

NEW WAVE CV GENERATOR

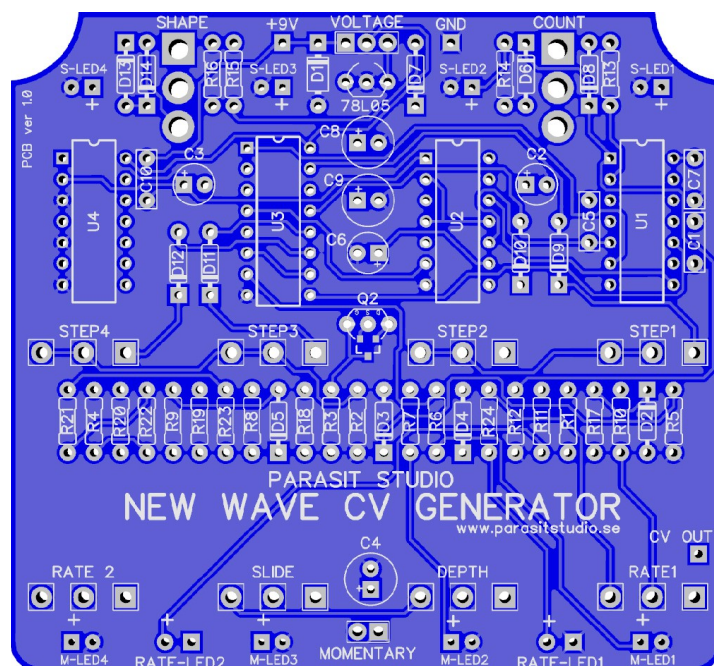
Build Document last updated september 2017
for PCB version 1.0

The "New Wave" is a Control Voltage Generator. It has two LFO's (low frequency oscillators) and four different output modes: square wave, triangle wave, sample & hold and sequencer.

It's meant to be used together with other effects to modulate the sound of those effects. It will work with other Parasit Studio pedals that has an optional CV input, such as: Into the Unknown, U-235 Suboctave Generator and many upcoming projects, aswell as some old projects that will be updated with CV inputs.

It's also possible to modify almost any effect that has an internal LFO (phasers, tremolos ect.) to take a CV input from the New Wave CV Generator, by switching off or replacing the stock LFO(*).

Have fun building and using this device!



** examples of how to do that will not be covered in this build document.*



New Wave prototype build

CONTROLS

Potentiometers

- STEPS (x4) – Controls the waveshape of the sequencer.
Note: These are highly interactive controls.
- RATE 1 – Controls the rate of the square wave oscillator.
It also sets the rate of the sample & hold and the sequencer.
- DEPTH – Controls the depth of the CV output.
Turn it up (clockwise) for maximum depth.
- SLIDE (a.k.a. glide) – Controls the smoothness. Turn it up to soften the edges of the waveshape. This type of control is sometimes also called "portamento" on synthesizers.
- RATE 2 – Controls the rate of the triangle wave oscillator. This oscillator also controls the sample & hold waveshape.

Toggle switches

- COUNT – Toggles between 3 or 4 sequencer steps.
- SHAPE – Toggles between triangle, saw or ramp waveshapes for the triangle wave oscillator.
- VOLTAGE (*optional side mounted switch*) – Toggles between +5 or +9 volts internal operation and maximum output voltage.
You might want to limit the voltage if using this with modular synth modules with 5v CV inputs.

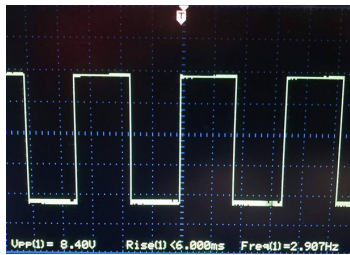
Foot switches

- MODE – Toggles the output between the four different modes:
 1. Square wave
 2. Triangle wave (and saw/ramp)
 3. Sample & Hold
 4. Sequencer
- ENGAGE (*optional*) – Toggles the CV output on or off

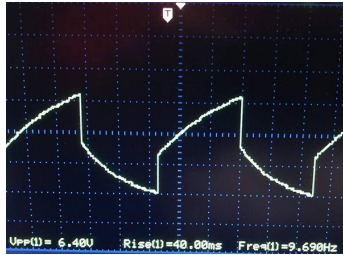
Modes and waveshapes

The oscillators and waveshapes are not super clean/high precision, but for low frequency modulation uses they work really well. There's a lot of different waveshapes to be found, especially when using the slide pot.

