

pittsburgh modular synthesizers lifeforms SV-1b user manual v.1_b

the heart and soul of modular synthesis

The Pittsburgh Modular Synthesizers Lifeforms SV-1b is a complete dual oscillator synthesizer, designed to be the core of your eurorack modular system. Building on the sound and legacy of our celebrated Waveforms oscillator, the SV-1b module features two full-range independent analog oscillators; sound sources that are perfect for dynamic and inspired performances. In addition to these two high-performance oscillators, we stuffed the SV-1b with a perfectly curated set of modular synthesis tools including dual, chained mixers, a plucky, four stage envelope generator, and of course, our legendary analog state variable filter.



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1. important information

1.1 important power information

Read Instructions:

Please read the Liforms SV-1b manual completely before use and retain for future reference.

IMPORTANT Ribbon Cable Power Information:

The Liforms SV-1b is a eurorack format synthesizer module. The module can be installed, rearranged, removed, and replaced in any compatible eurorack enclosure from Pittsburgh Modular or other manufacturers.

The Liforms SV-1b uses a standard 10 to 16 pin eurorack ribbon cable to connect the module to a bipolar +/-12v power supply. Please pay very close attention to the orientation of the ribbon cable when adding and removing modules. The stripe on the ribbon cable marks -12v. This stripe needs to line up with the -12v pins on the power rail and the -12v pins on the module. The Liforms SV-1b includes reverse polarity protection so it will not be damaged when plugged in incorrectly; however, as a general rule, failure to match up the pins correctly can result in damage to one or all the modules in a case. On a Pittsburgh Modular enclosure power rail, the -12v pins are clearly labeled. On the Liforms SV-1b module, the positive side of the pin connector is on top, and the negative sides of the pin connector is on the bottom so the red stripe should be toward the bottom of the module.

Do NOT remove the Liforms SV-1b module from any case while it is plugged in.

Do NOT unplug ribbon cables from the Liforms SV-1b or case while the case is plugged in.



2. user interface

midi module

1. **mode button** - switch between midi responses.
2. **edit button** - modify selected mode.
3. **hold button** - enable/disable hold mode.
4. **mono led** - indicates monophonic midi mode selected.
5. **arp led** - indicates arpeggiator midi mode selected.
6. **gate led** - midi note on/off gate output jack.
7. **clock button** - tap clock tempo button.
8. **clock led** - clock output indicator.
9. **lfo button** - switch between digital lfo waveforms.
10. **glide knob** - midi note portamento control.
11. **lfo output jack** - digital lfo output.
12. **lfo output jack** - digital lfo output.
13. **cc output jack** - assignable midi cc output.
14. **velocity output jack** - midi velocity output.
15. **pitch output jack** - midi note pitch 1 volt per octave jack.
16. **gate output jack** - midi note on/off gate jack.
17. **midi in input jack** - custom jack for included 1/8" to midi cable.
18. **clock i/o input or output jack** - clock input or output jack.

oscillator 1 module

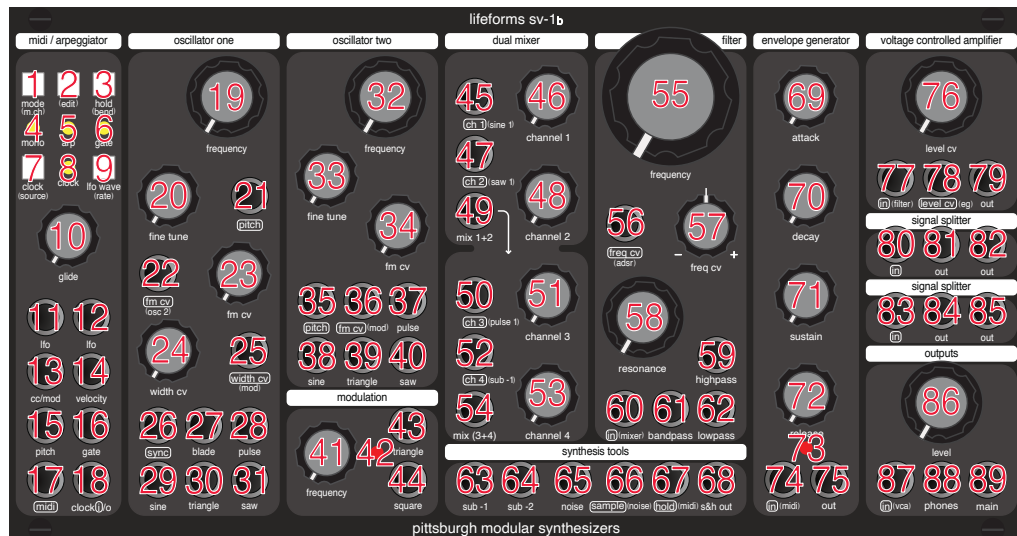
19. **oscillator 1 frequency knob** - coarse frequency control.
20. **oscillator 1 fine tune knob** - fine frequency control.
21. **oscillator 1 pitch input jack** - 1 volt per octave pitch tracking input.
22. **oscillator 1 fm input jack** - exponential fm input jack.
23. **oscillator 1 fm input attenuator** - fm input level control.
24. **oscillator 1 width cv attenuator** - blade & pulse width input level control.
25. **oscillator 1 width cv input jack** - blade & pulse width modulation input.
26. **oscillator 1 sync input jack** - oscillator sync input jack.
27. **oscillator 1 blade output jack** - blade wave output jack.
28. **oscillator 1 pulse output jack** - pulse wave output jack.
29. **oscillator 1 sine output jack** - sine wave output jack.
30. **oscillator 1 triangle output jack** - triangle wave output jack.
31. **oscillator 1 saw output jack** - saw wave output jack.

oscillator 2 module

32. **oscillator 2 frequency knob** - coarse frequency control.
33. **oscillator 2 fine tune knob** - fine frequency control.
34. **oscillator 2 fm input attenuator** - fm input level control.
35. **oscillator 2 pitch input jack** - 1 volt per octave pitch tracking input.
36. **oscillator 2 fm input jack** - exponential fm input jack.
37. **oscillator 2 square output jack** - square wave output jack.
38. **oscillator 2 sine output jack** - sine wave output jack.
39. **oscillator 2 triangle output jack** - triangle wave output jack.
40. **oscillator 2 saw output jack** - saw wave output jack.

modulation module

41. **modulation lfo frequency knob** - coarse frequency control.
42. **modulation lfo led** - lfo frequency indicator.
43. **modulation lfo triangle output jack** - triangle wave output jack.
44. **modulation lfo square output jack** - square wave output jack.



mixer module

45. **channel 1 input jack** - channel 1 input jack.
46. **channel 1 input attenuator** - channel 1 input attenuator.
47. **channel 2 input jack** - channel 2 input jack.
48. **channel 2 input attenuator** - channel 2 input attenuator.
49. **channel 1 & 2 mix output jack** - channel 1 & channel 2 output mix jack.
50. **channel 3 input jack** - channel 3 input jack.
51. **channel 3 input attenuator** - channel 3 input attenuator.
52. **channel 4 input jack** - channel 4 input jack.
53. **channel 4 input attenuator** - channel 4 input attenuator.
54. **mix output jack** - output mix jack.

filter module

55. **filter cutoff frequency knob** - filter frequency control knob.
56. **frequency cv input jack** - frequency cv input jack.
57. **frequency cv input attenuverter** - frequency cv input level control.
58. **resonance knob** - resonance control knob.
59. **highpass output jack** - highpass filter response output.
60. **filter input jack** - filter input jack.
61. **bandpass output jack** - bandpass filter response output.
62. **lowpass output jack** - lowpass filter response output.

