Sport Modulator 2 User's Guide (draft)

Getting Started 🪛

Inside the box, your module is neatly packed in a corrugated cardboard sleeve. Please open carefully! Inside, you will find a ribbon power cable. Connect the small end of the power cable **RED STRIPE to "-12V",** as indicated on the PCB of the module. We recommend only using the power cable provided. Carefully install and secure the Sport Modulator in your case while POWERED OFF. Power on, and flip the CYCLE switches to the UP position, MODE switches to the DOWN position. You should see a red/ green LED flashing for each channel. Congratulations! Your module is healthy.

Feeding and care 🪴

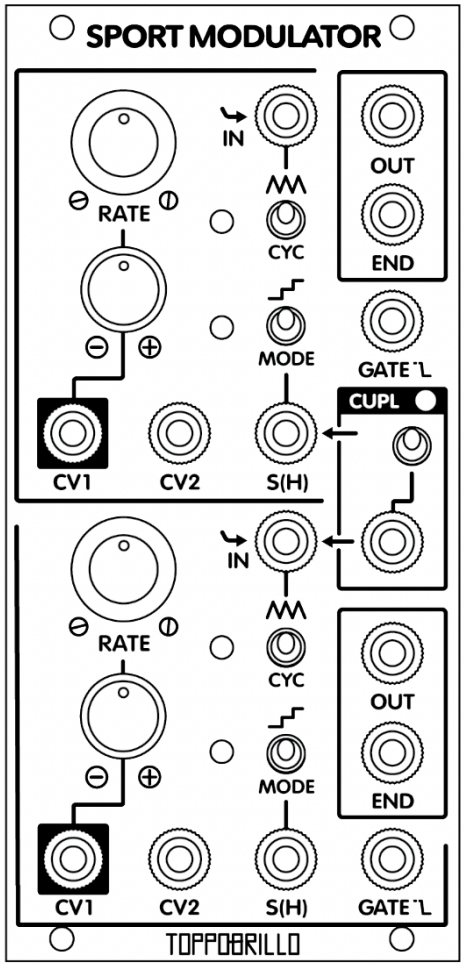
The Sport Modulator's average current draw is around **+30mA & -20mA @ +/-12V**. Be sure your case has plenty of juice. Powering the module on anything more (or less) than +/-12V is not recommended, and may damage the module. Feeding any of the inputs (or outputs for that matter) with sources outside a +/12V range may damage the module. This type of damage is not covered under warranty. The module is reverse-polarity protected. Please use only the provided power cable.

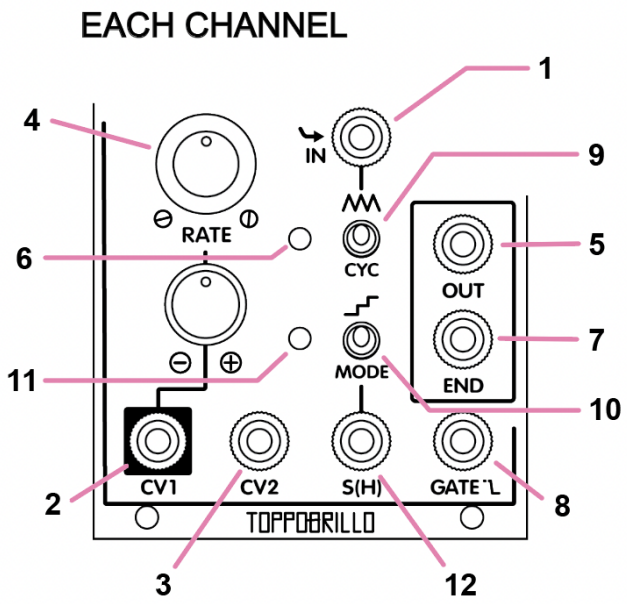
The low-profile construction of the SM2 is slick and efficient, but note that it leaves electro-static sensitive electronic guts exposed on the rear of the module. As such- please observe basic anti-stat protocol (like you would if you were installing a new SSD or RAM stick in your computer, say) **Avoid touching the electronics and do not set, store or pack in regular plastic bags or bubble wrap..** If you need to store the module or ship it, please use only specifically anti-static/ static dissipative materials or paper/ cardboard works just fine.

