

- Now increase the release time (*R*) of the VCA1 to the value 1000 ms so that the sound persists after the release of the keys. Be sure to set the level of the general sustain fader (*S*) to 0, so that the changes on the release time can be effective.



*Increase the VCA release time*

Now you can add all the parameters you want, like changing the oscillator waveform, activate the sine waveform, change the filter attack.

### 7.1.2 The modulation matrix

We will discover one of the many additions to the CS-80V: the modulation matrix.

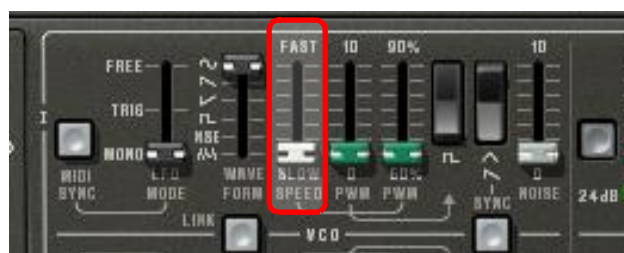
To begin, open the matrix hatch by clicking on its bottom-left corner:



*Open the Modulation Matrix*

Now set the LFO1 as a source in the first modulation source area, and the VCO 1 Freq as destination.

The LFO1 speed can be changed with the speed button:



*Set the LFO Speed*

The VCO1 frequency is now modulated by the LFO1. It creates a kind of detune, if you set the amount to the maximum, the sound becomes much more pronounced.



*Matrix amount*

For the second modulation, we will now modulate the filter by the sub-oscillator.

For that, select the *SubOsc* as source and the *HP1 cut* as destination. Set the amount you prefer and listen to the sound. You can choose the threshold of the filter by lowering the filter frequency.

And to finish this part, connect the modulation *Wheel* to the *LFO2 speed*, and the *LFO2* to the *LP1 cut*:



Your sound is now modulated by different parameters, adding unique complexity.

Try different matrix settings to see how the CS-80V can become an effective solution to design your own sounds.

### 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.

#### **Velocity and aftertouch**

These 2 controllers are directly linked to the playing on the keyboard:

- Velocity controls the cutoff frequency (*BRILL*) and the VCA volume.
- Aftertouch 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, as these controls are among the sources of modulation.

Aftertouch can be employed to accentuate one of the 2 voices of synthesis: apply aftertouch 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 aftertouch on the VCA volume*

### **The ring modulator**

The ring modulator is essentially used to add a variety of harmonics to a sound. Let's use the example of the sound from a bell:

- ▶ Start by activating the ring mode by clicking in the >M< logo:



*Activate the ring modulator*

- ▶ 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, barely the halfway mark for the knob), or a simple beating identical to a tremolo (around 2 Hz).

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



*The SPEED setting*

- ▶ Lightly lower the >M< lever (around 0.20) to mix the volume of the raw sound with the one coming from the ring modulator.



*Using the ring modulator for a bell sound*

- ▶ If you wish, you can control the speed of the ring modulator in a progressive manner with an attack envelope (A) or even through an external MIDI controller. This helps you to easily create special effects.

## **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 *Multi\_Sequence* in the bank *Templates*, sub-bank *Sequences\_arp*. On launch the 8 voices are assigned to the voice1 (C0 to C8). Each of the 4 zones has a different single sonority (the singles named 1, 2, 3 and 4). These singles can be detuned, assigned to a pan position and mixed. In this example, voices 1 to 8 are the same and have the same settings such as Pan and volume.
- ▶ Change the pan position of the first voice. Place the sound to the left of stereo space: turn the *PAN* knob fully to the left, value 1.00L.
- ▶ Also detune it by lightly turning the *DET* knob to the left, value of 0.99.
- ▶ Now change the pan position of the fifth voice fully to the right, value 1.00R.
- ▶ Detune the third: set the *DET* knob to a value of 1.01.
- ▶ Use pan to position this single lightly to the right, value 0.78R.
- ▶ Detune the fourth: put the *DET* knob 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.
- ▶ Now change the second and the seventh voice to zone 2 with single patch 2.
- ▶ Change the voice mode of the second voice to *Unilow*.
- ▶ You can now edit the second single patch by clicking on the *EDIT* red button.
- ▶ Set the transpose of the seventh voice to -12.
- ▶ Now set the different level of each voice to get your sound.

By performing these first settings, you have modified the *Multi\_Sequence* preset. You can now save it in your own bank.



*The completed 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 played outside the limits of each of the 4 zones will not sound.