tools module

63. **oscillator 1 sub -1 output jack** - -1 octave sub-oscillator output jack.
64. **oscillator 1 sub -2 output jack** - -2 octave sub-oscillator output jack.
65. **noise output jack** - analog noise output jack.
66. **sample & hold sample input jack** - sample source input jack.
67. **sample & hold hold input jack** - hold gate input jack.
68. **sample & hold output jack** - sample & hold output jack.

adsr module

69. **attack knob** - envelope attack control knob.
70. **decay knob** - envelope decay control knob.
71. **sustain knob** - envelope sustain control knob.
72. **release knob** - envelope release control knob.
73. **adsr led** - indicates the status of the envelope output.
74. **adsr input jack** - envelope input gate jack.
75. **adsr output jack** - envelope output jack.

voltage controlled amplifier module

76. **amplifier level cv input control** - amplifier level cv input control.
77. **amplifier input jack** - amplifier input jack.
78. **amplifier level cv input jack** - amplifier level cv input jack.
79. **amplifier output jack** - amplifier output jack.

splitter module

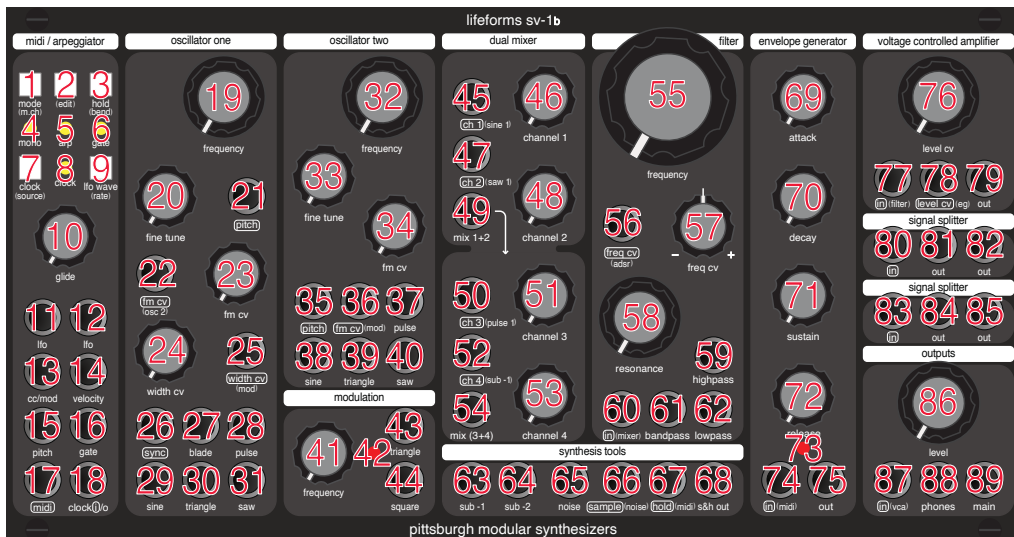
80. **splitter input jack** - splitter input jack.
81. **splitter output jack** - splitter output jack.
82. **splitter output jack** - splitter output jack.

splitter module

83. **splitter input jack** - splitter input jack.
84. **splitter output jack** - splitter output jack.
85. **splitter output jack** - splitter output jack.

outputs module

86. **outputs level control knob** - headphone and main output level knob.
87. **outputs input jack** - outputs input jack.
88. **headphones output jack** - stereo headphones output jack.
89. **main output jack** - mono line level output jack.



3. lifeforms SV-1b modular synthesizer overview

3.1 overview

The Pittsburgh Modular Lifeforms SV-1b combines the functionality of 12 individual modular synthesizer modules behind a single panel. Connect different modules using patch cables to create complex sounds and textures.

The Lifeforms SV-1b signal path is divided into two types of signals: audio signals and control voltages. The audio signal is the sound that is produced. The audio signal path starts at an oscillator or other sound source. The audio signal is then patched through other modules used to shape the sound such a mixer, filter, or amplifier.

Control voltages (cv) manipulate the audio signal in several different ways. Gates are represented by a high or low control voltage. A gate can be generated using a pulse or square wave from an oscillator or modulation source, or by using the gate or clock output from the midi module. A gate can be shaped using the adsr to control the attack, decay, sustain, and release of the gate. The modified gate signal can then be sent to any cv input on the Lifeforms SV-1b.

A second use for control voltages is as a modulation source. For example, a control voltage from the pitch output of the midi module patched into the pitch input on the oscillator 2 module controls the frequency of oscillator 2 based on the midi note received. The modulation module provides a separate low frequency oscillator that makes a perfect control voltage modulation source. Audio signals also make a great control voltage source for oscillator FM (frequency modulation).

3.2 panel labeling conventions

The Lifeforms SV-1b uses several simple labeling conventions to make the user interface and signal flow easy to understand.

The large gray rectangles outlined in black are used to separate individual modules.

Output jacks are labeled using plain black lower case letters.

Input jacks are labeled using white lower case letters surrounded by a black background.

Internally patched signals are labeled with parenthesis at their destination.

3.3 manual labeling conventions

Within the user manual, user interface buttons, knobs, and jacks are marked with brackets. For example [clock led] refers to the led labeled clock in the midi section.

3.3.1 internal patching

The Lifeforms SV-1b utilizes internal patching to create a single oscillator synth voice that does not require patch cables to play. To modify the internal patch or to create something completely new, all of the internal routing can be bypassed using patch cables. This allows total patching freedom without the constraints of a fixed voice architecture.

The patch points that the SV-1b uses internally are clearly marked on the panel with the origin of the signal written in parenthesis. **Plugging a patch cable into an internally patched input jack will override any internal patching.**

3.3.2 internal patching diagram

The diagram below shows the prepatched audio and cv signals. The audio signals are shown in purple and the cv signals are shown in green.



4. individual modules

4.1 panel layout

The Lifeforms SV-1b is organized into 12 independent sections. Midi, oscillator 1, oscillator 2, lfo, mixer, tools, filter, adsr, vca, splitter, splitter, and outputs. Each module can operate on its own and can be patched into any other module within the Lifeforms SV-1b or other eurorack format modules.



5. midi module



5.1 overview

Convert digital midi data from a midi controller or daw into the analog voltages needed to control the Lifeforms SV-1b synthesizer using the midi module. A full featured monophonic midi to cv converter with arpeggiator, glide, tap tempo clock, and digital lfo.

5.2 two performance modes

The midi module has two main modes, monophonic and arpeggiator. Monophonic mode converts midi note on and note off messages into monophonic 1 volt per octave cv and gate signals that can be used to control oscillator pitch and trigger the adsr. The arpeggiator mode creates a repeating sequence of 1 volt per octave cv and gate signals based on the incoming midi notes.

The [mode button] switches between monophonic and arpeggiator modes. The selected mode is identified with an illuminated led.

Monophonic Mode works great when using the Lifeforms SV-1b as a single voice monosynth. Monophonic Mode has several keyboard responses to choose from: last note priority, low note priority, and high note priority. Each response is available with and without gate retriggering.

Arpeggiator Mode includes multiple responses to choose from. Available responses are notes played in order, notes played in order with a double trigger, random, and random with a random gate. The arpeggiator can be clocked using tap tempo, midi clock, or external gate signal.

5.2.1 monophonic mode

Monophonic Mode outputs a single cv and gate signal based on the active midi note. The midi module features up to 10 note recall when multiple keys are pressed at once.

Eurorack standard 1 volt per octave scaled cv is output from the [pitch output jack]. This signal is patched into the [oscillator pitch input jack] or [oscillator 2 pitch input jack] to control the pitch of the oscillator. based on the incoming midi note.

The [gate output jack] outputs a high signal (+5v) when the midi module when a key is pressed. The [gate output jack] outputs a low signal (0v) when all the keys are unpressed. This gate signal can be patched into the [adsr input jack] to trigger the envelope generator.

Enable the hold function by pressing the [hold button]. The hold function latches the gate output high. The [mono led] will blink while the hold function is enabled. **Disable the hold function by pressing the [hold button].** The [mono led] will stop blinking to verify the hold function is disabled.