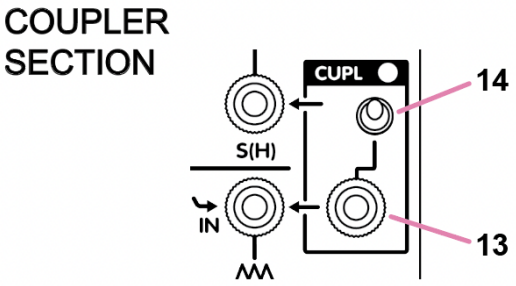
Power PSA ⚠

Toppobrillo modules are designed to work in Eurorack systems and expect reasonably clean, reasonably stable **+/-12V** power to operate optimally. With myriad subpar power solutions out there, it is impossible for us to plan for a 'worst case scenario' with regards to possible performance degradation due to low quality power. Do not expect a 30$ "cheese-grater" to offer optimal performance. These are not designed, nor are they suited, for audio work , and while, anecdotally, they may work "just fine", they are not doing your system any favors, and are likely, in fact, significantly degrading signal fidelity in your system. Do not cheap out on power. Thank you for listening.

Front Panel Key







1- IN input

2- CV1 and attenuator

3- CV2 input

4- RATE knob

5- OUT output

6- OUTPUT LED

7- END output

8- GATE input

9- CYCLE switch

10- MODE switch

11- HOLD LED

12- S(H) input

13- CUPL output

14- CUPL switch

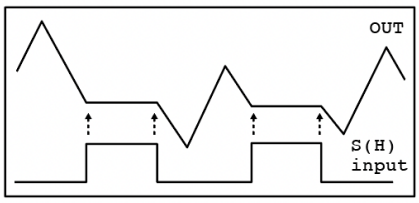
15- CUPL LED

Introduction

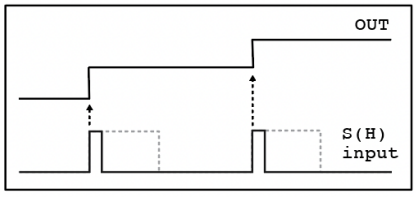
The Sport Modulator 2 is a dual “lag and hold” device that can be quite a few things, depending on how you use it. It can be patched as a slew, oscillator/ LFO, triggered staircase generator, subharmonic generator/ divider, VCA, switch, sample and hold, track and hold, set of comparators, trigger delay, one-shot, envelope follower, quadrature function generator, “bit-crusher” and probably several other things I can’t think of right now… The Sport Mod’s open-ended architecture is heavily inspired by the Serge SSG, with quite a few distinctions, and should invite plenty of experimentation and discovery.

The Sport Modulator 2 is composed of two identical sections- these are referred to as the “Top” and “Bottom” sections throughout the rest of this guide. This is functionally inconsequential until we start talking about the CUPL section and comparator- so the inputs/ outputs and controls will only be covered once. Before moving on, it’s important to understand the basic operational modes…

Operational Modes- basic overview



SMOOTH mode



STEPPED mode

Generally, each section can be operated in one of two modes: **STEPPED** mode is akin to **sample-and- hold**, traditionally speaking, and **SMOOTH** mode would be more akin to **track-and-hold**. The main difference here (amongst other things) is that the SM allows for voltage-controllable slew rate in either mode.. So- we call it a “Lag and Hold” device.

In **SMOOTH** mode, the OUTPUT follows the INPUT as quickly as the RATE parameter allows. A high at the S(H) input will freeze the OUTPUT.

In **STEPPED** mode, the OUTPUT waits for a low-to-high going voltage transition at the S(H) input to grab a new sample. The SM2 will attempt to sample the voltage at the INPUT as well as the RATE parameter allows. Set the RATE control to full CW (wide open) to get typical **Sample and Hold** action. If the RATE parameter is set lower, the OUTPUT will only step as much as it allows.

PANEL I/O in more detail

IN

The IN**(1)** jack is where you will patch external sources to be processed by the SM2. Patch sources to be slewed, sampled, chopped, etc. here. Accepts any signal within a +/-12V range. Note that if the CYCLE switch is engaged, INPUT is ignored.

RATE and CV inputs

Both CV1**(2)** with its attenuverter, CV2**(3)** and RATE control the rate at which the Sport Mod can slew. They are summed. The RATE knob**(4)** covers an extremely wide range- in terms of self-cycle frequency (8V p-p), it is calibrated to span from about 30s/ cycle at the low end to about 1KHz at the top. This range is extended with CV from 0 (stopped) at the low end to about 1.5KHz, give or take. You'll find 20Hz around noon.

