

Thanks for supporting Ondes. We hope that you have a blast using the SUD.

Installation

WATCH OUT!

⚡ **Electrocution Hazard!** ⚡

Even though there are not High Voltages in the Eurorack format, there are some risks involved when dealing with the Power Supply.

Be careful, always turn your system off and unplug the power cord before dealing with the PSU, even if you're just connecting a module and never ever touch the electrical terminals of the distribution bus.

SUD is a module for the Eurorack modular format that requires -12V/+12V DC and takes up 20mA from both the -12V and +12V power supply rails. Remember to leave around 20% headroom of amperage in the overall current that your PSU can deliver.

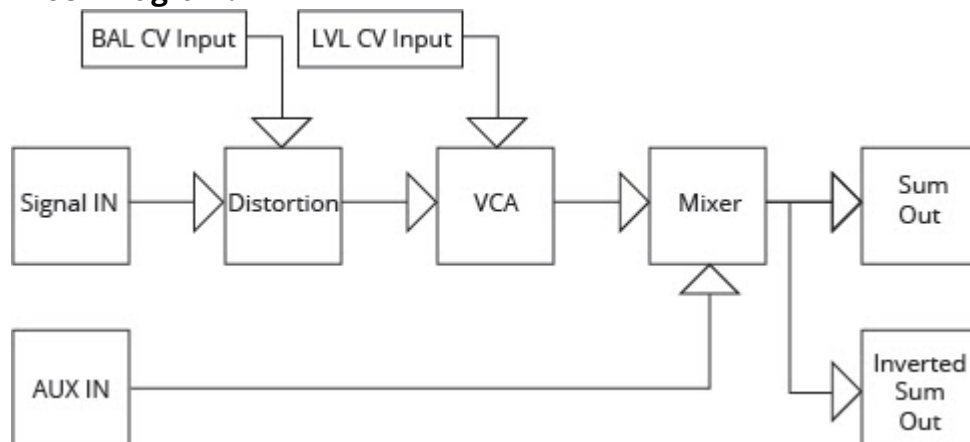
Ok, now, finally, you can find 6HP in your case, connect the cable to the power distribution bus and screw it in place.

The red stripe of the power cable should point to the bottom of the PCB as [Doepfer intended](#), this stripe indicates the -12V, which is marked -12V on the PCB.

The module comes with the cable attached, so you should be ready to go.

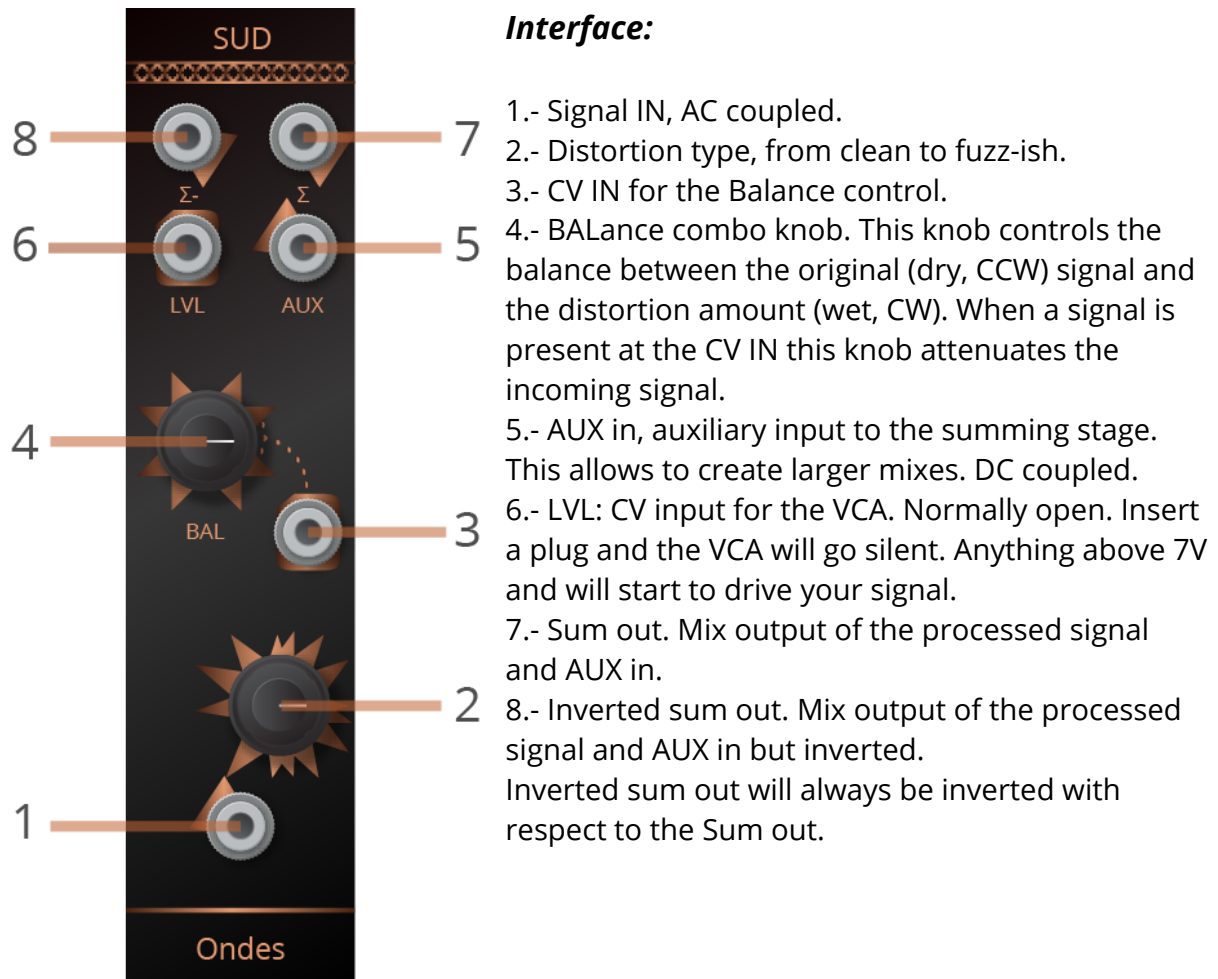
The module is equipped with reversed polarity protection ([thanks Mr. Paul Schreiber](#)) and a shrouded header making it impossible to plug the cable backwards, if it's a second hand module the cable could have been built reversed, or depending on your power distribution you could flip the cable when plugging it in, in any case the module won't fire up making it silent. Double check and go.