5.2.2 monophonic keyboard response

The [edit button] cycles between 6 different monophonic response types. The selected type is identified by a blinking [mono led]. The number of times the [mono led] blinks identifies the selected monophonic response type. The selected monophonic response type is saved in memory and recalled when the Lifeforms SV-1b module is powered on.

When monophonic mode is active, press the [edit button] to cycle through monophonic response types.

1. **Last Note Priority with Gate Retrigger** - Last note played sounds when multiple notes are active. [Gate output jack] retriggers for every new note.
2. **Last Note Priority** - Last note played sounds when multiple notes are active. [Gate output jack] triggers only when a single note is active.
3. **Low Note Priority with Gate Retrigger** - Lowest note played sounds when multiple notes are active. Gate retriggers for every new note.
4. **Low Note Priority** - Lowest note played sounds when multiple notes are active. [Gate output jack] triggers only when a single note is active.
5. **High Note Priority with Gate Retrigger** - Highest note played sounds when multiple notes are active. [Gate output jack] retriggers for every new note.
6. **High Note Priority** - Highest note played sounds when multiple notes are active. [Gate output jack] triggers only when a single note is active.

5.2.3 arpeggiator mode

Arpeggiator Mode outputs a single CV and gate signal. Up to 10 note arpeggiations are available when multiple keys are pressed at once. The arpeggiator cycles through the selected notes. The set of selected notes resets when the arpeggiator receives a midi note off message (key unpressed) followed by a midi on message (key press).

Eurorack standard 1 volt per octave scaled cv is output from the [pitch output jack]. This signal is patched into the [oscillator 1 pitch input jack] or [oscillator 2 pitch input jack] to control the pitch of the oscillator. based on the active arpeggiator note.

The [gate output jack] outputs a high signal (+5v) when the midi module when a note is triggered. The [gate output jack] outputs a low signal (0v) 40ms after a note is triggered. This gate signal can be patched into the [adsr input jack] to trigger the envelope generator.

Enable the hold function by pressing the [hold button]. The hold function allows the arpeggiator to cycle through the last set of selected notes after the selected notes have been unpressed. The [arp led] will blink while the hold function is enabled. **Disable the hold function by pressing the [hold button].** The [arp led] will stop blinking to verify the hold function is disabled.

5.2.3 selecting an arpeggiator mode

The [edit button] cycles between 4 different arpeggiator response types. The selected type is identified by a blinking [arp led]. The number of times the [arp led] blinks identifies the selected arpeggiator response type. The selected arpeggiator response type is saved in memory and recalled when the Lifeforms SV-1b module is powered on.

When arpeggiator mode is active, press the [edit button] to cycle through arpeggiator response types.

1. **Notes Played in Order** - pitch output cycles through played notes. [Gate output jack] triggers with each clock.
2. **Notes Played in Order with a Double Trigger** - pitch output cycles through played notes playing each note twice. [Gate output jack] triggers with each clock.
3. **Random** - pitch outputs a randomly selected note. [Gate output jack] output triggers with a 100% probability.
4. **Random with Random Gate** - pitch outputs a randomly selected note. [Gate output jack] output triggers with a 60% probability.

5.3.1 three clock sources

The midi module has 3 clock sources: internal, external midi, and external gate. The clock is used to clock the arpeggiator. Internal clock and external midi clock output to the [clock i/o jack]. The clock source is selected using the edit mode.

1. **Internal clock** utilizes the clock button to modify the rate of the internal clock. The internal clock is used to clock the arpeggiator and is also output to the [clock i/o jack]. **Tap the [clock button] to change the tempo of the midi module.**
2. **External midi clock** responds to midi start/stop messages and midi tempo from an external midi clock source. The external midi clock is used to clock the arpeggiator and is also output to the [clock i/o jack]. **In external midi clock mode, the [clock button] acts as a clock divider cycling through five available clock divisions.**
3. **External gate clock** responds to gate signals patched into the [clock i/o jack]. The external gate clock is used to clock the arpeggiator. **With the external gate clock source, the [clock button] cycles through six available clock divisions.**

5.3.2 selecting the active clock source

The clock source is selected in the edit mode. **Enable edit mode by pressing and holding the [edit button] down for 1 second.** The [mono led], [arp led], [gate led], and [clock led] will blink 3 times to indicate edit mode is enabled.

In edit mode, the [clock button] cycles through the three available clock sources. Internal clock, external midi clock, external gate clock. The number of times the [clock led] blinks identifies the selected clock source. One blink represents the internal clock. Two blinks represents external midi clock. Three blinks represents external gate clock. The active clock source is saved in memory and recalled when the Lifeforms SV-1b module is powered on.

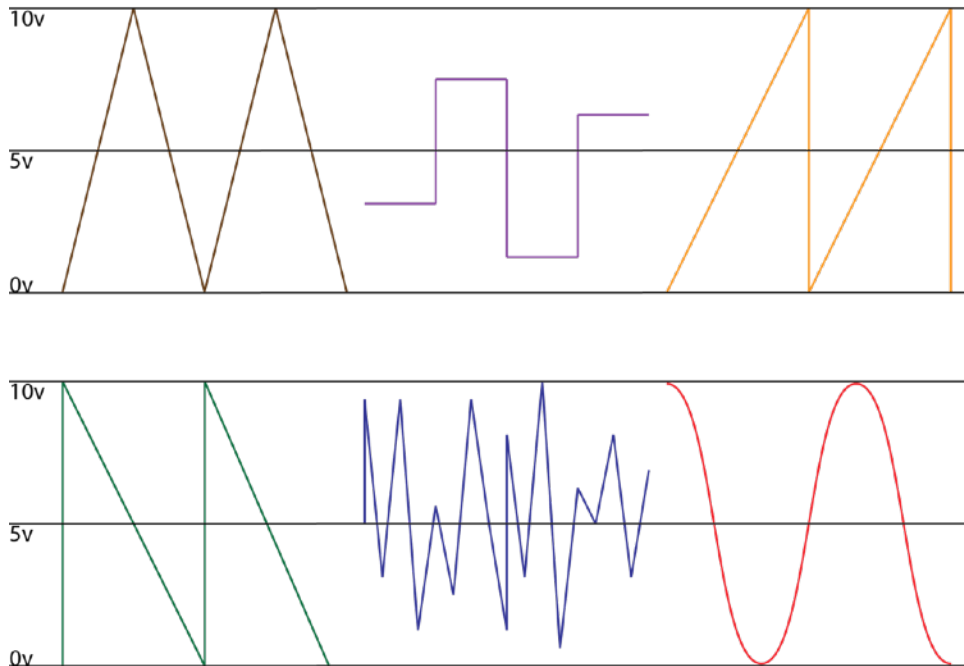
Disable edit mode by pressing and holding the [edit button] down for 1 second. The [mono led], [arp led], [gate led], and [clock led] will blink 3 times to indicate edit mode is disabled.

5.4.1 digital lfo

The midi module includes a digital lfo with two identical [lfo output]s. The frequency of the digital lfo is based on the active clock source. The active clock source can be the internal clock, external midi clock, or external gate clock. The digital lfo waveforms are positive voltage only and are centered around 5v.

Waveforms available include triangle, random, ramp, saw, digital noise, and sine.

Pressing the [lfo button] cycles through the available waveforms.



5.4.2 selecting the digital lfo clock division

The digital lfo can run at a division or multiple of the active clock source. **To select a clock division, Press and hold the [lfo button] then tap the [clock button] to cycle through the digital lfo frequency divisions.** The selected digital lfo clock division is saved in memory and recalled when the Lifeforms SV-1b module is powered on.