---

### 7.2.2 A composite sonority in unison mode

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

- ▶ Choose the preset *Multi\_Sequence* in the bank *Templates*, sub-bank *Sequences\_arp*. 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 keyboard.
- ▶ Deactivate the VOICE ARP next to the voice mode:



*Deactivate the arpeggiator*

- ▶ 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 *DET* knobs. The global sound will achieve more complexity.
- ▶ Also change the pan position of each of the singles in order to form a very large stereo sound.
- ▶ Singles can be sent to delay and chorus effects using the *FX* button. The ring modulator will not be used for this sound. Deactivate the *R.MOD* button on all of the singles.
- ▶ It is also possible to change the pitch 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 *2Parts\_Splits*, from the *Templates* bank, *Splits* sub-bank.

2 split zones on the keyboard are already in place:

- A single bass sound on zone 1, from C0 to B2, which will be played in ARP mode;
- A lead accompaniment single on zone 2, from C3 to C8.

The arpeggiator will act on zone1.

- ▶ Click on the arpeggiator *PLAY* button and set a speed next to 160 ms, or Tempo\*4 if you have clicked the MIDI sync button.



*The arpeggiator PLAY button*

- ▶ Play a chord between C0 and B2, 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 slider*

- ▶ 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 options that help you to go further.

Here are a few examples...


### 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\_Sequence*, from the *Templates* bank, *Sequences\_arp* sub-bank: the 8 voices are on the same zone (the first) and the same single 1. The *VOICE 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.

- ▶ When the arpeggiator is playing, you can set the decay time (*D*) 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 (*S*) is 0.
- ▶ So that the arpeggio plays alone, click on the arpeggiator *HOLD* switch.
- ▶ Set the height of each of the 8 notes by turning the *HOLD* transposition knob 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 decreases 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 distribution of the notes in stereo, you can set 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* knob for the selected single.

---

 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.

---

### 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.

## 8 MODES OF OPERATION

### 8.1 STANDALONE

The CS-80 V can be used as an instrument independently from a sequencer software (Standalone mode).

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

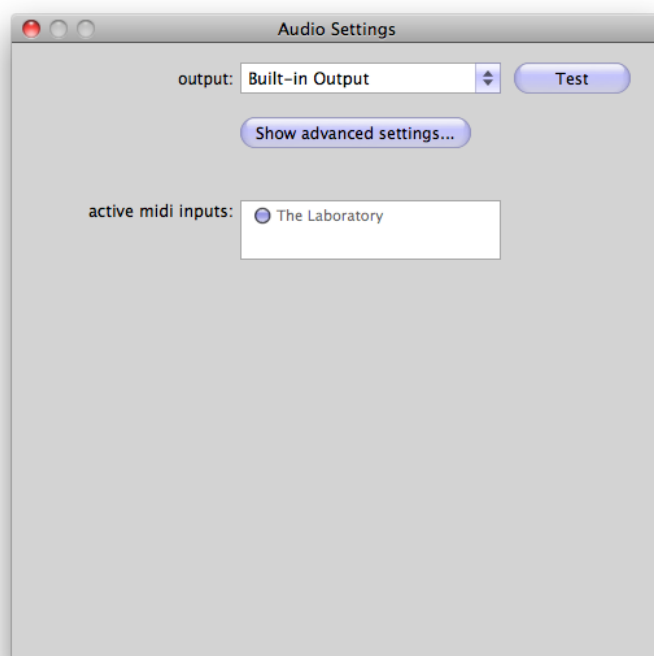
#### 8.1.1 Launch the application

To launch the CS-80 V application,

- on Windows, go to the menu Start > Programs > Arturia > CS-80 V2, and choose "CS-80 V2".
- on Macintosh, open the finder > Applications > Arturia and double-click on the CS-80 V2 application icon.

#### 8.1.2 Configuration of the instrument

Click on the "Settings" button on the CS-80 V toolbar. It will show the following "Audio MIDI Settings" dialog box.



In this option menu you can:

- Set the audio output port

- Choose the audio interface
- Choose memory buffer size (smaller size will increase the load on the CPU but will reduce latency, and reciprocally)
- Choose sample rate between 44100 Hz and 96000 Hz
- Choose one or several active MIDI input port(s)

## **8.2 VST 2**

VST (Virtual Studio Technology) is a plug-in standard created by Steinberg. It allows you to integrate software audio synthesizers and effect plug-ins with audio DAWs and host software. VST is supported by a large number of audio applications like Cubase, Nuendo, Wavelab, FL Studio, Audacity, Samplitude, Sonar, Audition, Live, etc.

The VST interface was updated to version 2 in 1999. One of the additions was the ability for plug-ins to receive MIDI data. This allowed for the introduction of VSTi (Virtual Studio Technology Instrument) format plug-ins.

