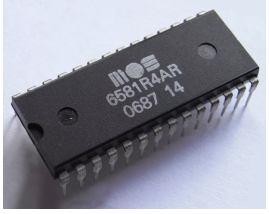
SIDmaster Synthesizer | SoedeSoft



- Emulation of the SID 6581/ 8580 ‘Sound Interface Device’ chip of the commodore 64 home computer.
- Three voices, each voice has its own:
    - Attack Decay Sustain Release control.
    - Waveform selection (triangle, sawtooth, pulse, noise, or any combination):
    - Pulse width can be modulated by the control wheel.
    - Arpeggiator (simulates chords by alternating notes on one voice)
    - Waveform effects presets (alternates waveforms/frequencies sequentially).
    - Ring modulation and synchronization options (modulates / synchronizes one voice with another).
    - Note transpose and detune.
- One filter, which can be configured as lowpass, highpass, bandpass or notch filter
    - Cutoff frequency, and resonance, which can be modulated by the control wheel and velocity.
    - Resonance can be modulated with the control wheel.
    - Can be enabled per voice
- LFOs for the pulse width, frequency of each voice and one LFO for the filter.
- Monophone mode: use all 3 voices simultaneously to create richer, layered sound
- Polyphone mode: operate as a 3 voice polyphonic synthesizer.
- Keyboard control: pitch bend, legato / slide
- Variable base frequency of the SID (on the rear).

UI Layout

main control voice 1 to 3 control filter control

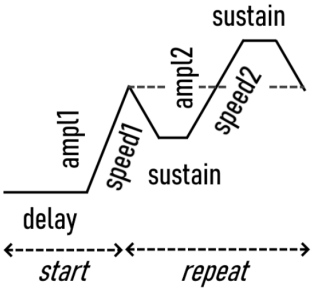
General concepts

Modulation of parameters

Some parameters can be controlled dynamically using the modulation (control) wheel. The *mod* button defines the range of the modulation. If it is positive, moving the ctrl wheel will add an offset to the pulse width. If it is negative, it will subtract an offset.

LFO

Low Frequency Oscillation is available for the filter, frequency and the width of the pulse waveform (more about that later). The LFO is built up in two parts. Part 1 is executed once, and part 2 is repeated forever.
The shape of an LFO is shown on the right, the parameters can be modified using buttons:



- **A DLY** button to modify the delay of the envelope,
- **AMP** buttons to modify *ampl1* or *ampl2*
- **SPD** buttosn to modify speed1,or speed2.
- a **HOLD** button to modify the sustain time.
- The start part is only played once, the repeat part will repeat forever.
- an *up/down* switch will flip the LFO, if it points up the LFO is as shown in the diagram, if it points down, the LFO is flipped and will go down first.

Main control

8580 / 6581: Select which version of the SID chip to use, the 6581 or the 8580 version. The main difference between the two versions is that the 6581 has a bit smoother filter, and the 8580 is a bit ‘punchier’.

BEND: the pitch bend wheel, the range can be modified up to one octave.

MOD: the control modulation wheel. this wheel modulates various parameters in other parts described later.

(BASE FREQ) **MOD**: the base frequency of the SID master (‘heart beat’) can be set at the rear side (more about that later). When this parameter is non zero, this frequency can be dynamically modified.

LEGATO*:* enables legato mode, no breaks between notes.

ENV RST*:* when a new note starts (‘note on’) and the old note hasn't been released yet (‘note off’), by default, the ADSR envelope does not restart. So when there is a note with a fast decay time and no sustain volume, the second note will be inaudible. When this is enabled, it will force a note off for a short period to force the envelope to reset (causing a small delay).

SLIDE*:* enables slide mode, moves from one note frequency to another.
speed: modify the slide speed. Turn it all the way left is infinite slide speed.

POLY/MONO: toggle between polyphone mode and mono mode. The behaviour of SIDmaster differs in each mode:.

