

June-21 Manual

a June 1 / 2 / MKS-50 emulation VST using CSound & Cabbage



Michel Rodriguez

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1 Introduction

This documentation covers the use of the June-21 VST synthesizer, a open source Roland Juno-1 / Juno-2 / MKS-50 emulator using CSound (<https://csound.com>) and Cabbage (<https://www.cabbageaudio.com/>).

June-21 can read and play Juno 1 / 2 MKS-50 presets. The emulator includes Juno 2 factory "Preset" and "Memory" bank tones. Many tones can be found on the web, in a form of a .SYX bulk dump extracted from synths.

The text and schematics are partly inspired by the original Juno-2 documentation.

The look of the GUI is obviously inspired by the Roland PG-300.

Nota Bene: June-21 is still in development and is not a perfect emulator, so some tones can be far from the real thing and some won't work (but some can be very accurate and pleasing!). As of now (Dec 2019) one things is implemented : **Aftertouch**. It won't be done (at least by me) as my own Juno-2's aftertouch is not working.

Have fun !

2 Installation

The latest version of June-21 can be found at <https://github.com/mikerodd/june-21>

2.1 Using distributions

There are ready-to-use distribution available :

- `vst-june-21-linux.zip` : VST¹ distribution for GNU/Linux
- `standalone-june-21-windows64.zip` : Standalone distribution for Windows 64-bits

2.1.1 Windows Installation

Download and unzip the appropriate file, execute `june-21.exe`

2.1.2 GNU/Linux Installation

Download and unzip the appropriate file, use `june-21.so` in your DAW or your favorite VST container.

2.2 Using Cabbage

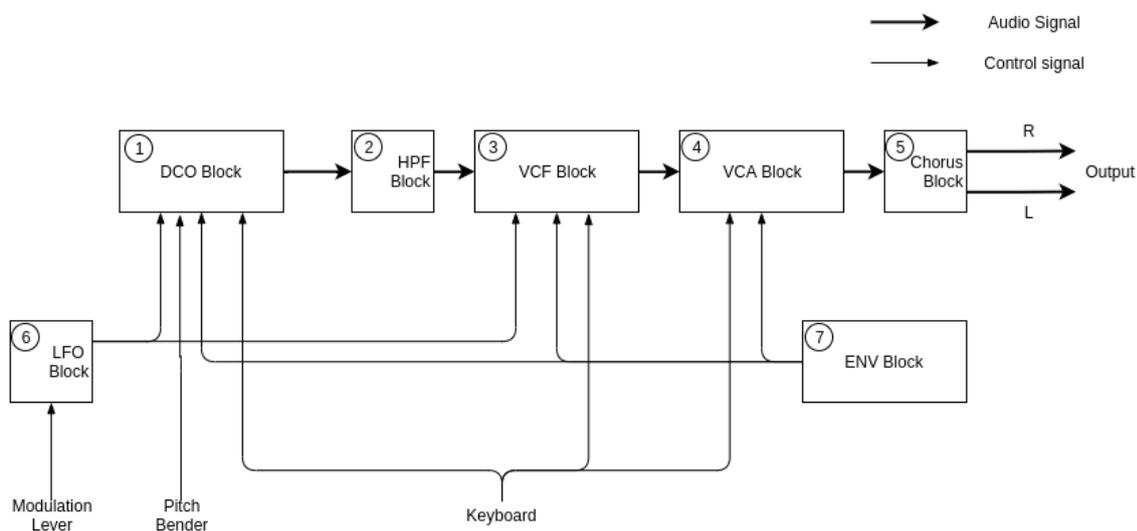
If you want to test/modify June-21, you can use Cabbage and open `june-21.csd` as you would do with any other Cabbage source files.

Note that a custom plugin is included, `libjs1` (source available in the `plugins/junosyxloader` section of the repository). This plugin interacts with the `.SYX` files (load tone, modify tone), it's a plain C program, you will need `CMake` and `CSound` headers installed in order to recompile it.

¹ Virtual Studio Technology (VST) is an audio plug-in software interface that integrates software synthesizer and effects in digital audio workstations, created by Steinberg.

3 Synth Description

June-21 consists of several blocks as shown below. Each blocs of the synth section is controlled by relevant tone-color parameters



- **① DCO (Digitally Controlled Osillator)**

DCO is the digitally controlled oscillator that controls the pitch and generates the waveforms that are the sound source of the synthesizer.