*Tip: The SM2, by default, slews in a **linear** fashion. Patching **OUT** back into **CV1** or **CV2** will give you logarithmic or exponential slopes. Patching the **END** output back into **CV1** or **CV2** will give you variable "rise" and/ or "fall" time as well.*

CV2

The Sport Mod can be handy as an audio source, sometimes a specifically-pitched one, and CV2**(3)** is roughly scaled to track V/OCT over a limited, low-end range. Your module has been calibrated to track 3 octaves from around 30 to 240Hz, the optimal range for a bassline or perhaps a tracking suboctave, etc.

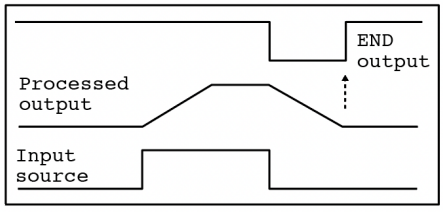
Tip: The calibrated control input can be useful for other applications than use as an audio source- In a trigger delay patch for instance, halving or doubling the CV at CV2 would result in exactly half or twice as long a delay..

OUT

The OUT jack**(5)** is where you will find the slewed or stepped output. A bi-color LED **(6)** indicates polarity and output amplitude- it lights green when the output is positive, red when negative.

END

The END output**(7)** is a gate output that normally sits high and becomes active when the input approaches the slew limit set by RATE. It will go LOW when the output begins to fall, and return HIGH again when the output has finished catching up with the input source.



END operation

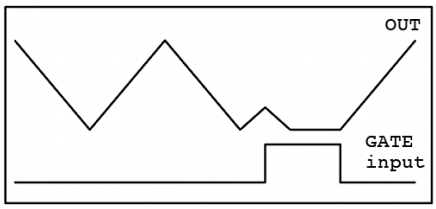
Tip: If you patch a gate to the SM2's INPUT, the END out will give you a logical inversion. This works because the

*END circuit has a bit of **hysteresis** and has a tendency to latch it's output into one state or another.*

GATE

The GATE input**(8)** is a unique feature that's been added to the SM2. A HIGH input here (any voltage above ~1.5V) will send the Sport Mod's output toward zero- at the rate set by the RATE knob and CVs. If and when it gets there, it will remain there until the GATE input returns low. This applies in either mode and whether or not the Sport Mod is self-cycling.

In SMOOTH mode, it will drift down to zero (so long as the S(H) input is low). In STEPPED mode, each successive trigger will send it closer to zero.

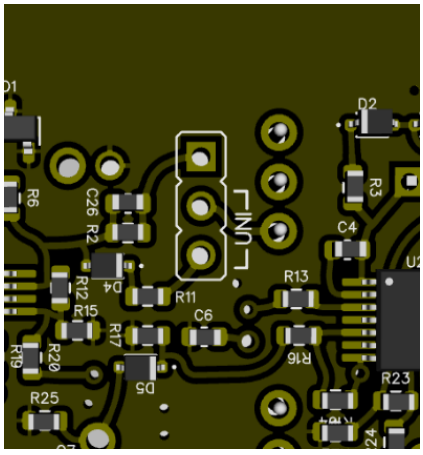


GATE operation

Tip: The GATE input is an easy way to gate self-cycling.. It can also be used as a type of sync (sounds great at audio range) or LFO delay, to chop/ switch sources, or add variation to anything that the Sport Mod is doing.

Cycle Switch

When the CYCLE switch**(9)** is in the UP position (/\/\) , the Sport Mod will want to oscillate (see below). The default range is +/-4V (8Vp-p). Depending on your use case, You may want to set the Sport Modulator to swing **only positive** when cycling. This can be set to 0-8V by the "Uni/ Bip" jumper in the rear of the module (see photo) whichever you choose, It is recom- mended to set both sections the same for proper operation of the **CUPL** section.



Set this jumper for UNIPOLAR or BIPOLAR cycling..

In SMOOTH mode, Flipping the CYCLE switch to the UP position will cause the SM2 to oscillate (so long as S(H) and GATE are LOW), giving a triangle wave at the OUTPUT and a square wave output at the END jack.