## **8.3 VST 3**

VST3 is a new update of VST audio plugins protocol. It was updated in 2008. This has improved performance over previous versions of VST and has many new features as well. Cubase 6 and Nuendo 5 are using this new protocol.

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

## **8.4 RTAS**

RTAS, short for Real-Time AudioSuite is an audio plug-in developed by Digidesign (AVID technology) for their Pro Tools systems.

## **8.5 AU**

AU for Audio Units is a plug-in protocol developed by Apple Computer. It used by Apple applications such as GarageBand, Soundtrack Pro, Logic Express, Logic Audio, Final Cut Pro, Mainstage, Ardour, Ableton Live, REAPER and Digital Performer.

## **8.6 64 BIT COMPATIBILITY**

The CS-80 V is optimized for both 32-bit and 64-bit modes. If you have a 64-bit operating system and a 64-bit digital audio workstation, you should use 64-bit version of the plug-in (for Windows).

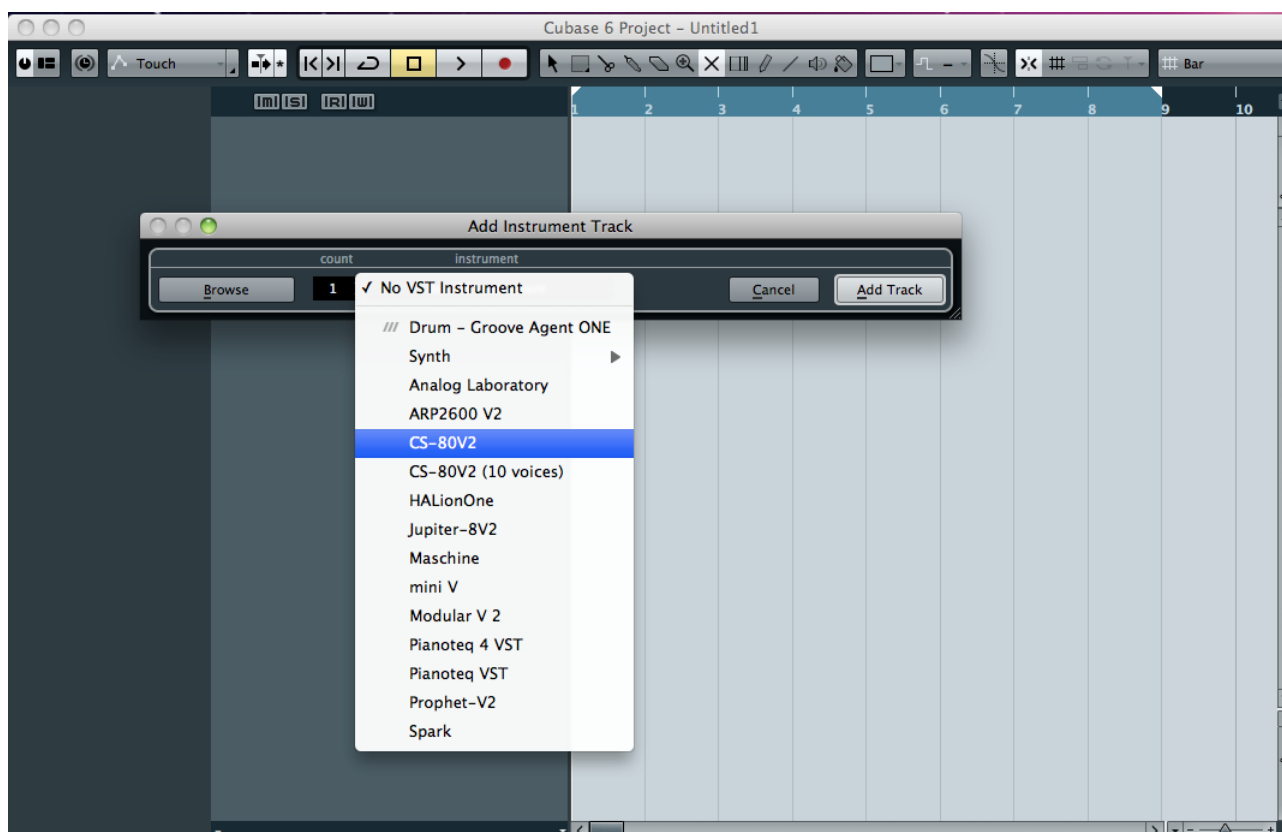
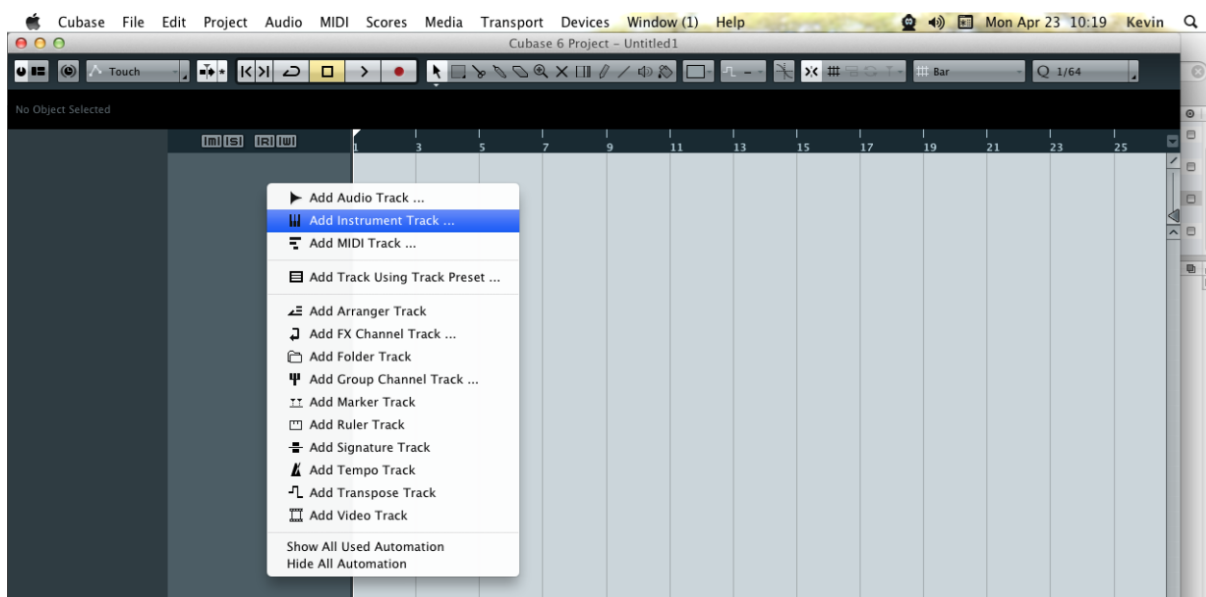
Usually on 32-bit Windows, all 32-bit programs are installed in C:\Program Files. However on 64-bit Windows, you can find the 64-bit programs in C:\Program Files\ and the 32-bit programs in C:\Program Files (x86)\.