1. **Clock =** - lfo frequency matches the active clock source.
2. **Clock x2** - lfo frequency is double the frequency of the active clock source.
3. **Clock x3** - lfo frequency is triple the frequency of the active clock source.
4. **Clock /2** - lfo frequency is half the frequency of the active clock source.
5. **Clock /4** - lfo frequency is a quarter the frequency of the active clock source.

5.5.1 midi cc expression output

The [cc output jack] outputs a 0v to 5v voltage based on assigned midi cc number. This jack can be assigned to a midi keyboard mod wheel or assignable knob. The [cc output jack] can also be assigned to a midi cc channel used by a daw.

5.5.2 selecting the midi cc source

The midi cc source is selected in the edit mode. **Enable edit mode by pressing and holding the [edit button] down for 1 second.** The [mono led], [arp led], [gate led], and [clock led] will blink 3 times to indicate edit mode is enabled.

Once in edit mode, the midi module assigns the cc channel based the last incoming cc message it receives. Simply move a mod wheel or turn a knob to assign that midi cc number to the midi module. The cc source is saved in memory and recalled when the Lifeforms SV-1b module is powered on.

Disable edit mode by pressing and holding the [edit button] down for 1 second. The [mono led], [arp led], [gate led], and [clock led] will blink 3 times to indicate edit mode is disabled.

5.6 midi velocity expression output

The [velocity output jack] outputs a 0v to 5v voltage based on the midi velocity messages. This voltage can be patched into the [frequency cv input jack] to modulate the frequency of the filter.

5.7 hold function

The hold function works differently in monophonic and arpeggiator modes. In monophonic mode, the hold function latches the gate output high until the hold function is disabled. In arpeggiator mode, the hold function allows the arpeggiator to cycle through the last set of selected notes after the selected notes have been unpressed.

In monophonic mode, **enable the hold function by pressing the [hold button]**. The hold function latches the gate output high. The [mono led] will blink while the hold function is enabled. **Disable the hold function by pressing the [hold button]**. The [mono led] will stop blinking to verify the hold function is disabled.

In arpeggiator mode, **enable the hold function by pressing the [hold button]**. The hold function allows the arpeggiator to cycle through the last set of selected notes after the selected notes have been unpressed. The [arp led] will blink while the hold function is enabled. **Disable the hold function by pressing the [hold button]**. The [arp led] will stop blinking to verify the hold function is disabled.

5.8 glide

The [glide knob] adds portamento to the midi [pitch output jack] creating smooth transitions between midi notes. Turning the [glide knob] to the right increases the length of time it takes to glide from one note to the other.

5.9.1 edit mode

Edit mode is used to modify the midi channel, pitch bend range, control change (cc) number, and clock source parameters. All changes made in edit mode are saved in memory and recalled when the Lifeforms SV-1b module is powered on.

Enable edit mode by pressing and holding the [edit button] down for 1 second. The [mono led], [arp led], [gate led], and [clock led] will blink 3 times to indicate edit mode is enabled.

Disable edit mode by pressing and holding the [edit button] down for 1 second. The [mono led], [arp led], [gate led], and [clock led] will blink 3 times to indicate edit mode is disabled.

5.9.2 modify edit mode parameters

To modify the midi channel, tap the [edit button] until the [mono led] is blinking. Pressing the [hold button] cycles through available options. Respond to all channels followed by channel 1 through channel 16. The number of times the LED blinks corresponds to the selected midi channel: 1 blink for channel 1, 2 for channel 2, etc... For all channels, the [mono led] will blink at a steady rate.

To modify the pitch bend range, tap the [edit button] until the [arp led] is blinking. - The pitch bend parameter assigns the range of the pitch bend. Pressing the [hold button] cycles through available options: 2 semitones (+/- 2 notes), 8 semitones (+/- 5th), 12 semitones (+/- 1 octave), 24 semitones (+/- 2 octaves).

The midi module assigns the cc channel based the last incoming cc message it receives. Simply move a mod wheel or turn a knob to assign that midi cc number to the midi module. The cc source is saved in memory and recalled when the Lifeforms SV-1b module is powered on.

The [clock button] cycles through the three available clock sources. Internal clock, external midi clock, external gate clock. The number of times the [clock led] blinks identifies the selected clock source. One blink represents the internal clock. Two blinks represents external midi clock. Three blinks represents external gate clock. The active clock source is saved in memory and recalled when the Lifeforms SV-1b module is powered on.

6. oscillator 1 module



6.1 oscillator 1 overview

Oscillator 1 is a wide range, fully analog, saw wave core waveform generator. Frequency is variable from sub-audio, low frequency oscillator range to ultrasonic allowing oscillator 1 to function as both an audio source and modulation source. All 5 waveforms are available simultaneously.

Exponential frequency modulation (fm) ranging from subtle to extreme is available using the [oscillator 1 fm input jack] and [oscillator 1 fm input attenuator].

Oscillator sync is available using the [oscillator 1 sync input jack]. Sync works best when the frequency of the sync source is slightly higher than the frequency of oscillator 1.

The pulse and blade waves can be modulated using the [oscillator 1 width cv input jack] and [oscillator 1 width cv attenuator]. The width of the pulse wave is modulated from 50% with no modulation to 150% with full modulation. Setting the [oscillator 1 width cv attenuator] below halfway ensures the pulse wave does not drop out. The blade wave is modulated over the full range of the [oscillator 1 width cv attenuator].

6.2 oscillator 1 inputs and controls

[oscillator 1 frequency knob] - Coarse frequency control. Used to set the lowest frequency range that the [oscillator 1 fine tune knob] and [oscillator 1 pitch input jack] add to.

[oscillator 1 fine tune knob] - Fine frequency voltage added to the base frequency. Used to dial in precise frequencies.

[oscillator 1 pitch input jack] - One volt per octave pitch tracking input added to the base frequency. Used to control the pitch of the oscillator with a keyboard controller, sequencer, or other calibrated voltage source.

[oscillator 1 fm input jack] - Exponential fm input jack used for frequency modulation.

[oscillator 1 fm input attenuator] - Fm input level control sets the amount of signal allowed to pass from the [oscillator 1 fm input jack] to the oscillator core.

[oscillator 1 width cv input jack] - Blade & pulse width modulation input. Controls the width of the pulse wave from 50% to 150%. Modulates the blade wave.

[oscillator 1 width cv attenuator] - Blade & pulse width input level control sets the amount of signal allowed to pass from the [oscillator 1 width cv input jack] to the pulse and blade wave shapers.

[oscillator 1 sync input jack] - Oscillator sync input jack used to create classic sync effects. Sync input signal resets the oscillator 1 waveform.

6.3 oscillator 1 outputs

[oscillator 1 blade output jack] - Modulatable, double frequency saw wave.

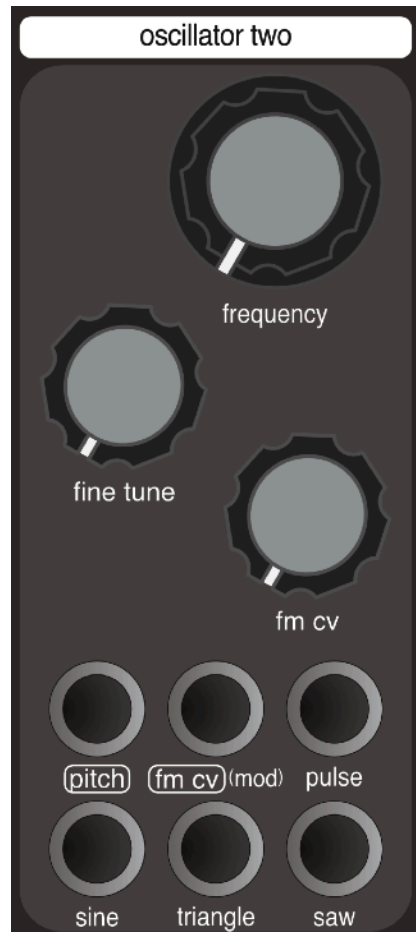
[oscillator 1 pulse output jack] - Variable width pulse wave.