- **② HPF (High Pass Filter)**

The HPF is a filter that passes high frequency harmonics and cuts off the lower ones. This changes the waveform and controls the tone color.

- **③ VCF (Voltage Controlled Filter)**

Each VCF lets lower frequency harmonics of the input signal pass and cuts off the higher ones. In other words, it is a usual low pass filter. By controlling the cutoff point and resonance, the waveform changes, thereby the tone color alters.

- **④ VCA (Voltage Controlled Amplifier)**

After filtered in the VCF, the signal is fed to the VCA where the volume (amplitude) of the sound is controlled.

- **⑤ CHORUS**

The chorus duplicates the signal with a pitch change, giving a rich and shimmering quality.

- **⑥ LFO (Low Frequency Oscillator)**

This oscillator generates extremely low frequency, so produces a vibrato or growl effect by controlling the DCO or VCF.

- **⑦ ENV (Envelop Generator)**

This generates the control voltage (Envelope) which controls the DCO, VCF and VCA, therefore alters the pitch, tone color and volume in each note.

4 Settings

4.1 DCO Block (Digitally Controlled Oscillator)



4.1.1 DCO Range



This is to change the pitch range of the DCO in exact one octave steps from 4' to 32' (4', 8', 16', 32'). 8' is standard.

4.1.2 DCO LFO Depth



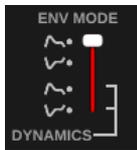
When the LFO is controlling the pitch of the DCO, this adjusts the depth of the vibrato effect in the range of 0 to 127.

4.1.3 DCO ENV Depth



When the ENV is controlling the pitch of the DCO, this parameter sets the depth of the modulation in the range of 0 to 127.

4.1.4 DCO ENV Mode



This selects the polarity of the envelope curve that controls the DCO. Usually  may be used. In  mode, ADSR pattern will be inverted.

- **Normal**  : ENV serves to increase the DCO's pitch.
- **Invert**  : ENV serves to decrease the DCO's pitch.
- **Normal with Dynamics**  : ENV with Dynamics serves to increase the DCO's pitch.
- **Invert with Dynamics**  : ENV with Dynamics serves to decrease the DCO's pitch.

4.1.5 DCO Bender Range



This sets the maximum effect of the Pitch Bender caused by moving the Pitch Bender/Modulation lever, 0 to 12 are valid for this parameter, and 1 is semi-tone, therefore 12 is an octave.

4.1.6 Pulse



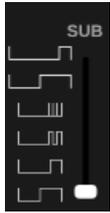
Pulse wave selected, according the selection, 3 different pulses are generated. The pulse  can be set at DCO PW/PWM Depth.

4.1.7 Sawtooth



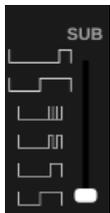
Sawtooth wave selected, according the selection, 5 different pulses are generated. The sawtooth  can be set at DCO PW/PWM Depth.

4.1.8 Sub



This selects the waveform of the Sub Oscillator that generates a pitch one or two octaves lower than the pulse wave or the sawtooth wave.

4.1.9 Sub Oscillator Waveform



This selects the waveform of the Sub Oscillator that generates a pitch one or two octaves lower than the pulse wave or the sawtooth wave.

- , ,  and  are one octave lower
-  and  are two octave lower

4.1.10 Sub Oscillator Level



This sets the volume of the Sub Oscillator from 0 to 3. At 0 there is no oscillation.

4.1.11 DCO Noise Level



This sets the volume of the White Noise, 0 to 3 are valid, at 0, there is no Noise generated.

4.1.12 DCO PW/PWM Depth



This parameter works only on the Pulse Wave 3 or the Sawtooth Wave 3. The pulse width of a wave can be determined by the value from 0 to 127.

4.1.13 DCO PW/PWM Depth



This parameter works only on the Pulse Wave 3 or the Sawtooth Wave 3. The rate of the LFO modulation that changes the pulse width of the waveform can be set. 0 to 127 are the values valid for this parameter. At 0, however, the pulse width is not modulated by the LFO but set at the PW/PWM Depth. When this parameter is set to a value other than 0, the pulse width set with the DCO PW/PWM Depth is the widest pulse made by the LFO modulation.

