



VC Divider Operation manual

The VC Divider

The SSSR Labs VC Divider is a dual, voltage controlled frequency divider module. It is equally suitable for both low-frequency or audio-rate signals, so it can be used with LFOs, clock sources, oscillators, or even noise or speech sources. Thanks to a space saving old-school design, the Eurorack version of this DIY-friendly module occupies only 4hp.

The VC Divider consists of two channels, which can work separately or be linked in different ways. Each channel has one clock input and one clock output. The division factor of each channel can be selected either manually with knobs, or remotely with a voltage applied to the control inputs. The division method is a «musical» type, which means that all patterns generated by this module will be perfectly in beat if they are all reset simultaneously. Unlike Flip-flop or binary counter based dividers, SSSR Labs VC Divider keeps the duration of incoming clocks intact, so it is not only able to trigger envelope generators, but can also directly gate them, providing articulation uniformity with variable rhythmic patterns.

Specifications

Module width:	4 hp
Module Depth:	59 mm (2.3")
Net weight:	74 g (2.6 oz)
Module dimensions:	129×20×80mm (5"×0.8"×3.14")
+12v rail power consumption:	15–26 mA
–12v rail power consumption:	1.5 mA

The VC Divider can be used in many different ways: to control a rhythmic pattern of percussive instruments with a sequencer or another clocked CV source, or to divide a master clock to get traditional note durations, or even to get distinctive sub-oscillation. With this module you can easily do stylish complex hi-hat patterns, or create unusual polyrhythmic textures. The linear mode also allows creating patches which imitate game console sound effects.

Modules are shipped as DIY kits. The PCB supports Eurorack format as well as open modular formats such as MOTM and accepts both 12v and 15v supply. It is designed to be easily expanded to add a number of additional features such as: individual reset inputs, advanced signal routing and mode selection. Even when there is no expander, the module can be configured with a few jumpers. Each part has its own dedicated micro-controller in order to achieve the best performance. The firmware is written in assembly language ensuring minimal latency.

INTERNAL MODULE OPERATION

The module consists of two identical channels, which can be connected externally or internally.

Internally, each of them has a controller having a clock input, clock output, reset input, analog CV input and a mode select input.

The controller constantly measures voltage applied to the CV input. When this voltage reaches a certain range, the controller selects the corresponding division factor and performs a reset. Reset also can be requested by logic "1" passed to the Reset input. When reset is performed, or the module is powered on, the next rising edge of the pulse passed to the Clock input is assumed to be the first in a sequence of pulses, which number is determined by the selected division factor. This first pulse will be represented on the Clock output. Let's call this allowed pulse. Then the controller counts incoming pulses, ignores them and starts the process again as the sequence is completed. However, if the division factor is changed right after allowed pulse, reset will not be performed and the new sequence will continue, as-

suming last pulse to be the first in new sequence instead of the following one. This feature is called Beat magnet and helps to keep output in beat when the module is used with sequencers.

Please note that each incoming clock will be represented at the output if Reset stays high.

The mode input (these inputs are always linked between both controllers) provides a choice of division factors:

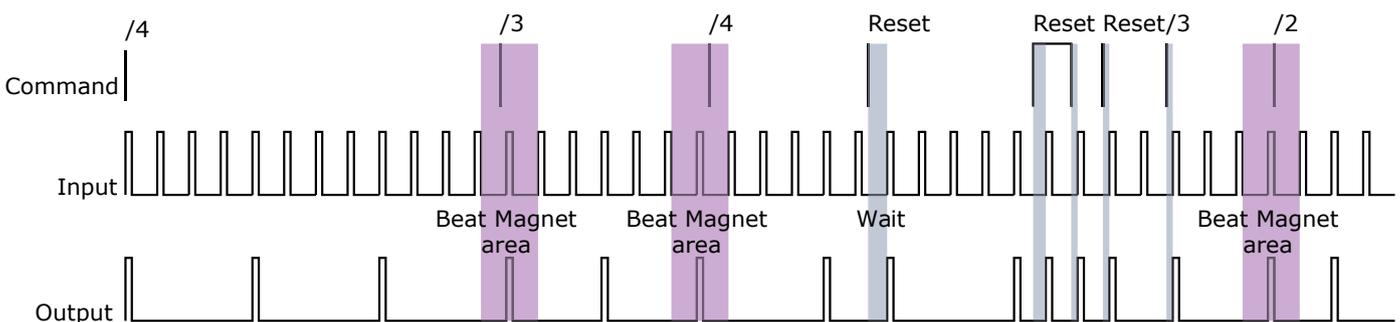
The default set is custom exponential: /1, /2, /3, /4, /6, /8, /12, /16, /24, /48, /32, /64, /128, /96, /144, /192.

