

SERGE

Triple+ Waveshaper

(TWS+) for Eurorack



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:

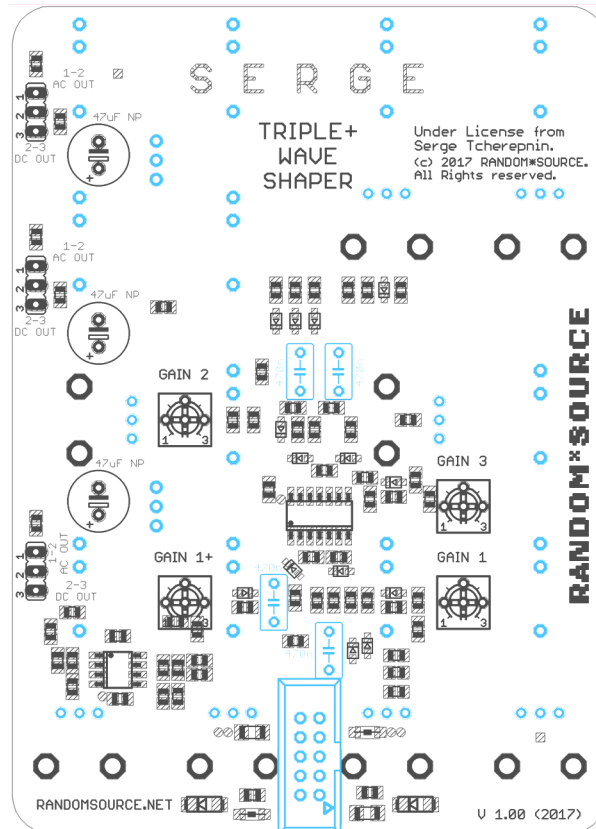
- **+1: An additional (4th) waveshaper has been added** (right after the first / bottom waveshaper) that can be dialed in smoothly using the +1 knob. Turned down (CCW) the bottom section acts as in the original (as if that additional waveshaper would not exist). Turned up (CW) the bottom section is actually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

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

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

TWS+ pcb (v 1.00):

- blue indicates (required) through-hole parts to be inserted / pins to be soldered -



Please note:

- The **front panel is screen printed** for nice saturated colors. That means the paint is on top of the anodised aluminum. Therefore it is important to **avoid mechanical or chemical influences** (scratches, acid, solvents) than other printing techniques. Do not use strong cleaning fluids or abrasive cleaning tools.
- 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 (or particularly recommended). So **you can simply ignore the jumper sections and the large 47µF capacitors**.
- **No trimmers / trimming required** - the pcbs is already preset for standard voltage levels. As an option, you can install trimmers, however, you have to remove a number of resistors for that.
- Board is designed to be powered by a +/-12V stabilized PSU only. (+/-15V is untested).

Bill of Materials

Trimmers

(4)	20k	GAIN 1, 1+, 2, 3 OPTIONAL!	Trimpot (Bourns 3362P or anything that matches the footprint). Not required / recommended - see "Options" below!
-----	-----	----------------------------	---

Capacitors

4	470n	5 mm lead spacing	Film caps, e.g. WIMA MKS 2-5
---	------	-------------------	------------------------------

Misc

1	Euro Power header		MTA-100 power connector, Reichelt: WSL 10G
12	Thonkiconn Jacks		3.5mm Jack Sockets (PJ301M-12) from Thonk
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 ...

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.
2. 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).
3. You can ignore the jumpers and the electrolytic caps.
4. Mount the Thonkiconn jacks, the pots and the switches onto the pcb. Pots should sit on the side facing the front panel (as marked on the board). **Don't solder them in yet.**
5. Carefully mount the pcb (with the pots etc. inserted) onto the front panel. You may then 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. Screw the jacks and pots to the panel.
6. Once everything is nicely in place, solder the pots, jacks und switches onto the pcb (while the front panel is attached). **You should solder the blues pins / spots shown in the picture above. In some areas there is not a lot of space towards the surrounding SMT components, so be careful not to burn or desolder anything else.**
7. 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 already jumpered to DC - consistent with the white jacks on the front panel. **So there is no need to do anything to use the module.**

However, if you want to be able to jumper each or some of the optputs to AC, you have to (for each output):

1. **Remove the 0R resistor (link) next to the jumper pads**
2. **Install a big 47uF electrolytic cap - I use Nichicon BP (bi-polar / non-polar) audio grade, BP should not be needed, however I have not tried any others.**
3. **Install 3 pin jumpers as indicated on the pcb and set the jumper to either AC or DC. (Output will not work if you do not set the jumper where you have removed the 0R resistor).**

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.

B. Gain trimmers

The pcb is pre-configured so you don't need any trimmers or trimming. Using trimmers could allow you to adjust the output level of each section precisely. However, due to the nature of the module and DC offsets involved in teh folding action, I see no reason to try that - the default should work nicely. **Just be aware that you cannot simply install the trimmers**, you would also have to remove 2 resistors first.

So the simple recommendation is: **Do not install the trimmers.**

Calibration

No calibration needed :-)

Power consumption etc.

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

Module width: 18HP, depth: < 30 mm

(Last changes: 9. March 2017, 5:35 PM)

SERGE Modular by Random*Source. Module and circuit under license from Serge Tcherepnin. All rights reserved.