

# XFADER 2018 (Balanced) v1.0

*Please note that this doc refers to the 2018 version of the XFADER with a balanced TLS (6.3mm) output jack on the front panel only.*

The Random\*Source Equal Power XFader 2018 is a voltage controlled crossfader / VCA based on high-end THAT2180 blackmer VCAs:

- Balanced output, using „a new generation of monolithic audio differential line drivers offering improved performance over conventional crosscoupled designs“ for low noise and distortion. These outputs can be connected to balanced or unbalanced equipment (amplifiers, A/D converters...). The output is not available on the front panel, but can be wired for instance to an XLR jack in the boat.
- Emulation of the unique VCA character of classic Serge-VCAs.
- Designed for superior audio performance using Burr-Brown op-amps.
- Great distortion and soundshaping capabilities - try CV at audio rates and play with Gain.
- Output level can be reduced by trimmer to avoid super-hot levels without losing any overdrive performance. The massive gain / overdrive can lead to levels close to 24V pp, with the trimmer the output can be scaled down to allow easier integration with ADC converters that do not allow setting input gain levels.

## How it works

The XFader is both an x-fader and a VCA.

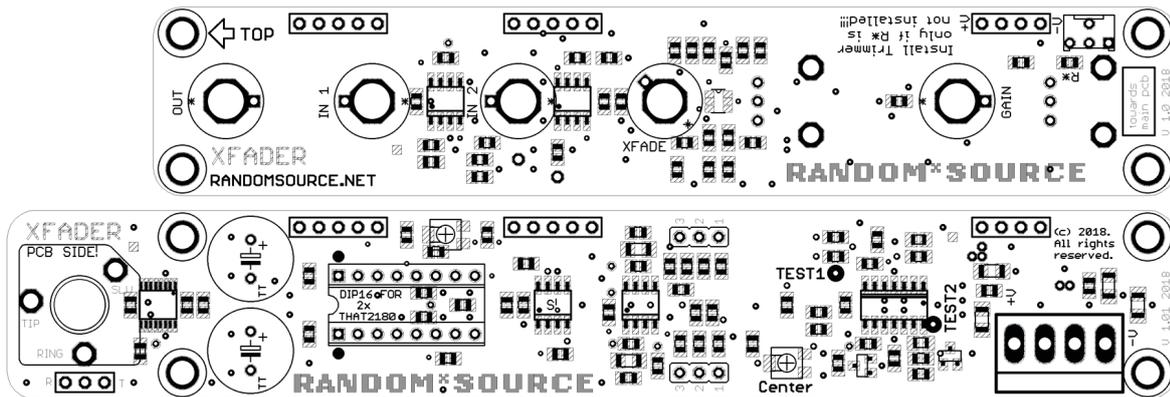
Feed two signals into IN 1 and IN 2 and the XFADE knob will blend from signal 1 to signal 2. Equal-power means it is designed for uncorrelated audio-signals, like a VCO signal and noise - in middle position (center) the signals are attenuated to avoid an unwanted increase in loudness. Of course you can also use it for phase-correlated signals (e.g. two different outs of the same DSG or NTO oscillator), however, unlike a linear crossfade (e.g. ACTIVE PROCESSOR), the waveform will not blend in a linear way from one wave to the other. You can also turn the FADE knob fully CCW and use CV (0 to 5V) to control the fade.

However, to hear something, the VCA becomes relevant - without any(! - unplug any cord) Gain CV, the GAIN knob allow you to turn up the level (pretty far - depending on input signal level, you typically can go above unity gain into quite a bit of distortion / overdrive bliss. This allows to use the module as an output module for sending a mix / blend of 1 and 2 straight out (and add some distortion or adjust the level).

Alternatively, you can use CV to control the VCA dynamically, however, please beware that the CV is added to the level the gain knob sets (**which means it can get very loud and dangerous for speakers!**). So **turn the GAIN knob all the way down before you send in CV** and then adjust the GAIN pot to the desired level.

# Building the XFADER 2018

The XFader comprises 2 pcbs, a main pcb and a panel pcb. Both have all required SMT parts already reflow soldered in. To build the board, **install only the through-hole parts listed in the BOM** and omit / ignore any others.