Mono mode

In mono mode, the SIDmaster behaves as a monophonic synthesizer with 3 stacked oscillators (voices). Each voice can be edited separately by clicking on the *edit voice* button. Use **EDIT VOICEs** to edit each voice individually.

Poly mode

In poly mode, the SIDmaster operates as a polyphonic synthesizer, e.g. to play chords.

- The SID only has 3 voices, only chords with 3 keys can be played (and only one voice is used for each note, so it does not sound as rich as mono sounds).
- The SID **cannot** control the volume of each voice individually, so when playing chords, the volume of the first keypress is used for all 3 voices.

The following buttons are disabled or hidden because they don’t make sense in poly mode:

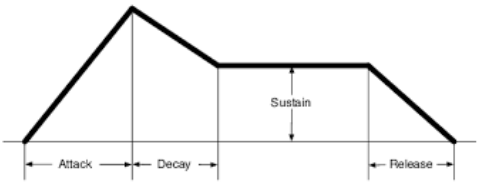
- ring modulation and synchronization off the waveform
- Muting of voice 3 is disabled
- Individual enabling of filters per voice
- Slide mode

Voice 1 to 3 control

All parameters of each of the 3 voices can be edited in this part.
When pressing the **VOICE** button the parameters of each voice can be modified (so actually there are three layers, one for each voice).
Note that to enable a voice, at least one waveform must be selected (see below).

ADSR

The Attack, Decay, Sustain, Release the envelope generator can be controlled by the *A D S R* sliders.



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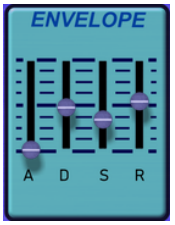
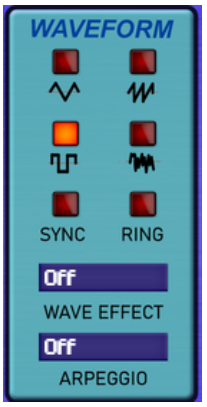


WaveForm



The SID supports four different waveforms (from top to bottom): triangle, sawtooth, pulse, and noise generator. They can be enabled using the toggle buttons left of the waveform images. If none of them are selected, the voice is muted. It's possible to select more, to combine waveforms, some combinations work, for example when you combine the triangle and pulse waveforms.
The initial width of a pulse waveform can be modified (more about that later).

Synchronization

The **SYNC** button enables synchronization of 2 voices (which technically is a logical ANDing of two waveforms).

- Oscillator 1 always synchronizes with oscillator 3,
- Oscillator 2 always synchronizes with oscillator 1,
- Oscillator 3 always synchronizes with oscillator 2.

Ringmodulation

The **RING** modulation feature only works with the triangle waveform. If enabled for voice 1, it replaces the triangular output of oscillator 1 with a 'ring modulated' combination of oscillator 1 and 3. This can create bell or gong sounds.

Arpeggiator

The SIDmaster has a built-in arpeggiator, which in mono mode, can be individually enabled per voice.
The **ARPEGGIO** selector has a number of arpeggio styles in various speeds, but also other effects such as an octaver. When for example *Fast arpeggio* is selected, it will alternate the notes every tick is 20 milliseconds[1]. Pressing for example 3 keys will arpeggiate between the 3 notes (and between 2 if you press only 2 keys). The arpeggiator will continue even after you release the keys, even if you don't release them exactly at the same time. Arpeggio patches have *arp* in their names.

[1] The 20 ms timer tick comes from the fact that music players in the old days always run in sync with the video which ran at 50 Hz for PAL systems. Every 20 ms the music player had a few ms time to update all the registers of the SID (NTSC systems ran at 60 Hz).

NOTE: When using arpeggios, select mono mode. Using arpeggios in polyphone mode is possible but doesn't sound really nice.