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

## 8.7 USE IN CUBASE/NUENDO (VST)

### 8.7.1 Instrument use in VST mode

The opening of the CS-80 V VST plug-in is the same as opening all other VST plug-ins. Please consult the instruction manual of your host sequencer for more specific information. Under Cubase/Nuendo, create a new "Instrument" track, and choose CS-80 V2 in the rack.



## 8.7.2 Rescan the plug-in directory in Cubase

If the CS-80 V does not appear in the list of VST plug-ins, you can perform a “rescan” of the plug-in directory.

## 8.7.3 Saving of presets

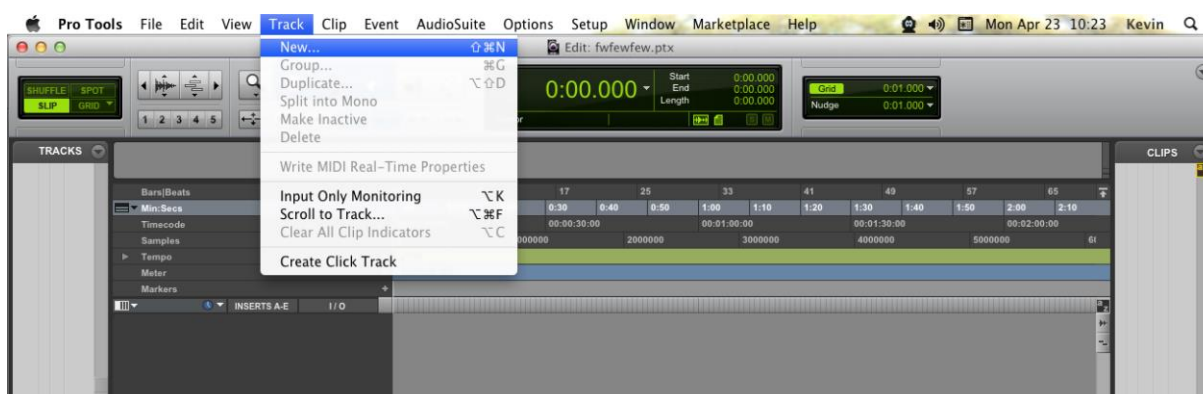
When the session/project is saved, the CS-80 V is saved in its last mode of operation, with all modifications intact. For instance, if you were working on a “P1” preset in which you had modified parameters (without saving them as a separate preset within the plug-in itself), the next time you open the project, the CS-80 V will load the “P1” preset plus the modifications you made previously.