4.2 HPF Block (High Pass Filter)



This parameter changes the cutoff point of the HPF:

- **0** : The lower frequencies are emphasized (High Shelving at ~106Hz)
- **1** : HPF is off
- **2** : Cutoff point is set at lower frequency (~124 Hz)
- **3** : Cutoff point is set at higher than 2 (~220 Hz). The produced sound is harder and thinner

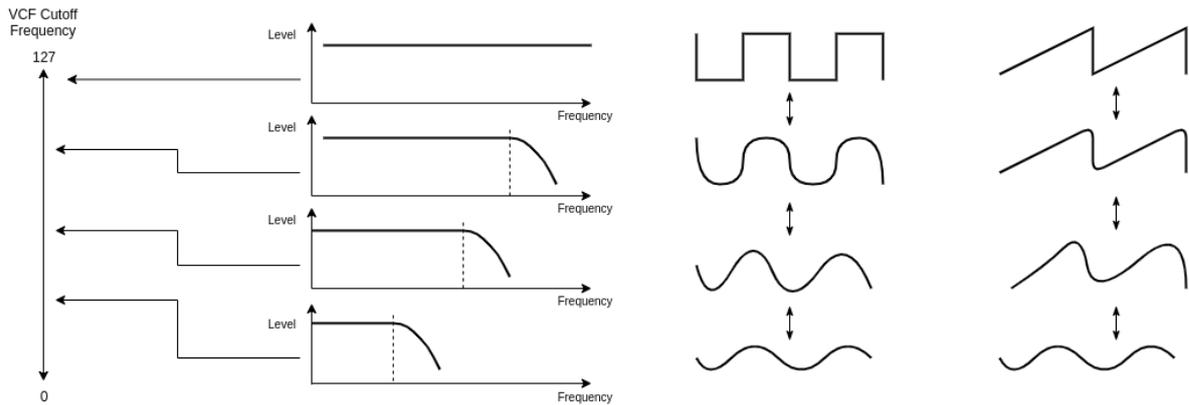
4.3 VCF Block (Voltage Controlled Filter)



4.3.1 VCF Cutoff Frequency



This is for changing the cutoff point of the VCF. As you decrease the value, the cutoff frequency will come down, and the waveform gradually becomes approximation of a sine wave, then the sound will fade out. 0 to 127 are valid for this parameter.



4.3.2 VCF Resonance



This parameter emphasizes the cutoff point set at the VCF Cutoff Frequency. 0 to 127 are valid for this parameter

4.3.3 VCF LFO



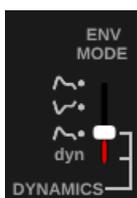
This parameter sets the depth of the LFO modulation that changes the cutoff point of the VCF (growl effect). 0 to 127 are valid for this parameter.

4.3.4 VCF Env



This parameter controls the cutoff point of the VCF in each note with the ENV curve set in the ENV section. As you increase the value, tone color within one note changes more drastically. 0 to 127 are valid for this parameter.

4.3.5 VCF Env

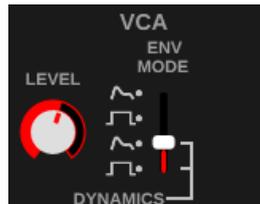


This is to select the polarity of the Envelope curve that controls the cutoff point of the VCF. Usually, may be used, in mode, ADSR pattern will be inverted.

- **Normal** : ENV serves to increase the VCF's cutoff point.

- **Invert**  : ENV serves to decrease the VCF's cutoff point.
- **Normal with Dynamics**  : ENV with Dynamics serves to increase the VCF's cutoff point.
- **dyn** : This mode is rather special ; the ENV has nothing to do with the VCF's cutoff point and the Dynamics directly works to increase the VCF's cutoff point.