This set can be used to pick particular note durations from conventional clock sources or it can be used for sub-oscillation.

The alternative set is linear: /1, /2, /3, /4, /5, /6, /7, /8, /9, /10, /11, /12, /13, /14, /15, /16.

This set is suitable for complex measures, polyrhythms or for console sound effects imitation.

Timing Diagram



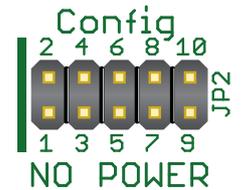
THE PANEL CONTROLS



1. **Div1 Knob.** Manual division factor selection knob. This knob acts as a virtual rotary switch allowing selection of the division factor for the upper channel. Only the first 10 values are available using manual selection.
2. **Out1 LED.** I Indicates logic state of Out1.
3. **CV1 Jack.** Control voltage analog input. When a jack is inserted into this socket, the Div1 Knob becomes inactive. All 16 division factor values are available when voltage control is used. The voltage range of each option is about 0.4 volts.
4. **In1 Jack.** Clock input of the upper channel. The threshold level is about +1v.
5. **Out1 Jack.** Clock output of the upper channel. The logic levels are 0v and +5v. Output is buffered and has standard 1k output impedance.
6. **Div2 Knob.** Identical to Div1 but for lower channel.
7. **Out2 LED.** Identical to Out1 LED but for lower channel.
8. **CV2 Jack.** Identical to CV1 Jack but for lower channel.
9. **In2 Jack.** This socket is a multi-functional logic input. It can be internally connected either to Reset or to the Clock input of the lower controller. This socket also has a switch that can be connected to an alternative source of logic when a jack is not inserted. The available internal sources are either buffered Clock1 In or buffered Clock1 Out. The whole routing can be determined by a combination of jumpers installed on the Configuration header, or by controls on the expansion module.
10. **Out2 Jack.** This output is identical to Out1 Jack but for the lower channel.

THE CONFIGURATION HEADER

The 10-pin IDC header placed at the top side of the PCB can be used to configure the module by a combination of jumpers, or to connect an external expansion module.



Pinout:

1. **Reset1.** Connected to the Reset input of the upper controller with a 10K pull-down.
2. **Ground.** This pin is grounded.
3. **Reset2.** Connected to the Reset input of the lower controller with a 10K pull-down.
4. **Mode.** Connected to the Mode inputs of both controllers. It uses an internal pull-up.
5. **Reset2.** Linked to pin 3 of the header.
6. **In2.** Conditioned signal from In2 Jack.
7. **In1.** Conditioned signal from In1 Jack. This pin is also connected directly to the Clock input of the upper controller.
8. **Clock2.** Connected to the Clock Input of the lower controller.
9. **In2 Sw.** Connected directly to the switch of the In2 Jack.
10. **Out1.** Connected to the buffered Out1.

Suggested jumper combinations



Default setup. This setup is suitable for situations when the Reset input is not needed and two independent clock sources may be used. (Manual reset can still be performed during stand-by, by turning a pot back and forth. When In2 socket is free, In1 goes to the Clock input of the lower controller.



Linked setup with reset. This setup is suitable for use with a single clock source. Both channels always work from the Clock passed to In1. In2 Jack is used as the Reset input for both channels.



Custom divisions with common reset. This setup enables linear mode and also connects the output of the upper channel to the input of the lower channel. The reset configuration is identical to the previous setup. Using this routing you can get any division from Out2, up to 1/100 or even 1/256 using CV.