[oscillator 1 sine output jack] - Smooth sine wave.

[oscillator 1 triangle output jack] - Triangle wave.

[oscillator 1 saw output jack] - Saw wave.

7. oscillator 2 module



7.1 oscillator 2 overview

Oscillator 2 is a wide range, fully analog, saw wave core waveform generator. Frequency is variable from sub-audio, low frequency oscillator range to ultrasonic allowing oscillator 2 to function as both an audio source and modulation source. All 4 waveforms are available simultaneously.

Exponential frequency modulation (fm) ranging from subtle to extreme is available using the [oscillator 2 fm input jack] and [oscillator 2 fm input attenuator].

7.2 oscillator 2 inputs and controls

[oscillator 2 frequency knob] - Coarse frequency control. Used to set the lowest frequency range that the [oscillator 2 fine tune knob] and [oscillator 2 pitch input jack] add to.

[oscillator 2 fine tune knob] - Fine frequency voltage added to the base frequency. Used to dial in precise frequencies.

[oscillator 2 pitch input jack] - One volt per octave pitch tracking input added to the base frequency. Used to control the pitch of the oscillator with a keyboard controller, sequencer, or other calibrated voltage source.

[oscillator 2 fm input jack] - Exponential fm input jack used for frequency modulation.

[oscillator 2 fm input attenuator] - Fm input level control sets the amount of signal allowed to pass from the [oscillator 2 fm input jack] to the oscillator core.

7.3 oscillator 2 outputs

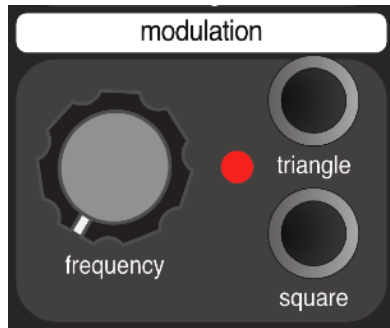
[oscillator 2 square output jack] - 50% period square wave.

[oscillator 2 sine output jack] - Smooth sine wave.

[oscillator 2 triangle output jack] - Triangle wave.

[oscillator 2 saw output jack] - Saw wave.

8. modulation module



8.1 modulation interface

[modulation lfo frequency knob] - Coarse frequency control. Used to set the frequency of the lfo.

[modulation lfo led] - Lfo frequency indicator.

[modulation lfo triangle output jack] - Triangle wave.

[modulation lfo square output jack] - 50% period square wave.

8.1 modulation overview

The modulation section is a utility low frequency oscillator with triangle and square wave outputs. Perfect for long sweeps or audio rate frequency modulation.

9. mixer module



9.1 mixer overview

Perfect for audio or control voltages, the mixer module is a pair of 2 channel mixers joined together. In normal operation, channels 1, 2, 3, and 4 combine to work as a single 4 channel mixer. However, patching into the [channel 1 & 2 mix output jack] splits the mixer into two independent 2 channel mixers. Channel 1 and Channel 2 are sent to the [channel 1 & 2 mix output jack] and channel 3 and channel 4 are sent to the [mix output jack].

9.2 mixer interface

[channel 1 input jack] - Channel 1 audio or cv input jack.

[channel 1 input attenuator] - Channel 1 input attenuator.

[channel 2 input jack] - Channel 2 audio or cv input jack.

[channel 2 input attenuator] - channel 2 input attenuator.

[channel 1 & 2 mix output jack] - channel 1 & channel 2 output mix jack.

[channel 3 input jack] - channel 3 audio or cv input jack.

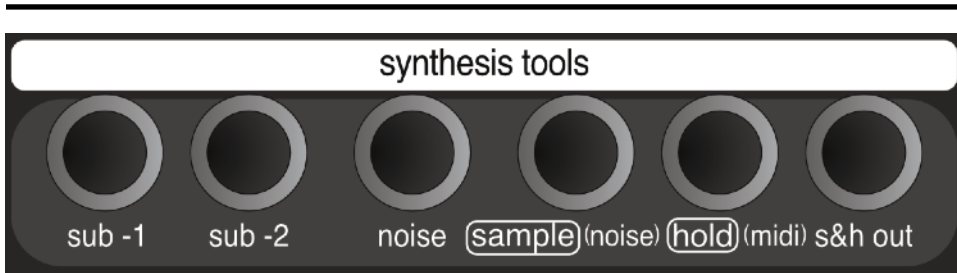
[channel 3 input attenuator] - channel 3 input attenuator.

[channel 4 input jack] - channel 4 audio or cv input jack.

[channel 4 input attenuator] - channel 4 input attenuator.

[mix output jack] - output mix jack.

10. tools module



10.1 tools overview

Multi-purpose module with three separate functions, sub-oscillator, analog noise, and sample & hold.

The sub-oscillator is tied to the frequency of oscillator 1. The two outputs, one octave lower and two octaves lower, are positive voltage only square waves that add unique, harmonically rich low end to a patch.

The transistor core analog noise is pitched between pure white and pink noise. Perfect for percussion or adding a bit of edge to a sound.

Sample & Hold samples the voltage patched to the **[sample & hold sample input jack]** and outputs that voltage until a new sample voltage is taken. A sample is taken when the Hold input receives a positive gate or trigger. The sample source can be audio or cv.

10.2 tools interface

[oscillator 1 sub -1 output jack] - one octave down sub-oscillator output jack.

[oscillator 1 sub -2 output jack] - two octaves down sub-oscillator output jack.

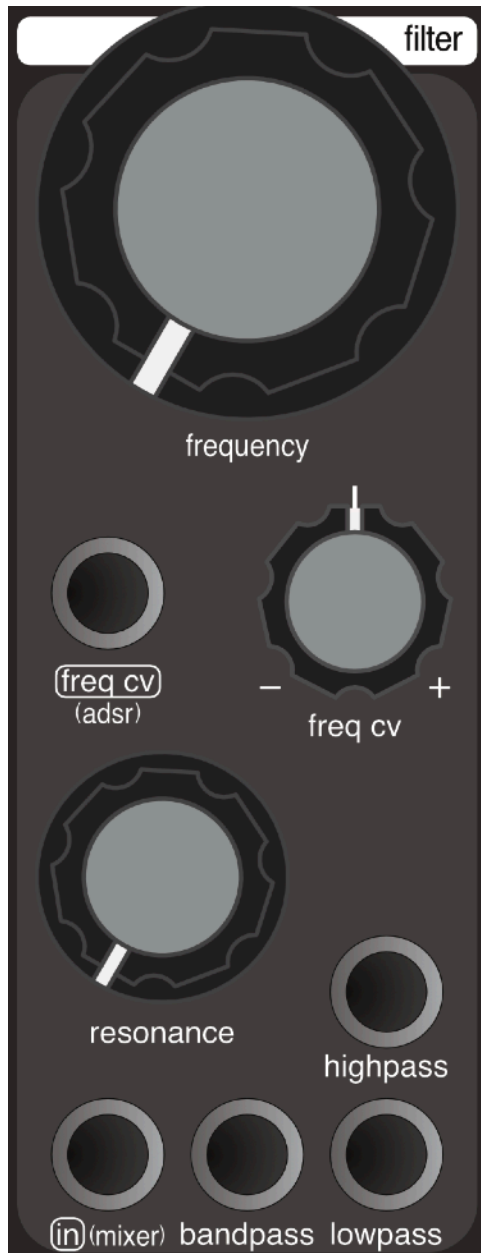
[noise output jack] - analog noise output jack.

[sample & hold sample input jack] - sample & hold source input jack.

[sample & hold hold input jack] - sample and hold gate input jack.

[sample & hold output jack] - sample & hold output jack.