4.4 VCA Block (Voltage Controlled Amplifier)

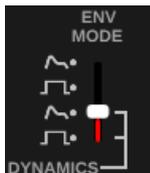


4.4.1 VCA Level

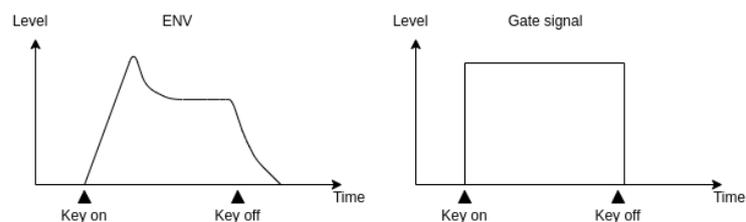


This is for changing the volume, and can be effectively used when writing a tone color. When the value is set too high, sound may be distorted.

4.4.2 VCA ENV Mode

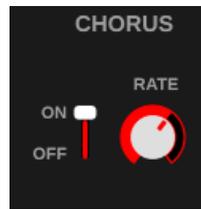


This is to select whether to control the VCA by the signal from the ENV or by the Gate signal (Key On/Off signal).



- **ENV**  : ENV changes the volume.
- **Gate**  : Gate signal changes the volume.
- **ENV**  : ENV with Dynamics changes the volume.
- **Gate**  : Gate signal with Dynamics changes the volume.

4.5 CHORUS Block



4.5.1 Chorus On/Off

This turns on or off the Chorus effect.

4.5.2 Chorus Rate

This parameter determines the rate of the chorus effect from 0 to 127.

4.6 LFO Block (Low Frequency Oscillator)



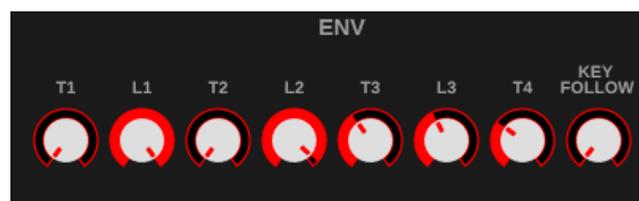
4.6.1 LFO Rate

This parameter changes the rate of the LO modulation. 0 to 127 are valid for this parameter

4.6.2 LFO Delay Time

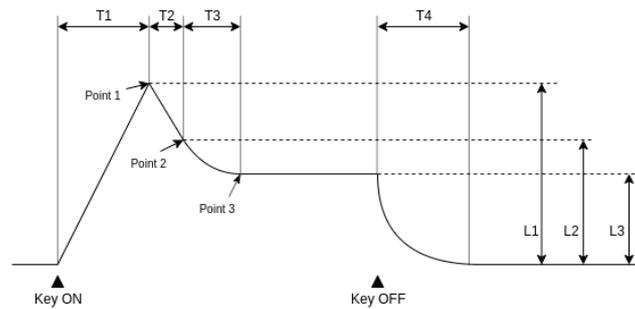
This parameter sets the time needed for the LFO modulation to work from the moment the key is played. 0 to 126 are valid for this parameter

4.7 ENV Block (Envelope Generator)



4.7.1 Envelope definition

The parameters of this part defines the ADSR envelope, 0 to 127 are valid for all parameters :



4.7.2 ENV Keyboard Follower

the time required for the envelope to complete its curve can be changed depending on which key is pressed. 0 to 15 are valid for this parameter. There is no change of the time at all when it is set to 0, but as the value is increased, envelope time become shorter with higher key pressed.

5 Using Tones



5.1 Tone organisation

There are 8 tones per banks and 8 banks in a group (64 tones per group). Groups are usually extracted from Junos via a Bulk Data Transfer resulting on a binary file known as SysEx file (short `.SYX`) for Midi System Exclusive messages.

June-21 includes the two factory presets of the Juno 2 and a blank group :

- **PRESET** : Contains the factory preset of the Juno 2 (`presets/FACTORYA.SYX`)
- **MEMORY** : Contains the factory memory of the Juno 2 (`presets/FACTORYB.SYX`)
- **FILE** : mapped to an empty cartridge in order to store user tones (`presets/USERCART.SYX`)

You can change tone using 1 to 8 bank or number buttons and **PRESET**, **MEMORY** and **FILE**.

5.2 Change Tone name



You can modify the tone name by using < and > to navigate through the name. The green slider can be used to change the underscored character.

5.3 Save Tone

To save a tone, 3 steps :

- use the **Copy** button. June-21 transfers all parameters in a buffer.
- Select a destination Tone. If you want to overwrite current tone, just stay in this tone
- Use the **Paste** button, your buffer is saved on the current tone of the `.SYX` file.