Wave Effects

To create more interesting sounds, old C64 songs often alternated waveforms and note pitches every tick, for example, to create a cymbal like sound (without using a dedicated voice), a high pitched noise waveform was enabled for one tick (called the *click* presets in the **WAVE EFFECT** selector). After that tick, it switched back to the desired waveform. Some presets do only a small click at the start, and others do a small bending effect.

Frequency

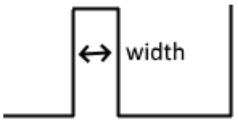
A key can be transposed plus or minus 2 octaves using the up down buttons.
The control wheel can be used to transpose even more, also plus or minus two octaves. By default, this is disabled, but the **MOD** button can be used to enable this. Effectively, this is an extra pitch bend, but it can be individually controlled for each voice.
This is useful when waveforms are synchronized or ring modulated, to create interesting effects (more later how to enable synchronization and ring modulation).
To slightly change the pitch of a note, use the **DTN** button. This effect creates a richer sound when layering two voices (in mono), and slightly detunes the second voice. An example of this is the patch named *HeavySaw*.

Frequency LFO

A vibrato effect can be created with the frequency LFO. It does have a **MOD** switch to modulate the amplitude using the control wheel. This can be used to quickly increase the amplitude of the vibrato on individual notes, which was often used by C64 composers.
It also has an *inc* button, if non-zero, the amplitude of the LFO is increased at each repeat cycle (also an often used effect in C64 tunes).
The parameters are described in the general concepts section.

Pulse

When a pulse waveform is selected, the width can be set using the **PULSE** button.



The pulse width can be modulated using the control wheel if the **MOD** button is set to a non-zero value.
See the general concepts for a description of the mod parameters.

Pulse LFO

The pulse width can also be modulated using an LFO (low frequency oscillator).

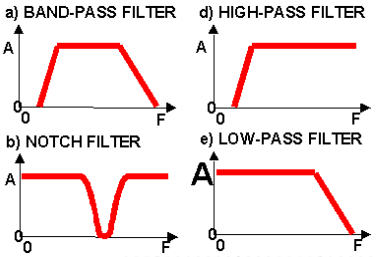
See the general concepts for a description of the LFO parameters. When the **ENV** button is selected, the LFO envelope will not restart when the next note is pressed.

Filter control / main volume

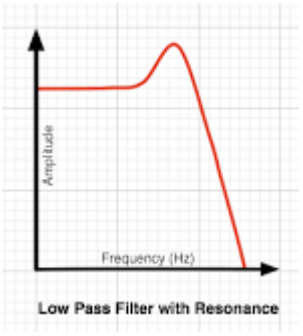
Filter

The SID only has one filter but it can be enabled for each voice using the *1, 2, 3* buttons. If enabled, the output of the specific voice will be filtered.
It has 4 modes which can be selected using the selector button.

- The low pass (selected in the picture on the right) will cut off the high frequencies,
- the high pass filter, which is the opposite of the low pass filter,
- the band bass, which is a combination of a low and high pass filter,
- and the notch filter, creating a very ‘pinched’ sound.



The frequency where the filter kicks in can be set using the **CUT** button.
The resonance of the filter can be modified as well using the **RESONANCE** button (resonance amplifies the amplitude at the cut-off frequency..
Both the cut-off frequency and the resonance can be modulated with the control wheel using *mod* buttons. The cut-off frequency can also be modified by the velocity of a pressed key using the **VEL** button.



Filter LFO

The cut-off frequency can be modulated with an LFO as well, with the same parameters as the pulse LFO. The start part is useful for bass type patches, the repeat part is useful for wow-effects.
The fiter LFO has one extra toggle switch next to the up-down switch defining the shape of the lfo. When the switch is moved up it uses the default triangle shaped LFO as used for pulse and frequency LFOs. When the switch is moved down it uses a sawtooth shape.
When the **FREEZE** toggle is enabled, the filter will not restart at the press of a new key, enabling ‘wah wah’ like sounds.

