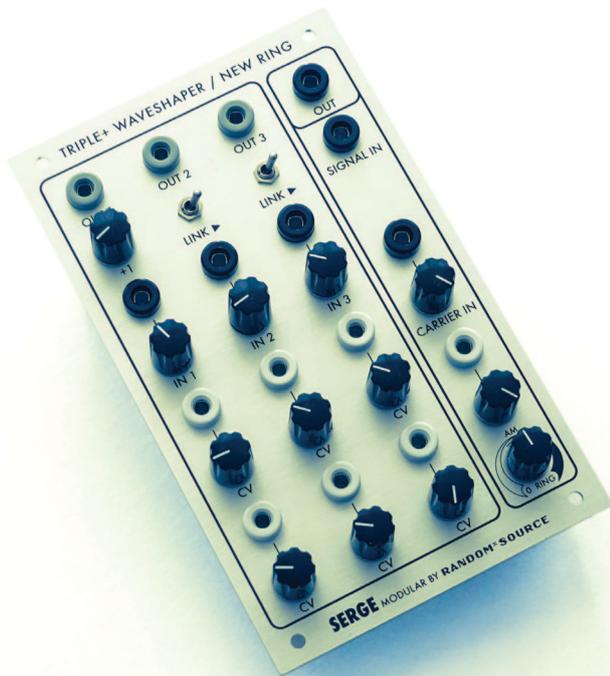


# SERGE

## Triple+ Waveshaper (TWS+) for 4U



The TRIPLE WAVESHAPER (TWS) is a non-linear modifier which can transform a sawtooth wave into a sine wave. This classic module incorporates three independent waveshapers for modifying synthesizer waveforms or for processing signals from preamplified instruments. Although originally designed as a waveshaper for early Serge oscillators, this module has been found to be an excellent modifier of electronic and acoustic sounds, and is highly recommended for subtle timbral modifications beyond the range of simple oscillator/filter patches.

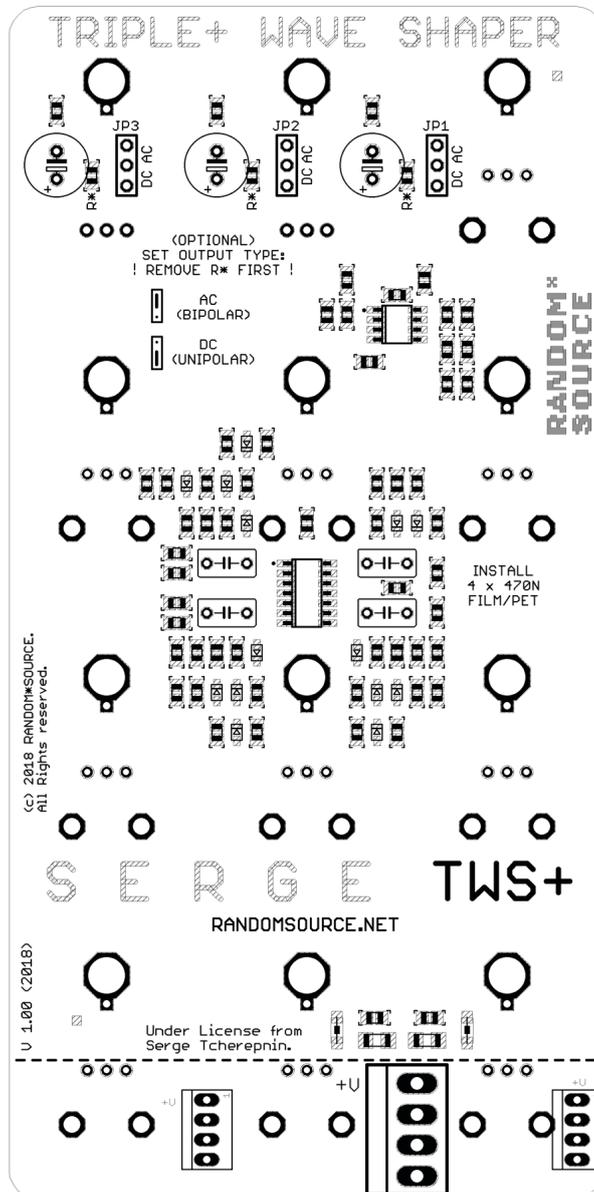
The R\*S version extends the classic TWS concept:

- **+1: An additional (4th) waveshaper has been added** (right after the first / bottom waveshaper) that can be dialed in smoothly using the +1 knob. Turned down (CCW) the bottom section acts as in the original (as if that additional waveshaper would not exist). Turned up (CW) the bottom section is actually 2 waveshapers in series.
- Switches to link the 3 sections - left to right. Using these switches all sections can be set to act in series, providing the combined effect of 3 to 4 waveshapers (or anything in between) using the +1 knob.
- Linking only the middle and the right section and turning the +1 knob up (to have 2 sections on the left) allows you to use the module for instance as **two independent 2-stage waveshapers** (using left in and out for one and middle in and right out for the other) - e.g. for stereo processing.