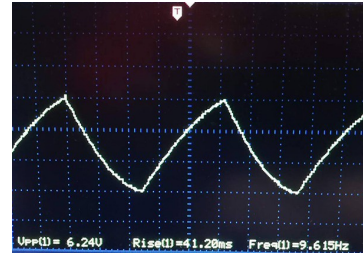
1. Square wave



clean square



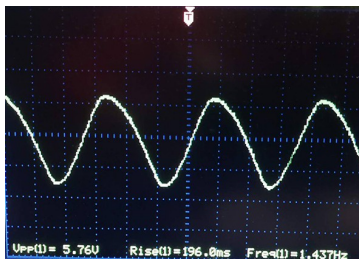
medium slide



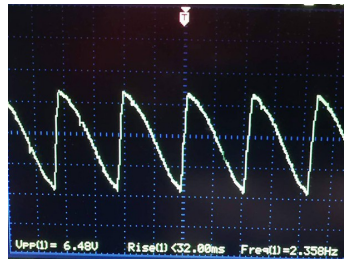
fast rate, high slide

Turning up the slide fully at higher rates will cause the waveshape to look more like a triangle wave. Note: The amplitude decreases when turning up the slide control, more so at higher rates.

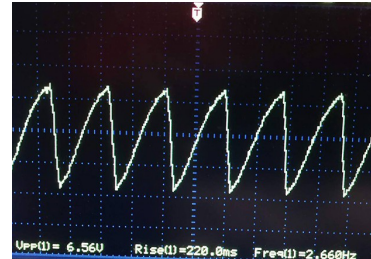
2. Triangle wave (or saw or ramp, depending on the shape switch)



shape sw middle position



shape sw up position

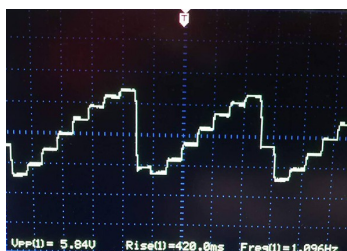


shape sw down position

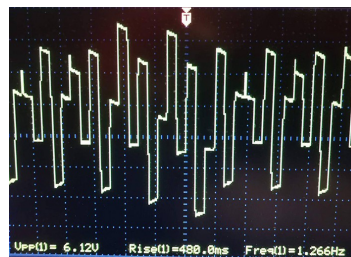
As you can see, the triangle looks more like a sine wave at lower rates.

3. Sample & Hold

In this mode the square wave oscillator (LFO1) will take small samples of the triangle oscillator (LFO2) waveform. So at lower LFO2 rates you will get "staircase" waveshapes, but the most interesting waveshapes can be obtained when almost matching the rates of both oscillators, which can create pseudo random waveshapes.

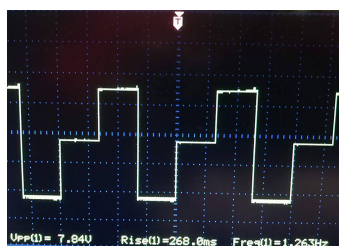


s&h of a ramp waveform

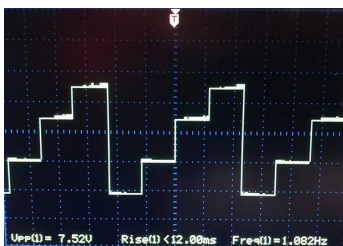


s&h at almost equal rates

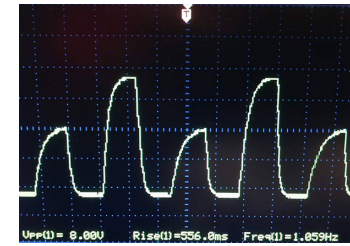
4. Sequencer (3 or 4 steps depending on the count switch)