Main volume

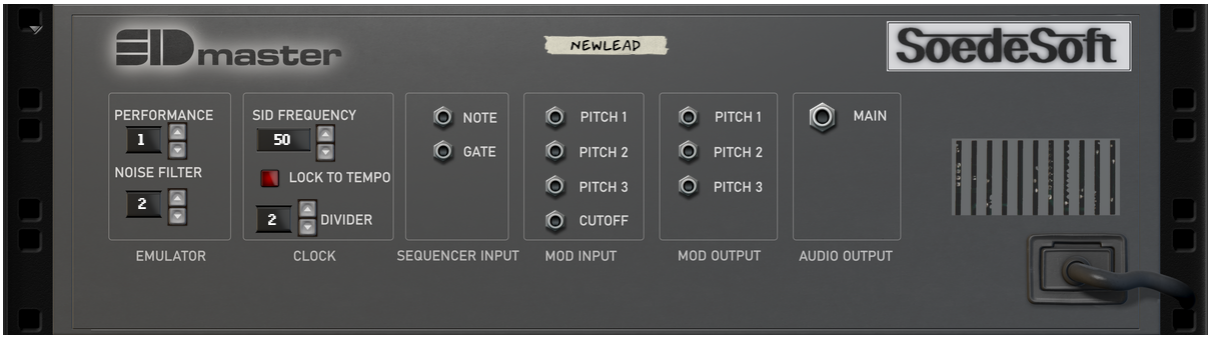
Use the **VOLUME** button to control the main volume of the synthesizer.
The **VOICE3ON** toggle switch can be used to mute the output of voice 3. When creating synchronization or ring modulated patches, and enabling it on voice 1, voice is combined with voice 3 (as explained earlier). If you want to hear the modulated output of voice 1 only, this switch can be used to mute the output of voice 3.

Patch

Use the patch buttons to select and save patches.

SidMaster back panel

Pressing TAB will show the back panel.



Emulator

With **PERFORMANCE**, a balance can be made between sound quality and performance. A value of 1 is the highest quality but will cost more CPU bandwidth. Setting it to 20 is the lowest quality (and is the same as earlier versions of SIDmaster).
For high notes, this can improve sound quality a lot, but for bass sounds, it's less noticeable.

With **NOISE FILTER**, the emulation noise can be filtered to reduce 'emulation' noise. Setting it to 0 will disable it.

Clock

The SIDmaster operates at a base frequency of 50 Hz, but can be modified e.g. to 60 Hz (which for example is the case in the USA).
All LFOs, arpeggiators and wave effects operate on this base frequency.

The base frequency can be modified using the **SID FREQUENCY** up/down buttons.
It's also possible to make it run in sync (lock it) with the tempo of Reason, use the **LOCK TO TEMPO** toggle button. If selected the SID frequency will be set to the tempo of reason divided by **DIVIDER**.

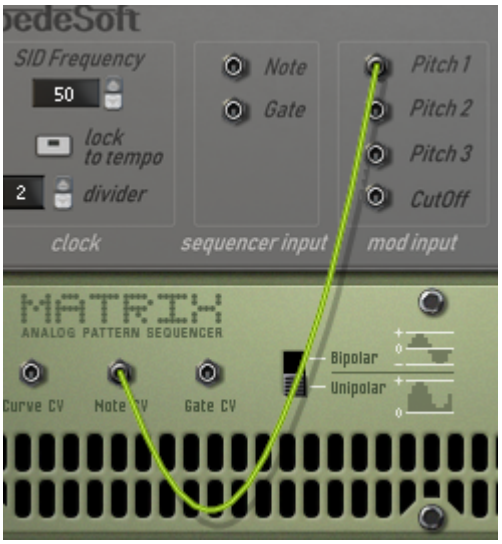
Sequencer input

You can connect the output for example of a reason utility (like the matrix pattern sequencer, or monophonic arpeggiator) to the *Note* and *Gate* sequencer input, to control the pitch and velocity of the SIDmaster.