The drop-down menu in which the VST sequencer allows you to save a new preset is of course usable with the CS-80 V. However, it is highly advised to use the CS-80 V internal menu: the presets saved in this way are usable in any other mode (standalone or with other sequencers), they can be exported and exchanged more easily, and they will remain compatible with the CS-80 V future versions.

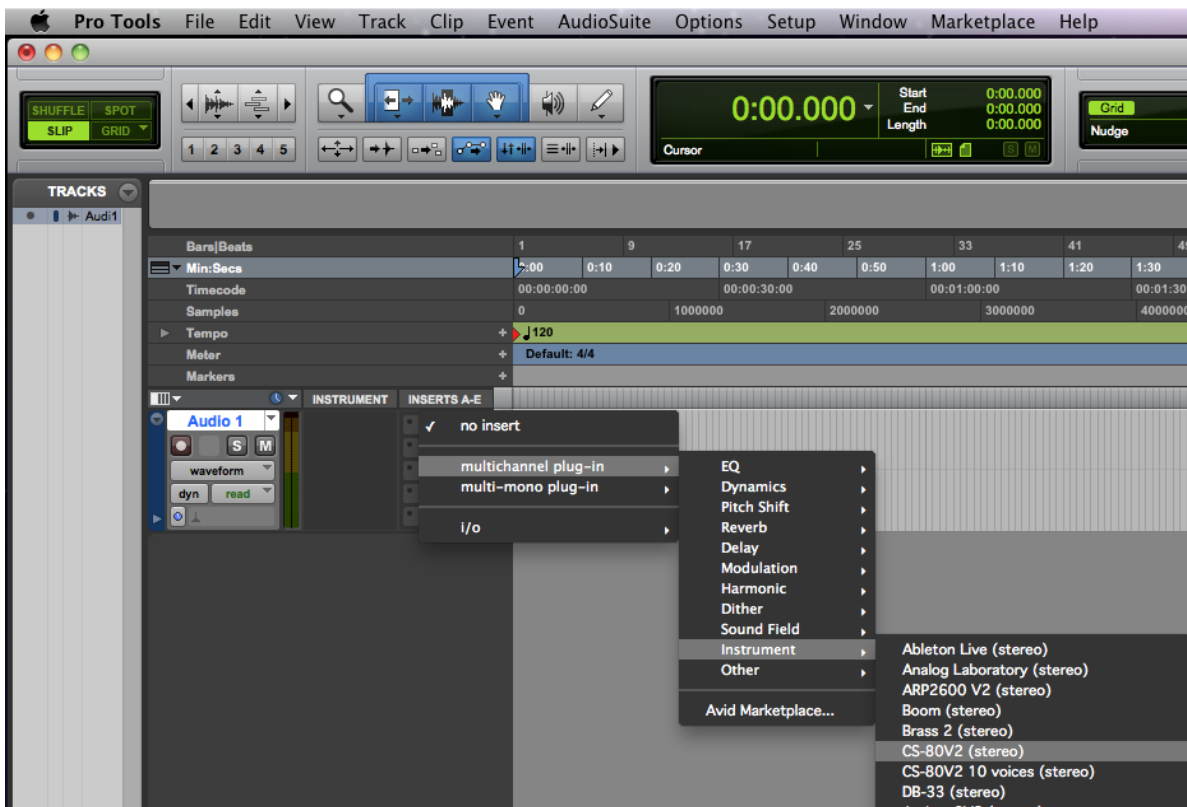
## 8.8 USING IN PRO TOOLS (RTAS)

### 8.8.1 Opening of the plug-in

Access to the CS-80 V plug-in is like all other plug-ins in Pro Tools, via a new Instrument Track creation:







The CS-80 V must be loaded on an instrument stereo track. We can now make CS-80 V sound by playing with the mouse on the virtual keyboard.

### 8.8.2 Saving the presets

When the session is saved, the status of the CS-80 V is saved as it is, even if its programming does not correspond to the preset. For example, if you are working on a preset "P1" in which you have modified the parameters (without saving them in the plug-in itself), the next time you open the session, CS-80 V will load the "P1" preset plus the modifications you made to it. The "Librarian Menu" of Pro Tools can be used with the CS-80 V like with all other plug-ins.

Nevertheless it is highly recommended to use the internal CS-80 V menu: with the presets saved like this, they are usable no matter which mode is chosen (standalone or other sequencer), and they can be exported, exchanged more easily, and will stay compatible with future versions of CS-80 V.