The Random\*Source version is a licensed and authorized adaptation of the original Serge design.

## DIY - Building the DSG XL

The Random\*Source TWS kit consists of a front panel and a pcb with all SMT components already installed, that also serves as an interface to the front panel.



### Please note:

- Use antistatic precaution when handling the pcb - don't touch the small SMD parts and ICs.
- Outputs are by default unipolar (DC, white jack) - i.e. ranging (about) 0 to 5V. As an **option**, each output can be modified so you can jumper between DC and AC. However, that is not required. So **you can simply ignore the jumper sections and omit the large 47uF capacitors.**
- **No trimmers / trimming required** - the pcbs is already preset for standard voltage levels.
- Board is designed to be powered by a +/-12V stabilized PSU only. (+/-15V is untested).

## Bill of Materials

### Capacitors

4	470n	5 mm lead spacing
3	47uF BP	

Film caps, e.g. WIMA MKS 2-5  
Optional! Bi-Polar, Nichicon Audio-Grade  
Mouser: 647-UES1E470MPM

### Misc

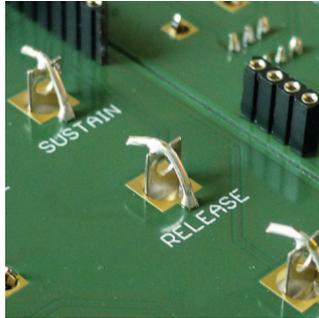
1	MTA-156		MTA-156 power connector
3 (+ 3)	Banana Jacks BLACK	IN	Emerson-Johnson Thonk / Mouser: 530-108-0903-1 (black)
6 (+3)	Banana Jacks WHITE	CV inputs, OUTs if not installing the optional DC caps and jumpers	Emerson-Johnson Thonk / Mouser: 530-108-0910-1 (blue), 530-108-0901-1 (white)
3	Banana Jacks GREY or other	OUT - Idea: pick GRAY if installing optional caps and jumpers for configurable output(s) to show that the output could be set to uniplar (white) or bipolar (black)	Emerson-Johnson Thonk / Mouser: 530-108-0913-1
2	Switches SPDT	ON - ON or ON - OFF (2 positions)	Sub-Miniature Switch, e.g. Mountain Switch (Mouser: 108-0042-EVX)
7	Potionmeter 50k or 100k	linear (B50K or B100K)	Alpha 9mm vertical pcb mount available from Thonk, Tayda, Mouser ...
1	Potionmeter 10k	linear (B10K)	Alpha 9mm vertical pcb mount available from Thonk, Tayda, Mouser ...
up to 3	Jumpers		install always - even if 47uF audio caps are not installed, jumpers have to be set to DC!

## Building

This is simply a suggestion - you might find a different workflow more practical:

1. Read section "Options" below first - these are not required or ever recommended, however, should you desire to implement them it makes sense to think about it before you start building. Install the jumpers (pins).
2. Mount the banana jacks onto the front panel.
3. Solder the film caps and power connector onto the pcb. The picture above shows in blue all spots to be installed / soldered (for a standard build without any options).
4. Install the optional electrolytic caps if you want to have the AC output option.
5. Carefully mount the pcb (with the pots inserted) onto the front panel. You may have to wiggle each pot a bit to get the pots through. Make sure the threads of the pots go through completely and the pots sit right at the front panel.
6. Screw the pots to the panel.
7. Once everything is nicely in place, solder the pots onto the pcb (while the front panel is attached).

8. **Solder the banana jacks in. You can either solder them directly to the surrounding vias (ring round) or - which makes removing easier should you ever need to do that - by inserting a stiff (bare) wire into the little hole (via) and solder that wire to the top of the banana jack:**



9. **Connect a power cord supplying +12V, GND, GND, -12V to the power-header on the main board and double check the direction of the power header before you turn power on. You should be ready to go :-)**

## Options

### A. Selectable output DC / AC via jumper

There are 3 jumpers provided for on the pcb - each to allow to set the output of that section to unipolar (DC, about 0 to 5V) or to AC (centered around 0V). By default, the board is **not** already jumpered to DC, you have to install and set the jumpers to DC even if you do not install the AC option. So you have to (for each output):

1. **Install 3 pin jumpers as indicated on the pcb**
2. **Optional: Install the 47uF electrolytic audio cap.**
3. **Set the jumper to DC if you skipped step 2, otherwise either AC or DC. (Output will not work if you do not set the jumper at all).**

If you decide to implement the jumpers, it is easiest to do this as the first step - in particular before you attach the front panel and solder the pots etc.

## Calibration

No calibration needed :-)

## Power consumption etc.

Power consumption:  $\leq 20\text{mA}$  @ +12V and  $\leq 10\text{mA}$  @ -12V

Module depth: < 30 mm

(Last changes: 29. August 2018, 7:18 PM)

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