3 steps



4 steps



wierd shape with slide

New Wave CV Bill of Materials

Resistors		Capacitors		IC's	
R1	220K	C1	100nF	IC1	CD40106BE
R2	47K	C2	33uF	IC2	CD4066BE
R3	1M	C3	10uF	IC3	CD4015BE
R4	4.7K	C4	100uF	IC4	CD4069UBE
R5	100K	C5	47nF	Potentiometers	
R6	15K*	C6	10uF	STEPS (x4)	A500K
R7	15K*	C7	100nF	RATE 1	C50K
R8	15K*	C8	100uF	DEPTH	C500K
R9	15K*	C9	100uF	SLIDE	C5K
R10	3.3K	C10	100nF	RATE 2	C250K
R11	470K	Diodes		Transistors	
R12	100K	D1	1N4001	Q1: 78L05 voltage regulator Q2: J201 JFET	
R13	15K*	D2	1N4148		
R14	15K*	D3	1N4148		
R15	15K*	D4	1N4148		
R16	15K*	D5	1N4148	Switches	
R17	100K	D6	1N4148	COUNT	SPDT on/on
R18	100K	D7	1N4148	SHAPE	SPDT on/off/on
R19	330K	D8	1N4148	VOLTAGE	SPDT on/on
R20	10K	D9	1N4148	MODE	Momentary SPST
R21	470K	D10	1N4148	ENGAGE	SPST (latching)
R22	1M	D11	1N4148	Connectors	
R23	15K*	D12	1N4148	DC jack 3.5mm jack (CV output)	
R24	15K*	D13	1N4148		
		D14	1N4148		
		10x LED's			

- * CLR's (current limiting resistors) for the LED's
 - R6-R9: Limiting resistors for the MODE indicator LED's
 - R13-R16: Limiting resistors for the Sequencer LED's
 - R23-R24: Limiting resistors for the RATE LED's
- I recommend using superbright LED's and around 15K resistors to minimize the current draw and put less stress on the 78L05.
- Note: It's normal that the 78L05 gets hot (but this circuit only draws about ¼ of what it can handle, so no worries).
- Q2 (J201) have dual pads so you can use either through hole version or the surface mount (SMD) version of the transistor.
- The MODE switch can be either a footswitch or a push button, as long as it's a momentary (normally open) type switch.

- The ENGAGE switch can be any type of latching switch since it's only used for breaking the connection to the CV jack.
- Not included in the BOM: Enclosure, LED bezels(holders).

General builds tips for populating the PCB

- Solder the low profile components first, from short to tall height. Recommended order: resistors, diodes, IC socket, film-caps, electrolytics, pots and switches
- CMOS chips are very sensitive to static charges and can be easily damaged. It's a good idea to wear a ESD wristband or at least avoid wearing a wool jumper and petting your cat/dog while building...
- Always use sockets for IC chips and transistors to avoid heating them directly. It also makes it much easier to swap them out if needed.
- Pay special attention to the orientation of the diodes and electrolytic capacitors.
- This PCB's is designed for 16mm angeled PCB mounted pots.

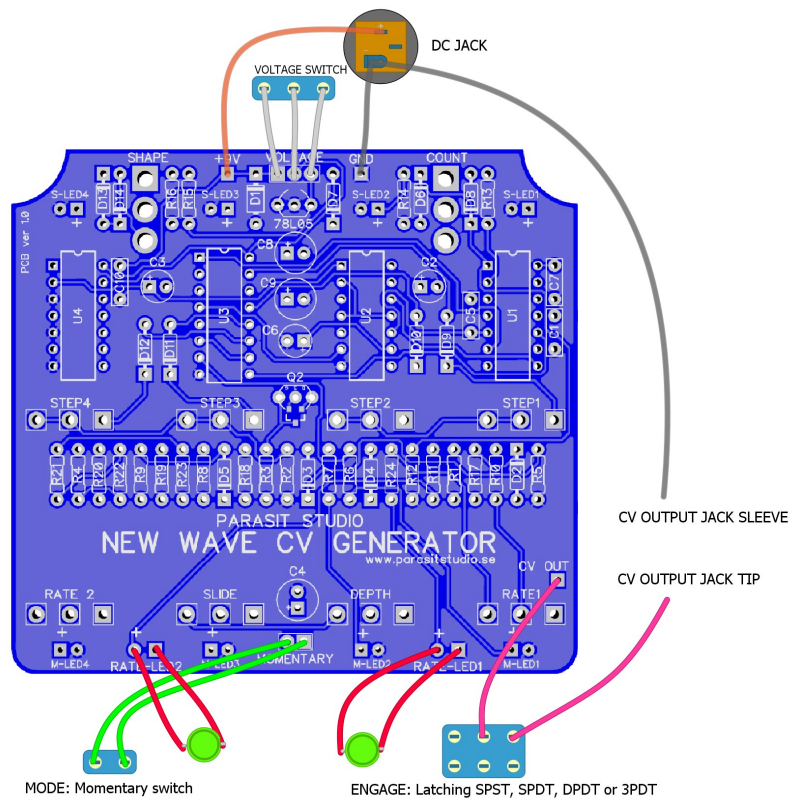
How to mount everything inside the enclosure

There's alot of board mounted pots, switches and LED's in this build. Mounting everything inside the enclosure can be tricky. It's best to do it in several steps insted of trying to mount everything at once.