### 8.8.3 Automation under Pro Tools

The automation function with CS-80 V functions like with all RTAS/HTDM plug-ins (check the Pro Tools documentation for more details on plug-in automations).

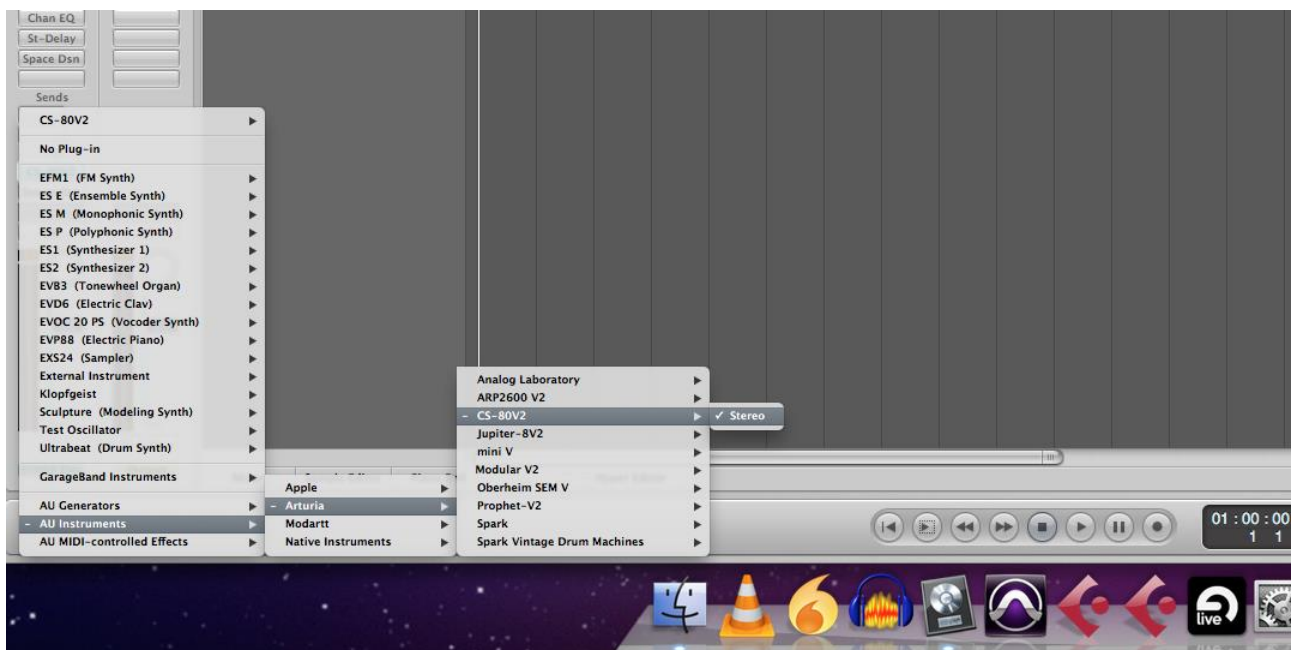
## 8.9 USING IN LOGIC, MAC OS X (AU)

Make sure the plug-in has been tested OK in the Logic Audio Units Manager. To launch it, click on the menu "Preferences > Start Logic AU Manager".

Create a new Software Instrument track.