Block Diagram:



About the SUD

The Single Utility Distortion, SUD, is a compact analog distortion module based on the classic Rat distortion pedal but with a couple of twists we managed to *drive* it to the utility territory: VCA, a 2 Ch. Mixer, an Inverter and a Distortion.



Interface:

- 1.- Signal IN, AC coupled.
- 2.- Distortion type, from clean to fuzz-ish.
- 3.- CV IN for the Balance control.
- 4.- BALance combo knob. This knob controls the balance between the original (dry, CCW) signal and the distortion amount (wet, CW). When a signal is present at the CV IN this knob attenuates the incoming signal.
- 5.- AUX in, auxiliary input to the summing stage. This allows to create larger mixes. DC coupled.
- 6.- LVL: CV input for the VCA. Normally open. Insert a plug and the VCA will go silent. Anything above 7V and will start to drive your signal.
- 7.- Sum out. Mix output of the processed signal and AUX in.
- 8.- Inverted sum out. Mix output of the processed signal and AUX in but inverted. Inverted sum out will always be inverted with respect to the Sum out.

Examples

Of course we won't show you how to distort your signal, use your ears and experiment. These examples are meant to be starting points for experimentation. We would recommend you to modulate everything at audio rate.

Drive

You will need a 7V or more Offset.

The Patch:

- Plug your signal to the signal input.
- Set the Distortion type knob full CCW.
- Set the Balance knob full CW.
- Patch your offset to the BAL CV in and start driving your signal. A combination of the position of the Balance knob and amount of Offset will determine how much Drive you get.

Flipping a Signal

Patch the signal to be flipped (i.e. inverted) to the AUX input. This can be CV or Audio.

Bipolar AM

This is trickier, it's not a feature directly available on the SUD module, but can be explored with the help of other modules. And maybe it's more versatile than a normal Ring Modulator.

As you probably know a Ring Modulator, or, Four Quadrant Multiplier, etc. is a circuit that with a positive voltage acts like a VCA, but when fed with a negative voltage the signal gets flipped. We can take advantage of the features of the SUD module for this patch.

You will need:

- Two VCAs
- One mixer
- One VCO as the carrier
- One signal, as the modulator, ideally use a bipolar signal (VCO), if not you will need to compensate by offsetting the signal after inverting it. Remember that when you invert a 5V the result is -5V and VCAs only respond to positive CV.

Go and look at the patch called Voltage Mirror, in the Make Noise Maths manual, page 17.

- A multiple
- An inverter

The Patch:

- Patch the carrier (VCO) to AUX input on the SUD module.
- Patch Sum out to your first VCA.
- Patch Inv Sum out to your second VCA.

- If you have a VCA with a sum output, you can directly patch the sum out to your Output module to monitor your signal, if not, this is the time to patch both VCAs out to the in of one mixer and the sum out of that mixer to your output module to monitor.
- Mult your modulator (signal, LFO, VCO), one copy goes to the CV input of your first VCA, the other one goes to the inverter. Take the inverted signal and patch it to the CV input of the second VCA.

Now you have the sound of a Ring Modulator. Since we do not have the circuit, maybe it's more appropriate not to call it a Ring Modulator. This patch it's more versatile than just patching a Ring Mod because you can alter the volume of your VCAs, attenuate the modulator signal, if your VCAs allow it you can change the response, etc. All this will affect the final sound.

A bit of explanation about this technique.

A VCA cannot flip a signal like a Ring Modulator, but by using two VCAs one with the original carrier signal and one with the flipped version we crossfade between the two states of the VCAs such as when one is open the other one is closed and vice-versa. Since we have control over all the parameters of the patch we can get results that are impossible on a Ring Modulator.

Square Shaper

This one is simpler, we will achieve a square wave by hard clipping an incoming signal.

Patch your signal to the signal input.

Patch the inverted Sum out to your output module to be monitored.

Patch the Sum out through an attenuator and set it so that is fully closed

Patch the output of the attenuator to the AUX input.

Open your attenuator and square the life out of your signal.

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And all the early adopters.