Mod input

The frequency of each voice can be externally controlled when you connect a cable to *Pitch 1* to *3* of the mod inputs. This *only* controls the pitch of voice 1, and not of voice 2 or 3. Controlling the pitch of one voice externally can be used for ring or synchronization effects. for example:

- Create a mono patch with a pulse waveform on voice 1 with synchronization enabled.
- Enable any waveform on edit voice 3, but disable the output of voice 3 (click on **VOICE3ON** in the volume section). This makes voice 3 an inaudible oscillator.
- If you turn *mod* in the frequency section to max, and play a note, you can already hear the synchronization effect using the control wheel.
- To use external pitch control, for example, using Reason's matrix utility connect the cables as shown here.
- When Matrix is playing, the pitch of voice 1 is now directly controlled by Matrix.



The cutOff frequency of the filter can be externally modified by connecting a cable to *CutOff*. When this is connected, this input is used instead of the modulation wheel's value.

Mod output

The frequency of each voice can be used as output as well. Connect a cable from **PITCH 1** to *3* of the mod output to (for example) the **PITCH 1** of another SIDmaster (or any other synth). When using synchronization or ring modulation, this can be used to have the output of (for example) a bass melody as input for a sync or ring effect. In 'the old C64 days', composers often used this trick to create interesting, sometimes a bit unpredictable sounds (as they had only one SID chip).

NOTE: Use mono mode if you want to use the pitch output. In poly mode, it alternates between voice 1 and 3, and the output of pitch 1 will only have a value when voice 1 is active. So the output is less usable as in input for another synth.

Audio output

Main mono audio output of the SIDmaster synthesizer.

Midi configuration for automation

The SID master can be controlled externally via MIDI CC messages.

MIDI cc	**parameter**

7	Volume
13	Filter Resonance
14	Filter CutOff
15	Filter LFO Delay
16	Filter LFO Amplitude
17	Filter LFO Speed
18	Filter LFO Hold
19	Filter LFO Amplitude Repeat
20	Filter LFO Speed Repeat
128	Pitch Range
129	Slide Speed Voice
130	Pulse LFO Width Voice 1
131	Pulse LFO Delay Voice 1
132	Pulse LFO Amplitude Voice 1
133	Pulse LFO Speed Voice 1
134	Pulse LFO Hold Voice 1
135	Pulse LFO Amplitude Repeat Voice 1
136	Pulse LFO Speed Repeat Voice 1
137	Frequency Transpose Voice 1
138	Frequency Detune1
139	Frequency LFO Delay Voice 1
140	Frequency LFO Increase Voice 1
141	Frequency LFO Amplitude Voice 1
142	Frequency LFO Speed Voice 1
143	Frequency LFO Hold Voice 1
144	Pulse LFO Width Voice 2
145	Pulse LFO Delay Voice 2
146	Pulse LFO Amplitude Repeat Voice
147	Pulse LFO Speed Repeat Voice
148	Pulse LFO Hold Voice 2
149	Pulse LFO Amplitude Repeat Voice 2
150	Pulse LFO Speed Repeat Voice 2
151	Frequency Transpose Voice 2
152	Frequency Detune2
153	Frequency LFO Delay Voice 2
154	Frequency LFO Increase Voice 2
155	Frequency LFO Amplitude Repeat Voice
156	Frequency LFO Speed Repeat Voice
157	Frequency LFO Hold Voice 2
158	Pulse LFO Width Voice 3
159	Pulse LFO Delay Voice 3
160	Pulse LFO Amplitude Voice 3
161	Pulse LFO Speed Voice 3
162	Pulse LFO Hold Voice 3
163	Pulse LFO Amplitude Repeat Voice 3
164	Pulse LFO Speed Repeat Voice 3
165	Frequency Transpose Voice 3
166	Frequency Detune3
167	Frequency LFO Delay Voice 3
168	Frequency LFO Increase Voice 3

169	Frequency LFO Amplitude Voice 3
170	Frequency LFO Speed Voice 3
171	Frequency LFO Hold Voice 3