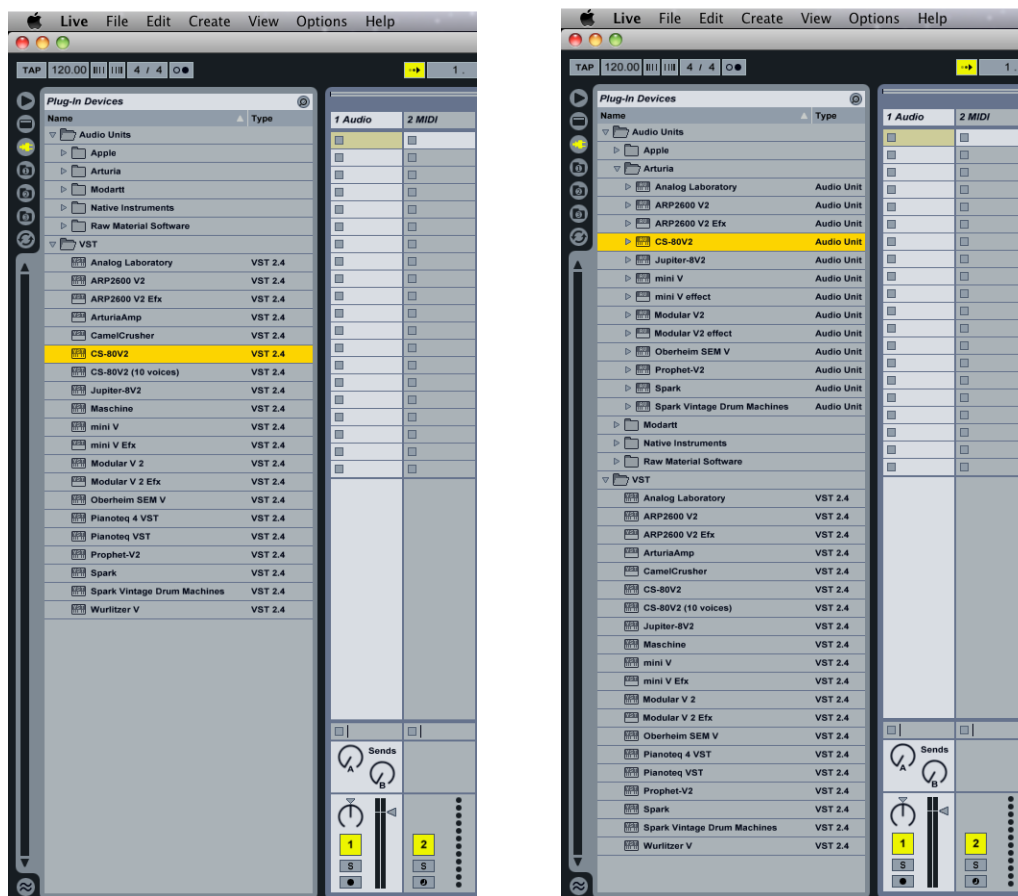


On the channel of the mixer corresponding to the selected track, click on the button “**I/O**” to list the available plug-ins, then select “AU Instruments > Arturia > CS-80 V2 > Stereo”.



## 8.10 USING IN ABLETON LIVE (AU AND VST)

From the plug-ins tab, simply double click on the CS-80 V2 VST or AU icon, or drag-and-drop the plug-in into a MIDI track:



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

## 9 APPENDICES

### 9.1 GENERAL PARAMETERS FOR ALL POLYPHONIC VOICES

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

Each setting begins with  $s_x$ , with  $x$  being the tone number (single) from 1 to 8, so the following list is related to single 1:

s1AfBr1	Brilliance of line 1, controlled by the pressure (aftertouch)
s1AfLe1	Volume of line 1, controlled by the pressure (aftertouch)
s1AfBr2	Brilliance of line 2, controlled by the pressure (aftertouch)
s1AfLe2	Volume of line 2, controlled by the pressure (aftertouch)
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

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

# 10CS-80V END USER LICENSE AGREEMENT

## 1. General

1.1 In consideration of payment of the Licensee fee, which is a portion of the price you paid, Arturia, as Licensor, grants to you (hereinafter termed "Licensee") a nonexclusive right for the use of software including related media, documentation (for example program descriptions, manuals) and other documents and materials manufactured by Arturia SA ("Product(s)").

All intellectual property rights in the software belong to Arturia SA (hereinafter: "Arturia").

1.2 The following editions of the Product are available: "**Demo**", "**Standard**", "**EDU**" and "**NFR**". Whilst each edition equips the User with the same software, the editions vary as regards both the scope of functions activated in the Product, and the rights of use granted under this EULA.

1.3 By installing the software on your computer you agree to these terms and conditions. If you do not approve these terms and conditions, you must not install this software.

1.4 If you do not approve these terms and conditions, please return the complete Product (including all written matter, packaging and similar material) to the dealer from whom it was originally bought within 14 (fourteen) days after the day of purchase. For purchases from the Arturia Online Store, please contact Arturia on the internet website: [www.arturia.com/support/askforhelp/purchase](http://www.arturia.com/support/askforhelp/purchase).

1.4 Arturia reserves all rights not expressly granted in the EULA.

## 2. Right of use

2.1 The Product is protected by copyright. The Licensee may not lease, loan or sub-license the software. The Licensee is not authorized to modify the software.

2.2 Owning any product provided to the Licensee as "**Standard**" version grants the Licensee a non-exclusive right to use the Product in perpetuity including commercial purposes. The Licensee can activate the Product on up to five computers, as long as only one installation is used at any given time. The Licensee must register the Product to Arturia to get access to client support, and to activate his Product. (An internet connection is required to register and activate the Product, either on the computer on which the Product is installed, either on another device able to exchange files with the computer on which the Product is installed). Owning a license of the Products entitles the Licensee to get access to the future updates of this Product.