1. Place the PCB on your table with the component side down
2. Place the 8 pots and the two toggle switches onto the PCB (leave the LED's out in this step).
3. Carefully lift the PCB and place it inside the drilled enclosure from underneath. Keep holding the PCB and the enclosure to make sure that the pots and switches stay in place and gently screw on the nuts for the pots and the switches.
4. Turn the enclosure around and solder the pots and switches.
5. Unscrew the nuts and remove the PCB from the enclosure
6. Attach the 8 LED's for the sequencer and mode indicators to the PCB
7. Carefully place the PCB in the enclosure again, make sure that the LED's line up with the holes/LED bezels
8. Solder the LED's

The rate LED's are wired offboard, so you can mount them separatley. It's a good idea to prepare wires for the offboard wiring (9v, gnd, cv out, led's ect.) and solder them to the PCB before you place the PCB inside the enclosure.

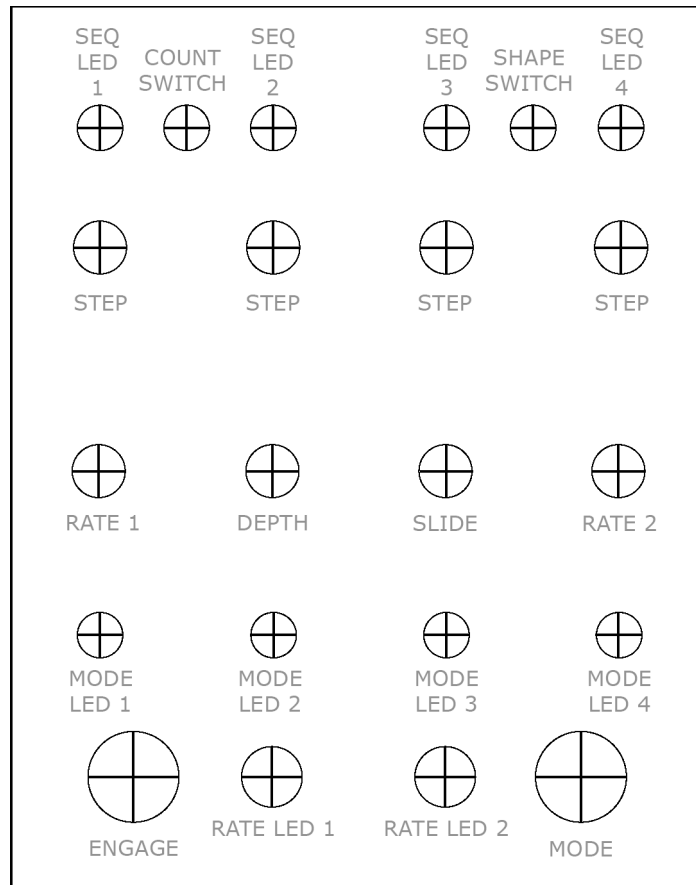
Offboard wiring



- The DC jack connects to the +9V and GND pads on the PCB.
- The DC jack negative lug also needs to be connected to the sleeve lug on the CV output jack. This will ground the enclosure (unless you have an isolated jack) which is good.
- NOTE: When using it with another pedal, make sure that the CV jack sleeve connection of that pedal is also connected to ground!
- If you are using a stereo/balanced (Tip/Ring/Sleeve) CV output jack, just leave the ring lug unconnected.
- The ENGAGE switch is optional. If you don't want it you can wire the CV OUT pad directly to the tip of the CV output jack.
- The ENGAGE switch can be any type of latching switch. Just use pin 1 and 2 of the switch (which wire goes where is not important). For my build I used one row of a DPDT switch.
- The VOLTAGE switch is also optional. If you want to keep your build simple, you can link the switch pads for use with one type of voltage operation only. IMAGE 1 (left): 9V. IMAGE 2 (right): 5V