In STEPPED mode, each successive sample command at the S(H) input will cause the output to bound between the oscillation thresholds (+/-4V by default. See above). At slower rates, this will resemble more of a smooth triangle at the output, at higher rates, it will resemble regular stair-step waveforms and beyond that- the SM2 is designed to allow for overshoot of the oscillation bounds when the rate is cranked up, resulting in aliased (undersampled) irregular wave shapes and patterns. Experiment.

Tip: With the SM2 in STEPPED mode and CYCLE switch engaged, crank the RATE up past noon and beyond while clocking the S(H) input for "pseudorandom" bounded stepped voltages. You can find lots of interesting patterns that repeat in interesting ways in there.

MODE switch
The MODE switch**(10)** selects between **SMOOTH** (down) and **STEPPED** (up) modes. The orange HOLD LED**(11)** will light whenever the SM2 is in a hold state- constantly lit when in STEPPED mode and lighting when the S(H) input goes HIGH in SMOOTH mode.

S(H) Input
James Cigler suggested I label this input "S(H)"**(12)** , as opposed to "S/H". I agree, it was a good choice. This is an input that does one of two related things depending on which mode the Sport Mod is in. When the Sport Mod is in SMOOTH mode (mode switch down) a HIGH input here **(any voltage above ~1.5V is recognized as "HIGH")** will cause the OUTPUT to hold it's state until this input goes LOW again. When the Sport Mod is in STEPPED mode (mode switch up) a HIGH input here will cause the output to step to (sample) a new value on the low to high transition of the S(H) input source. The output will not step again until this input goes LOW then HIGH again.

CUPL output
The unlabeled jack**(13)** in the CUPL section is a comparator. This comparator compares the Top and Bottom sections' outputs at all times. This outputs a HIGH (+5V) when the Top section's output goes *higher* than the Bottom section, inversely, this outputs a LOW (-5V) when the Bottom section's output is *higher* than the Top's..

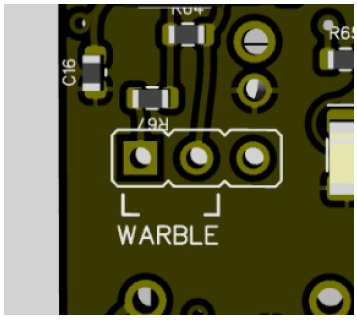
CUPL Switch
When the CUPL switch**(14)** is engaged (flipped UP), the pink CUPL LED**(15)** will light, and the comparator referenced above will be electronically switched to the **normals** of both the **S(H)** input of the Top section and the **INPUT** of the Bottom section. This sets up a feedback loop and accomplishes the basic Serge "Random Voltage Generator" patch that is implemented in Serge's Random Source module (sans the random input to the Top section.. See RVG patch in

Patches section). Note that It also locks the TOP section into STEPPED mode. (The Bottom section can still be set to either.)

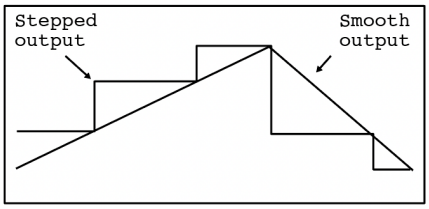
Tip: Since the Sport Modulator is open ended, enabling the CUPL switch with the Bottom section's CYCLE switch engaged and patching something into the Top section's INPUT (a noise source, say) sets up the classic LFO-clocking-a-S/H circuit found in so many synths with the flick of a switch.

WARBLE

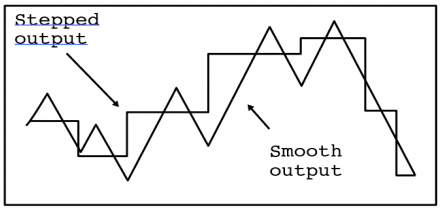
The Warble jumper on the rear of the module adds quite a bit of overshoot to the comparator circuit at the heart of the CUPL section. The "RVG" patch is useful but can get a bit stale- so this adds a bit of wiggle (warble) around the STEPPED voltage that was last sampled (see diagram).Try it out! Note that this causes the comparator to not do it's job very well.. But in a good way :)



the WARBLE jumper



"R.V.G." ala Serge



"Warble" mode

In effect, the smooth side is warbling around a sampled value, at a rate determined by the rate control/ cv and the delta between the previously held sample and the incoming sample. See diagram. By default , this jumper is in the 'normal' position. Note that when jumpered to Warble, the comparator will behave differently, as it now has quite a bit of hysteresis.