2.3 Any Products provided to you as "**NFR**" (Not For Resale) version grants the Licensee a non-exclusive right to use the Product for a limited period of time. The Product shall only be used for demonstration, testing and evaluation purposes. NFR Products must not be used for commercial purposes, and must not be resold or transferred. The Licensee can activate the Product on up to five computers, as long as only one installation is used at any given time. The Licensee must register the Product to Arturia to get access to client support, and to activate his Product. (An internet connection is required to register and activate the Product, either on the computer on which the Product is installed, either on another device able to exchange files with the computer on which the Product is installed). NFR Products are exempt from update, upgrade or crossgrade offers, and cannot be

purchased with or exchanged for vouchers or coupons. Furthermore, as an owner of a NFR Product, you are not entitled to any vouchers that ship with the standard version of the Product.

2.4 Any Products labelled or otherwise provided to you as an **"Educational"** version grants the Licensee a non-exclusive right to use the Product in perpetuity. The Product shall only be used by students or those working in educational institutions. This definition includes students, faculty, staff and administration attending and / or working at an educational institutional facility: private / public schools, colleges, universities and similar. These Products must not be used for commercial purposes, and must not be resold or transferred. The Licensee can activate the Product on up to five computers, as long as only one installation is used at any given time. The Licensee must register the Product to Arturia to get access to client support, and to activate his Product. (An internet connection is required to register and activate the Product, either on the computer on which the Product is installed, either on another device able to exchange files with the computer on which the Product is installed). These Products are exempt from upgrade or crossgrade offers, and cannot be purchased with or exchanged for vouchers or coupons. Furthermore, as an owner of an educational Product, you are not entitled to any vouchers that ship with the standard version of the Product.

2.5 Any Products labelled or otherwise provided to you as a **"Demo"** version grants the Licensee a right to use the Product only for demonstration and evaluation purposes. These Products must not be used for commercial purposes, and must not be resold or transferred. These Products are exempt from upgrade or crossgrade offers, and cannot be exchanged for vouchers or coupons.

### **3. No Unbundling**

Bundles (product bundles are an association of software and hardware or software-only products) can only be resold / transferred as a whole. The individual components of a bundle must not be resold / transferred separately.

### **4. Resell**

4.1 Renting or lending the licensed Software to a third party is expressly forbidden. Apart from that and if not provided otherwise within this EULA.

4.2 Except if otherwise stated within this EULA, Licensee may resell the software to a third party or transfer the software permanently free of charge, provided the third party agrees in writing with this EULA and Licensee ceases all use of the software, completely removes all installed copies of the software from his computers and – if the software was not purchased via download – deletes or transfers the original media delivered with the software to the third party. In addition, Licensee is required to de-register the purchased software with Arturia (more information available on [www.arturia.com](http://www.arturia.com)).

### **5. In case a sound library is part of the purchased Product the following shall apply in addition to the EULA**

The provided samples, instruments and presets can be used for commercial or non-commercial music and audio Productions without the prior permission from Arturia under the terms of this Agreement. The usage of this Product (in particular samples, instruments and presets) for the creation of a sound library or as a sound library for any kind of synthesizer, virtual instrument, sample library, sample-based Product or other musical instrument is strictly prohibited. Individual samples, sound sets or audio loops may not be distributed (commercially or otherwise) standalone. Furthermore these samples, sound sets or audio may not be repackaged in whole or in part as audio samples, sound libraries



or sound effects.

## **6. Data Protection**

Arturia attaches great importance to compliance with legislation on data protection. The User data collected are used exclusively for performing its contractual obligations. No data is passed on to third parties. Further information can be obtained from our Privacy Policy at [www.arturia.com/privacy](http://www.arturia.com/privacy).

## **7. Limited Warranty**

Arturia warrants that the physical media on which the software is provided is free from defects in materials and workmanship under normal use for a period of thirty (30) days from the date of purchase. The Licensee's invoice shall be evidence of the date of purchase. Any implied warranties on the software are limited to thirty (30) days from the date of purchase. Some states do not allow limitations on duration of an implied warranty, so the above limitation may not apply to the Licensee in this case. All programs and accompanying materials are provided "as is".

## **8. No Liability for Consequential Damages**

Neither Arturia nor anyone else involved in the creation, production, or delivery of this Product shall be liable for any direct, indirect, consequential, or incidental damages arising out of the use of, or inability to use this Product (including without limitation, damages for loss of business profits, business interruption, loss of business information and the like) even if Arturia was previously advised of the possibility of such damages. Some states do not allow limitations on the length of an implied warranty or the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusions may not apply to the Licensee in this case. This warranty gives the Licensee specific legal rights, and the Licensee may also have other rights which vary from state to state.