



ELECTRONIC AUDIO EXPERIMENTS

LONGSWORD v3

Technical Manual (Rev 1)

Introduction

Thank you for your purchase of the Electronic Audio Experiments **Longsword!**
This manual is an in-depth guide for properly using and enjoying your pedal.

But first, a little bit on the origins of the Longsword: I conceived this circuit to be a general-purpose distortion with character – in other words, you can coax a wide variety of tones out of it while never compromising its sonic signature. There are many distortion pedals I love, but this one was designed to meet specific needs I had which, as it turns out, are not particularly unique (and probably why you bought this pedal). When playing distorted guitar in a band setting, my preferred style is to set a single channel amplifier on the verge of breakup and push it a bit harder with a mix of pure clean gain and some saturation inherent to whatever pedal(s) I'm using.

At its core, the Longsword is an op-amp drive with diode shunt clipping. An integrated circuit called an operational amplifier (aka op-amp) increases the signal amplitude (loudness), and a pair of diodes limits the peaks. Cutting the peaks off of a signal generates a bevy of extra harmonics, producing the distorted tones we all know and love. This circuit block is found in hundreds of pedals (*ranging from the Rat to the OCD to even the venerable Klon Centaur*) and is, in itself, not special.

The Longsword is made special because of the way the clipping amplifier is wrapped up in a series of other amplifiers and filters. Many op-amp-centric overdrive pedals sound good with one particular kind of guitar or amp, or they have only one sound that they do well. Oftentimes, ones that sound good on their own can drop out of the mix in a band setting. By taking advantage of the headroom available in the Longsword, wide range of gain, and powerful equalization, the player may easily defeat these shortcomings.

-John Snyder, EAE

Operation

Only use a standard reliable **9-volt center-negative DC power supply** with this pedal! (e.g. *OneSpot, Voodoo Labs, Pedaltrain, etc.*) Also, the Longsword does not operate on batteries. The Longsword V3 contains a charge pump which converts a 9V supply to 18 volts internally for extra headroom.

A distortion circuit with more than the standard volume/tone/gain arrangement can take some work to dial in, so here's my recommended algorithm for dialing in the Longsword for the first time.

1. Begin with your amplifier set to its optimal clean tone.
2. Then, set all of the EQ controls on the Longsword to **noon**, set the **drive** and **level** at **minimum**, ensure the boost is **off**, and set all toggle switches to the **right**.
3. Turn on the pedal and slowly increase the **drive** and **level** until they are to your liking. You'll notice that the **drive** control introduces a natural high-end rolloff as it is increased, reducing harsh upper harmonics. You'll also notice lots of volume on tap!

Next, it's time to adjust the **tone controls**. With everything at **noon**, the Longsword has a mostly flat response for guitar frequencies. The Longsword controls are like a studio EQ - the bands are almost entirely non-interacting, and small changes can have a drastic effect. Thus it is recommended to adjust the equalizer gradually, with small boosts and cuts away from noon. The **low** and **high** controls form a James-Baxandall arrangement, which are shelving filters that cut frequencies below or above a certain crossover point. The **mid** control is a parametric boost/cut with a selectable center frequency using the **FREQ toggle switch**.

Some notes on the EQ:

- The James-Baxandall stack is not just a bass and treble arrangement. If you boost both the **low** and **high**, you can get an effective mid-scoop, and conversely you can cut both to get an effective mid boost. Certain settings may reduce the volume output but there is more than enough output on tap to compensate.
- The Longsword has a great deal of low end available, but a tighter tone can be achieved by cutting the bass, especially when combined with an already dirty amp
- Don't be afraid to scoop the low midrange (set the **FREQ switch** left), as it may be a source of muddy tone with some guitars, especially on the neck pickup!
- **Extreme settings** may be of interest, for example:
 - Maximum bass and high gain will result in extra clipping of the later circuit stages, producing a more fuzzy tone
 - High midrange settings coupled with high gain, particularly on the center position of the clip switch, will result in extra clipping at that particular frequency band
 - High treble settings will result in a "clangy" sound without being too harsh

The **CLIP toggle switch** will affect the dynamic response of the pedal, with settings as follows:

- Switch **right** is the **hybrid MOSFET/LED** setting, which has high headroom but a smooth transition into clipping. Gets fairly aggressive at higher gain settings.
- The **middle** position is **open clipping**, or no diodes, which lets the natural clipping of the op-amps shine through. This mode is recommended if you want high dynamic range or are running the pedal as a clean boost/EQ into an already dirty amp.
- Switch **left** is a finely curated “**chef’s choice**” **setting**, a combination of silicon and germanium diodes featuring cool new old stock parts we have kicking around. *The overall volume when using this mode will sound quieter compared to the right and middle positions; this is normal. Just turn the level knob up!*

Finally, the **Boost Footswitch** activates a boost circuit that is integrated with the Longsword.

You can adjust the **gain** of the boost using the **blue trimpot** located inside the pedal.

Longswords are shipped out with this control **close to maximum**, but it can be adjusted with a small phillips or flathead screwdriver. The boost circuit has a moderate low cut, which is perfect for tightening up the Longsword at higher gain settings and providing two distinct tones.

In conclusion...

The Longsword is a very versatile distortion / overdrive pedal with a plethora of options on hand and we hope it helps you dial in the exact tone you’re looking for, regardless if you’re playing blues or doom metal. Thanks again!

Changelog

Version 3 (Fall 2017)

- Charge pump for 18V of headroom from a 9V supply
- Boost channel added
- All new clipping modes
- New artwork

Version 2.1 (November 2016)

- Updated PCB layout
- Eliminated range toggle

- Removed most electrolytic capacitors from the signal path

Version 2 (Fall 2015)

- New PCB layout (Rev 1)
- Added gain switching
- Added clipping selector
- Added range toggle
- Now capable of running from 9V to 18V

Version 1 (Summer 2015)

- Original release