Please read the build instructions below before commencing the build. The module is designed to be used with a +12V / -12V power supply. Any values given here assume such a supply.

## Bill of Materials (XFADER 2018 V1.01)

### Variable Resistors

0 (all required trimmers are installed in SMT)

### Capacitors

2 47uF BP Bi-Polar, Nichicon Audio-Grade  
Mouser: 647-UES1E470MPM

### ICs

2 THAT2180B IC7, IC8, IC9, IC10 Alt: version A (better, more \$\$\$)  
or C

### Misc

1	MTA-156	PWR	MTA-156 power connector
4	SIL header 5pol		5-pin and 4 pin connectors,
1	SIL header 4pol		linking both pcbs
2	SIL header 3pol	JP1, JP2 - OPTIONAL -	Jumper for equal power db
			attenuation
1	DIP-16 sockets		for THAT2180 - precision (milled)
			recommended
1	Phone Jacks	J1	Switchcraft N112BPCX
			1/4" jack socket (6.35mm)
			Mouser: 502-N112BPCX
3	Banana Jacks	(bipolar) for AUDIO inputs / outputs	Emerson-Johnson
			Mouser: 530-108-0903-1 (black)
2	Banana Jacks	(unipolar) for PAN / GAIN CV inputs	Emerson-Johnson
			Mouser: 530-108-0901-1 (white)
			530-108-0910-1 (blue)
1	Potentionmeter	XFADE: linear (B50K)	Alpha 9mm vertical pcb mount
	50K		available from Thonk, Tayda
1	Potentionmeter	GAIN: linear (B100K)	Alpha 9mm vertical pcb mount
	100K		available from Thonk, Tayda

## General Build Recommendations

- DIP16 sockets can be used for the 2 THAT2180 ICs - precision ones (milled) recommended.
- Make sure you pay attention to the direction of the THAT2180 chips - pin 1 (indicated by a notch on top of the IC) is marked by a white dot on the pcb. Inserting them the wrong way will kill the chips.
- If you solder the TS jacks into the main pcb until everything else is done and the module is calibrated and tested, you cannot simply remove the main pcb any more - you have to unscrew the jacks from the front panel and remove them along with the main pcb.

# Setup / Calibration

## Center Attenuation (optional):

The **jumper**s determine how much the combined volume is attenuated when the XFADE is in center position: Connect Pin 1 and 2 for -6dB equal power attenuation or Pin 2 and 3 for -4.5 db attenuation. **Leave the jumpers open for no attenuation at all (default setting).**

## Equal Power XFading (CENTER)

The XFader circuitry is designed for exact reference voltages and is therefore quite sensitive to deviations. You may want to check that your power supply is actually calibrated to +/-12.0V before you start.

You also need a scope and a (symmetrical) triangular control voltage (LFO) going from 0V to (exactly) 5V. It's a good idea to check the actual voltage - a (properly calibrated) Serge Dual Slope Generator works fine, the triangle output of a Serge NTO / PCO, however, does only go up about +4V and is therefore not suited. You should see the triangle at **TEST 1** (as indicated in the picture above).

Set the FXADE pot **all the way to the Left (CCW)**. Feed a fairly slow (a few Hertz) triangular wave / LFO that goes from 0V to +5V into the XFADE CV input. Use a scope to look at the test point marked TEST 2. Use the CENTER trimmer to get a symmetrical wave:



## Output Level Attenuation (optional)

Use the second trimmer (close to the THAT2180s) to set the desired output level (attenuation). This is intended for setups where the equipment where the output is sent to (mixer, ADC converter) cannot handle / attenuate very hot signal levels. Adjusting this is easiest by sending a constant signal in (remove any patch cord from the GAIN CV input) and increasing the GAIN knob until you notice clipping - that's the maximum level going out. Now use the trimmer to get to the desired level (e.g. 16V pp).

Power consumption: appr. 90mA at +12V / 85mA @ -12V

(Last Change: 11. June 2018, 10:25 AM)