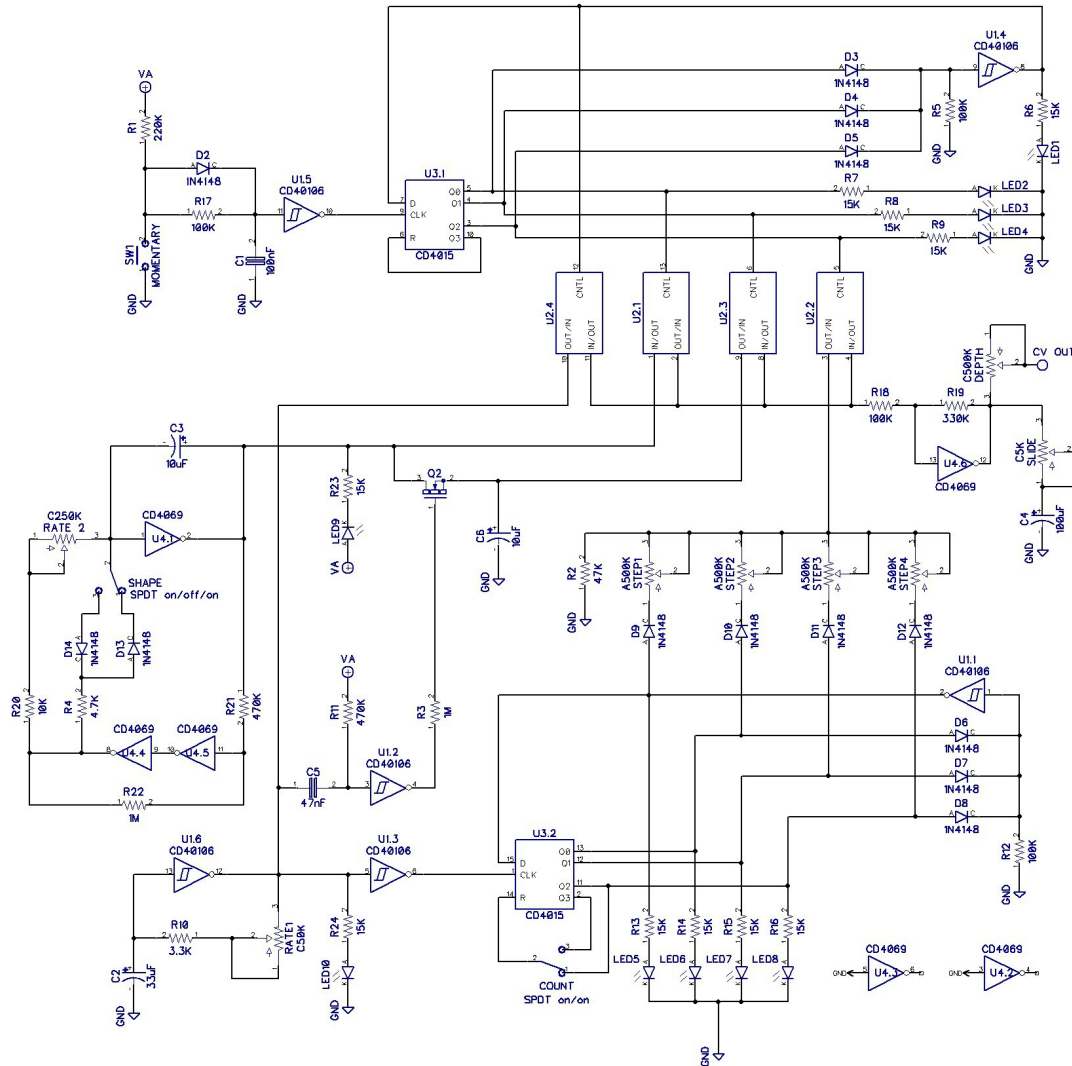


Drilling template (1590BB)



- Use at your own risk! This template is approximate.
- Make sure your printer is printing 100% print size and isn't doing any scaling.
- Drill holes on the sides for the CV input jack, DC jack and the voltage switch to your own preference.
- **Measure and confirm before drilling!**
- You decide on which side the ENGAGE and MODE switches are placed. I recommend placing them like I have here on the drilling template (which is the opposite of my own prototype build) because it will keep the offboard wires shorter.

Schematic



Please do not repost or share this schematic without asking first. Thanks! Note: DC filtering, polarity protection and +5v regulation are not shown.

Troubleshooting

There's always a chance of running into trouble. To minimize error, follow the BOM and general building tips carefully. Take your time and don't rush. Take a break now and then. Use good solder, and it helps to have a decent soldering station insted of a cheap iron.

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