Nota Bene : There is no mecanism protecting the factory presets !

5.4 Use other Tones

You can download a lot of `.SYX` files on the internet ! Here is very interesting source : http://www.llamamusic.com/mks50/mks-50_patches.html

Once you have a `.SYX` file you want to try, use the `...` button to load it as a file.

Nota Bene : June-21 is not a finished emulator, so some tones might not sound as expected...

6 Preset and Memory Tone List

6.1 Preset Tones

MKS-50 Factory Presets (A Group) / Alpha Juno-1 and Alpha Juno-2 Factory Presets (ROM)

#	Tone Name	#	Tone Name	#	Tone Name
P-11	PolySynth1	P-12	JazzGuitar	P-13	Xylophone
P-14	Low String	P-15	LeadSynth1	P-16	ChorusGuit
P-17	SynthBass1	P-18	ElectroDrm	P-21	HighString
P-22	TeknoStrng	P-23	StringOrgn	P-24	FastString
P-25	LongString	P-26	Cello	P-27	SoloViolin
P-28	Pizzicato	P-31	Piano 1	P-32	E Piano 1
P-33	E Piano 2	P-34	Piano 2	P-35	E Piano 3
P-36	Clav	P-37	Harpsichrd	P-38	PianoPad
P-41	Organ 1	P-42	Organ 2	P-43	CheesyOrgn
P-44	PipeOrgan1	P-45	PipeOrgan2	P-46	VoicePad
P-47	sinusoidal	P-48	Voices 1	P-51	Brass 1
P-52	Syn Rise	P-53	Spit Valve	P-54	Fat Synth
P-55	Arpeggiatr	P-56	Velo-Reso1	P-57	Big Brass
P-58	Pad 1	P-61	LeadSynth2	P-62	LeadSynth3
P-63	Flute	P-64	LeadSynth4	P-65	Sax
P-66	E Bass 1	P-67	SynthBass2	P-68	SequencrBs
P-71	Bells 1	P-72	BellChime1	P-73	BellChime2
P-74	Syn-Bello	P-75	Marimba	P-76	Syn Koto
P-77	StlDrumBnd	P-78	Harp	P-81	Tron Blast
P-82	NoiseShots	P-83	TwiliteZne	P-84	Scratchin
P-85	Syn Echo	P-86	PolePositn	P-87	--U-F-0--
P-88	Timps				

6.2 Memory Tones

MKS-50 Factory Presets (B Group) / Alpha Juno-1 and Alpha Juno-2 Factory Presets (RAM)

#	Tone Name	#	Tone Name	#	Tone Name
M-11	Brass 2	M-12	Brass 3	M-13	BrassHorns
M-14	FatBrass 1	M-15	Trumpets	M-16	BrassSwell
M-17	PolySynth2	M-18	PolySynth3	M-21	BowdStrngs
M-22	RichStrngs	M-23	Orchestra	M-24	SynOrchsta
M-25	StrngSweep	M-26	SoloVioln2	M-27	DblBasses
M-28	Ominous	M-31	Piano 3	M-32	E Piano 4
M-33	Loud-Piano	M-34	Piano-FX	M-35	Clavichord
M-36	Harpsi 2	M-37	AccGuitar	M-38	BassPiano
M-41	Organ 3	M-42	Organ 4	M-43	ChowaOrgan
M-44	PipeOrgan3	M-45	Accordion	M-46	Vocorder
M-47	Voices 2	M-48	Harmonica	M-51	SynthSweep
M-52	Poly Pulse	M-53	CosmoSweep	M-54	ChrusPluck
M-55	Bells 2	M-56	Vibe	M-57	Koto
M-58	BellChime3	M-61	Lead 5	M-62	Lead 6
M-63	Inv-Solo	M-64	Clarinet	M-65	Oboe
M-66	SynthBass3	M-67	SynthBass4	M-68	UpriteBass
M-71	Machines	M-72	EchoXplosn	M-73	oops
M-74	Jet Chord	M-75	Take-Off	M-76	Whistle
M-77	Surprise	M-78	Oct Jump	M-81	Jet
M-82	Helicopter	M-83	DogsBark	M-84	WET
M-85	oohSCARY	M-86	What the	M-87	SynthToms
M-88	Kick				