11. filter module



11.1 filter overview

The filter module is a voltage controlled, analog, state variable filter. State variable topology offers several filter output responses, highpass, lowpass, and bandpass. Each producing a very smooth and natural sounding sweep.

The filter has defined sound of Pittsburgh Modular from the moment it was introduced. A distinct sound that we have tweaked to perfection. It offers a warm, organic sweep through the full frequency range. The lowpass filter is gummy and relaxed while the highpass is clean and defined. The goal was to produce a filter that did not have a sweet spot; where the every turn of the frequency knob produced something interesting.

11.2 filter interface

[filter cutoff frequency knob] - Filter cutoff frequency control knob.

[frequency cv input jack] - Cutoff frequency modulation cv input jack.

[frequency cv input attenuverter] - Cutoff frequency cv input level control.

[resonance knob] - Resonance control knob.

[highpass output jack] - Highpass filter response output.

[filter input jack] - Filter audio input jack.

[bandpass output jack] - Bandpass filter response output.

[lowpass output jack] - Lowpass filter response output.

12. adsr module



12.1 adsr

The adsr module is a four stage envelope generator that smooths the shape of the incoming gates and triggers to produce a more expressive instrument. The adsr output can be used to control the amplitude of an oscillator, the cutoff frequency of a filter or any other function on a module that accepts control voltages.

The incoming gate or trigger signal passes through each of the four stages to output an envelope. When the adsr module receives a gate or trigger signal, the attack determines the amount of time needed for the envelope generator to reach the peak output voltage and move on to the decay stage. Decay sets the amount of time needed to transition to the level set by the sustain knob. The sustain level is maintained as long as the incoming gate remains on or high. Once the incoming gate goes low or off, the release knob sets the time needed to close the envelope and return the adsr output to 0 volts.

12.2 adsr interface

[attack knob] - Envelope attack control knob.

[decay knob] - Envelope decay control knob.

[sustain knob] - Envelope sustain control knob.

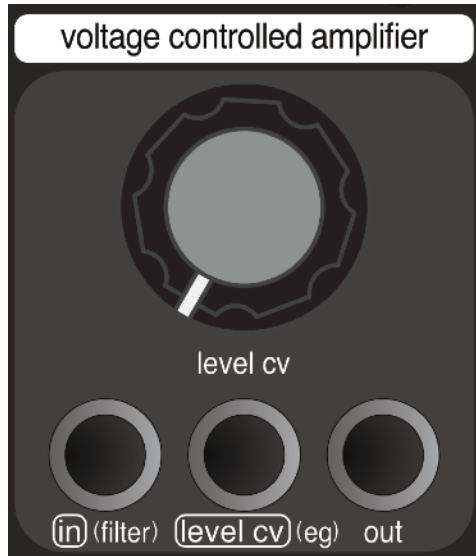
[release knob] - Envelope release control knob.

[adsr led] - Indicates the status of the envelope output.

[[adsr input jack] - Envelope input gate jack.

[[adsr output jack] - Envelope output jack.

13. voltage controlled amplifier module



13.1 voltage controlled amplifier

The vca is a high quality linear voltage controlled amplifier. Used to attenuate or amplify an audio or cv signal using voltage control. Typically the last stage of the synth voice signal chain and controlled with the output of the adsr to musically shape the volume of the synthesizer voice.

13.2 adsr interface

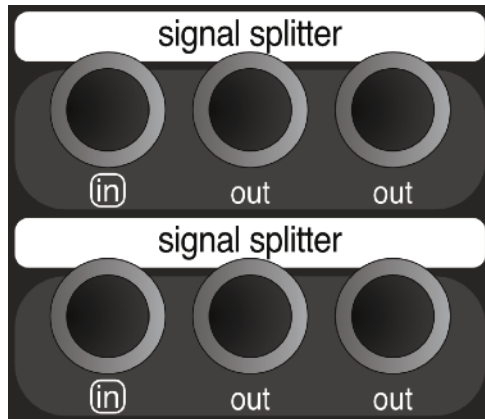
[amplifier level cv input control] - Amplifier level cv input control.

[amplifier input jack] - Amplifier input jack.

[amplifier level cv input jack] - Amplifier level cv input jack.

[amplifier output jack] - Amplifier output jack.

14. splitter module



14.1 splitter

The splitters are a pair of independent passive signal multipliers. Patching into the splitter allows one audio or control voltage signal to be sent to two destinations

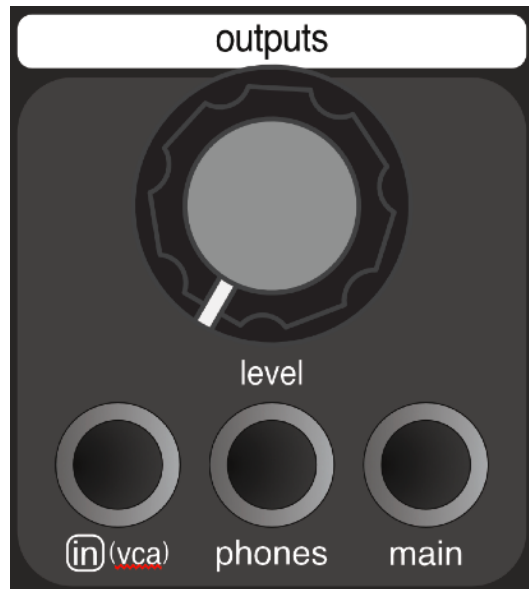
14.2 splitter interface

[splitter input jack] - Splitter input jack.

[splitter output jack] - Splitter output jack.

[splitter output jack] - Splitter output jack.

15. outputs module



15.1 outputs

Line level and headphone outputs. The line level output is monophonic. The headphone output is stereo but the same monophonic signal is routed into both the left and right channels.

15.2 outputs interface

[outputs level control knob] - Headphone and main output level knob.

[outputs input jack] - Outputs input jack.

[headphones output jack] - Stereo headphones output jack.

[main output jack] - Mono line level output jack.

16. patch examples

16.1 patch examples

This section contains a collection of patch examples that showcase the wide range of styles and sounds available using only the Lifeforms SV-1b and a midi keyboard. The patches are designed to familiarize musicians with the layout and potential available within the Lifeforms SV-1b.

Audio signals are shown in purple and cv signals are shown in green.

Knob positions are marked with red lines for knobs that are active in the patch.

16.2 default patch

The Lifeforms SV-1b is internally patched as a single oscillator monophonic synthesizer. Using patch cables between the prepatched jacks is redundant and unnecessary.



16.3 dual oscillator synth voice patch

Adding oscillator 2 to the default patch creates a larger, richer, dual oscillator synthesizer voice. Only 2 patch cables are necessary. Add pitch tracking to oscillator 2 by patching the [pitch output jack] into the [oscillator 2 pitch input jack]. Add the saw wave from oscillator 2 to the audio signal path by patching into the mixer. Adjust the frequency of oscillator 2 to a musical variant of oscillator 1. Try patching other waveforms from both oscillator 1 and oscillator 2.



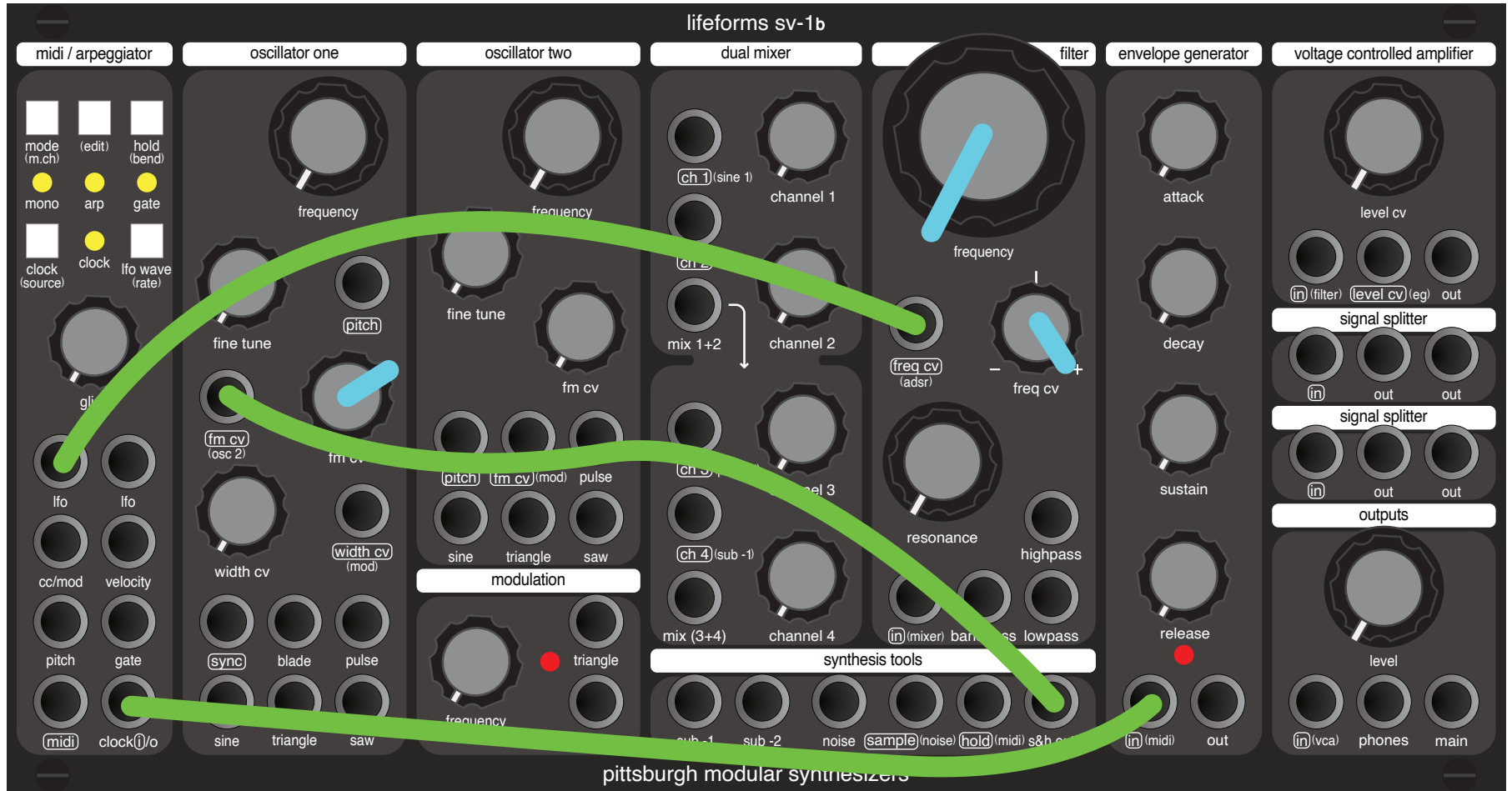
16.4 midi module patch options

This patch shows the range of functionality available within the midi module. The lfo is used to control the filter cutoff frequency. Don't forget to tap the lfo button to cycle through the available waveforms. The cc output is patched into the width control of oscillator 1. This allows a midi cc to set the pulse width of the pulse wave. Velocity is used to open the vca.



16.5 sample & hold random patch

Use the output of the analog sample & hold to control the frequency of oscillator 1 and use the digital lfo random waveform to control the filter cutoff frequency. Select the digital lfo random waveform using the [lfo button]. Trigger the adsr with the midi clock to create an auto running patch. Set the tempo using by tapping the [clock button]. Knob settings are guides, adjust to taste.



16.6 sample & hold wave crusher patch

The analog sample & hold can be used to simulate a bit crushing effect by patching oscillator 1 into the sample input and controlling the rate of the sample & hold with oscillator 2.



16.7 cosmic hi-hat

A large patch to end up with hi-hats. Very customizable with a wide range of sounds available. Perfect for everything from chirps to snares to blips and hats. Set the digital lfo waveform to random. Switch to the lowpass output for more woody type percussion sounds.



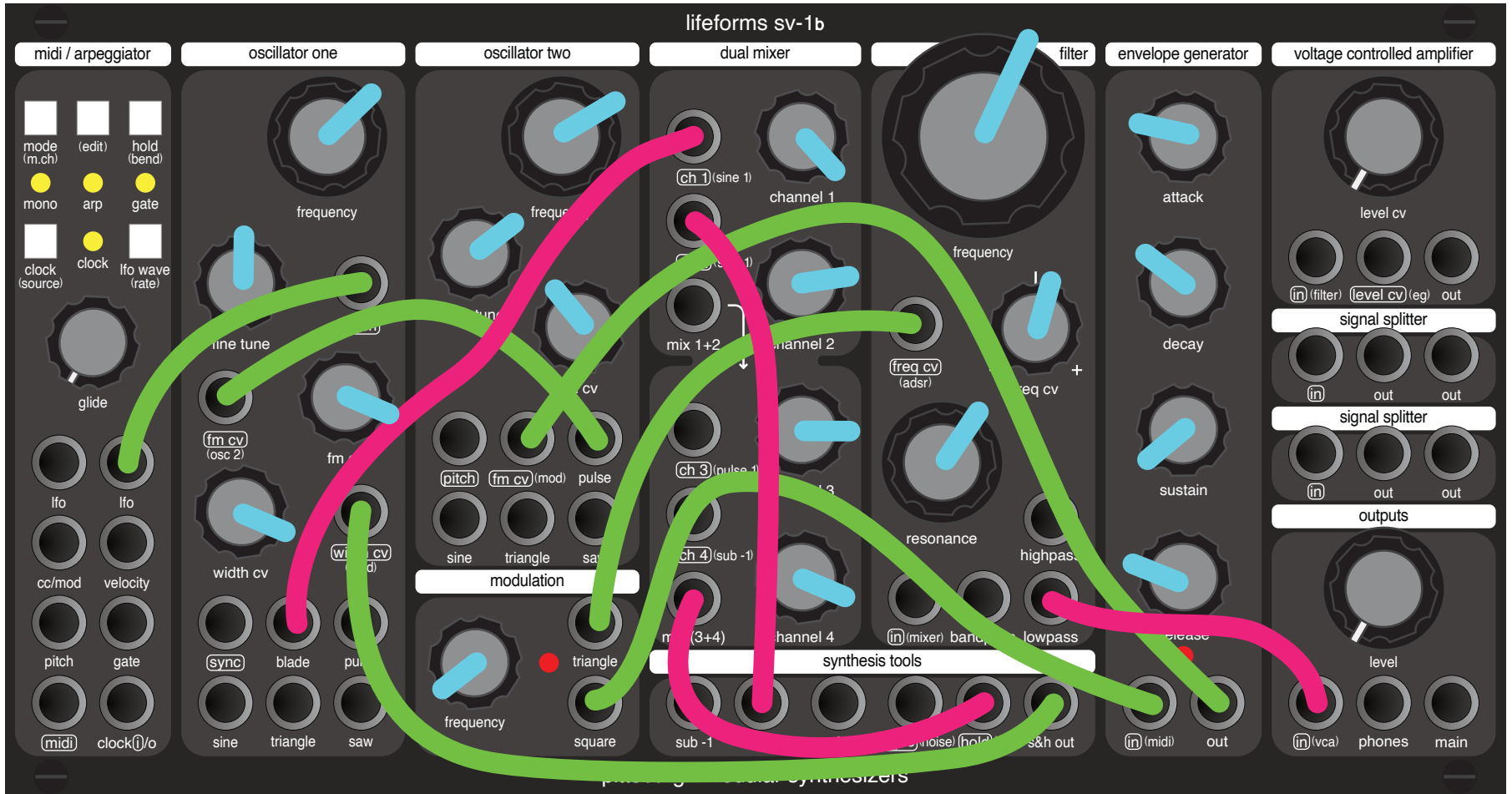
16.8 complex filter frequency sweeping

This patch uses the mixers ability to function as two independent mixers. The top half is used to mix waveforms from oscillator 1 and the bottom is used to blend the triangle wave from the lfo with the adsr output. The resulting cv is used to modulate the filter cutoff frequency.



16.9 noisescap patch

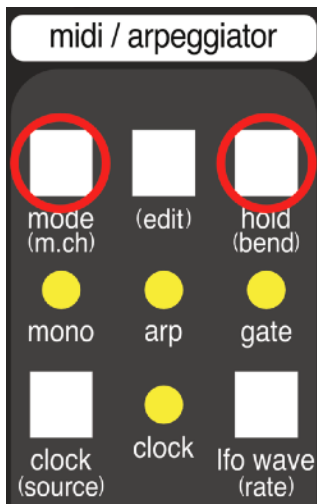
Moving and shifting noise soundscape built around 4 octaves of waveforms from oscillator 1. The digital lfo waveform selected is not terribly important. The additional patch cable colors are for clarity only. Once the patch is up and running, try randomly removing patch cables.



17. resetting and calibration

17.1.1 midi factory reset procedure

Performing a factory reset returns all of the stored settings to the default setting. Hold down mode first then hold down hold. Hold both for 4 seconds. The [mono led], [arp led], [gate led], and [clock led] will blink to show the reset is complete.



17.1.2 midi calibration procedure

The Lifeforms SV-1b midi module ships fully calibrated. The following information is included for reference only.

The [pitch output jack] is calibrated to the eurorack 1 volt per octave standard. Below is the calibration procedure.

The volt per octave tracking trimpot is located on the left side of the Lifeforms SV-1b module. It is labeled CH1. The trimpot is a precision 25 turn trimmer. For best results, adjust using small turns.

Attach a voltmeter to the [pitch output jack].

Place the Lifeforms SV-1b in mono mode.

Attach a midi keyboard and touch the C key. C notes should produce 1.0v, 2.0v, 3.0v, 4.0v, 5.0v, 6.0v, 7.0v output from the [pitch output jack].

Adjust the CH1 trimmer until the C key outputs the correct voltage.

Switch between several octaves of C notes to make sure the module is outputting the correct voltage.

17.2.1 oscillator 1 wave shape calibration

The Lifeforms SV-1b oscillator 1 ships fully calibrated. The following information is included for reference only.

This procedure calibrates the oscillator 1 wave shapes. A few of the steps can be done by ear but an oscilloscope is highly recommended.

Attach a oscilloscope to the [oscillator 1 triangle output jack].

Adjust the SAW1 trimmer until the hook is removed from the triangle wave. This is best done by ear. Listen for the buzz to minimize.

Adjust the TRI1 trimmer until the triangle wave is centered around 0v.

Attach a oscilloscope to the [oscillator 1 blade output jack].

Adjust the BLADE1 trimmer until the blade wave looks like a clean saw wave. The frequency of the blade wave should be twice the frequency of the triangle wave.

17.2.2 oscillator 1 pitch tracking calibration

The Lifeforms SV-1b oscillator 1 ships fully calibrated. The following information is included for reference only.

The [oscillator 1 pitch input jack] is calibrated to the eurorack 1 volt per octave standard. Below is the calibration procedure.

The trimpots are located on the top of the Lifeforms SV-1b module. The trimpots are labeled TEMP1 and V/O1. The V/O1 trimpot is a precision 25 turn trimmer. For best results, adjust using small turns with adjusting each trimmer.

Attach a tuner to the [oscillator 1 triangle output jack].

Place the Lifeforms SV-1b midi module in mono mode.

Attach a midi keyboard and touch the C key then the C key 2 octaves above.

Adjust the V/O1 trimmer until the octaves output the same pitch..

Switch between several octaves of C notes to make sure the module is outputting the correct pitch.

If oscillator 1 is far out of calibration, the TEMP1 trimmer can be adjusted. Typically the TEMP1 trimmer should be set around 12 o'clock. Small adjustments make a big difference. After the TEMP1 trimmer is adjusted, repeat the V/O1 trimmer adjustment. This may need to be repeated several times.

17.3.1 oscillator 2 wave shape calibration

The Lifeforms SV-1b oscillator 2 ships fully calibrated. The following information is included for reference only.

This procedure calibrates the oscillator 2 wave shapes. A few of the steps can be done by ear but an oscilloscope is highly recommended.

Attach a oscilloscope to the [oscillator 2 triangle output jack].

Adjust the SAW2 trimmer until the hook is removed from the triangle wave. This is best done by ear. Listen for the buzz to minimize.

Adjust the TRI2 trimmer until the triangle wave is centered around 0v.

17.3.2 oscillator 2 pitch tracking calibration

The Lifeforms SV-1b oscillator 2 ships fully calibrated. The following information is included for reference only.

The [oscillator 2 pitch input jack] is calibrated to the eurorack 2 volt per octave standard. Below is the calibration procedure.

The trimpots are located on the top of the Lifeforms SV-1b module. The trimpots are labeled TEMP2 and V/O2. The V/O2 trimpot is a precision 25 turn trimmer. For best results, adjust using small turns with adjusting each trimmer.

Attach a tuner to the [oscillator 2 triangle output jack].

Place the Lifeforms SV-1b midi module in mono mode.

Attach a midi keyboard and touch the C key then the C key 2 octaves above.

Adjust the V/O2 trimmer until the octaves output the same pitch..

Switch between several octaves of C notes to make sure the module is outputting the correct pitch.

17.4 filter calibration procedure

The Lifeforms SV-1b filter ships fully calibrated. The following information is included for reference only.

The frequency and resonance are individually calibrated. Below is the calibration procedure.

The trimpots are located on the top of the Lifeforms SV-1b module. The trimpots are labeled FTRIM (frequency) and QTRIM (resonance). Adjust using small turns.

Patch a saw wave into the filter module.

While sweeping the [filter cutoff frequency knob], adjust the FTRIM trimmer until the frequency sweep is centered on the [filter cutoff frequency knob].

The QTRIM trimmer adjusts the amount of resonance available. The Lifeforms SV-1b module ships set to allow the maximum amount of resonance. To set the maximum amount of resonance, adjust the QTRIM trimmer.

18. eurorack specs

18.1 Lifeforms SV-1b module specs

Panel size 48hp.

Module depth 35mm.

Power consumption 230mA with reversed power polarity protection.

19. warranty

19.1 one year limited warranty

For a period of one year after the date of original purchase, the Lifeforms SV-1b manufactured by Pittsburgh Modular Synthesizers LLC, is warranted to function properly and be free of defects in materials and workmanship. Should a factory installed hardware fail during the warranty period, contact Pittsburgh Modular Synthesizers LLC. We will repair it (or at our option, replace it) at no charge, and pay the cost of shipping it back to you.

This warranty is void if in our opinion the Lifeforms SV-1b has been damaged by accident, mishandled, altered, improperly serviced, or repaired by the customer where such treatment has affected its performance or reliability. This includes but is not limited to damage related to incorrectly attaching power ribbon cables. In the event of such misuse/abuse by the customer, costs for repairs plus two-way shipping costs will be borne by the customer. Products found defective should be returned to the factory carefully packed, as the customer will be responsible for freight damage.

Incidental or consequential damages or costs incurred as a result of product malfunction are not the responsibility of Pittsburgh Modular Synthesizers LLC.

20. service and other information

20.1 contact info

Please contact us for service or other information related to the Lifeforms SV-1b or any other Pittsburgh Modular product.

www.pittsburghmodular.com/contact



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