



GND CTRL

Control and function reference guide

1 SIGNAL PROCESSOR INPUT

Apply signals to be affected by GND CTRL's signal processor here. The signal processor consists of a manual attenuator, 7-preset gain/attenuation stage and DC bias - The signal is processed through those stages in respective order. The final output is then sampled by a bipolar LED clipping indicator before buffered to a voltmeter, milted normal and single inverted outputs.

2 7 PRESET GAIN/ATTENUATION

Seven most commonly needed amplitude conversion ratios at your finger tips. Use this control to conveniently interface audio and CV within your system. Settings are available to convert any level found in audio and video systems to within a needed amplitude range. Use with the DC bias control to convert bipolar to unipolar and vice versa. Boost external audio signals too!

3 MANUAL ATTENUATOR

Use the manual attenuator to add precise control for custom amplitude adjustments. Fully clockwise setting is unity and will not affect the presets. Fully counter-clockwise will completely mute the signal.

4 DC BIAS

This control sums a DC signal with the input, after preset gain and attenuator. Center position adds 0V DC - effectively adding nothing to the signal. +/-9V DC bias is available via this control.

5 BIPOLAR CLIPPING INDICATORS

These LEDs, marked "-" and "+" indicate that the signal is about to clip or clipping. The internal comparators are set to ~10V and when just barely lit, they indicate your are juuust about to clip. When fully lit you are clipping friend! The difference between just clipping and clipping is only within 100mV, approximately.

6 VOLTMETER DISPLAY

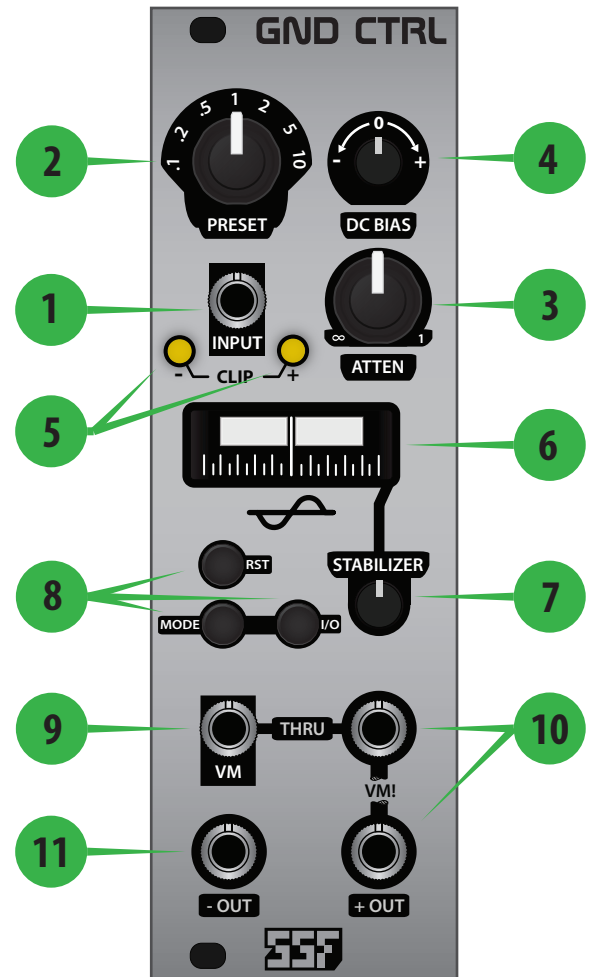
Very high contrast OLED meter display. The display has two modes of operation. The default mode (shown) produces a virtual analog needle to indicate the amplitude of your signal. At high frequencies, the display becomes a bipolar bar indicating the full range of the signal. the hash marks represent ~1V per step. The alternate mode is a numerical display. The numerical mode indicates the maximum and minimum voltages with floating point numbers accurate to two decimal places. While any mode can be used, the default mode is best for quickly viewing AC signals or for a pleasing visual appearance. Numerical mode works very well for AC and especially well for DC signals. Numerical is the recommended mode for measuring very slow AC and all DC signals accurately. See "VOLTMETER TIPS" on the bottom of this page.

7 STABILIZER

The stabilizer control is an important feature. For some very low and sub audio frequencies, the display may appear blank (very low freq) or react erratically with the changing signal (sub audio). This may not produce a useful or meaningful voltage indication. The stabilizer reduces the speed in which GND CTRL performs updating calculations as you turn the control from fully counter clockwise to fully clockwise. This enables very low frequency changes to be perceived and additionally causes erratic changes to settle on the maximum and minimum values. The default setting for this control is in the fully CCW position. Adjust only as needed or desired.

VOLTMETER TIPS

When using the numeric mode, the MAX and MIN values are displayed as positive and negative respectively. If the signal being measured is low frequency like from an LFO for instance, the current position of the voltage (positive or negative) is displayed twice, in other words the same reading on MAX and MIN. Similarly, for DC signals the voltage is displayed twice and differs slightly between MAX and MIN readouts. For positive DC, use the MAX value and the MIN value for negative DC.



TECH SPECS	
Width.....	8hp
Depth.....	25mm
Current Draw	
Average.....	+45mA -15mA
Max.....	+66mA -15mA
Disp off saves ..+11mA	
VM accurate within 20mV	
All inputs and outputs DC coupled, +/-10V	
Rev Polarity Protected RoHS & CE compliant	



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VOLTMETER and DISPLAY CONTROLS

RST - Reset. Use this button to reset the voltmeter software in the off chance that a malfunction occurs.

MODE - This button selects between the default needle meter and numerical displays

I/O - Display ON/OFF button. Save power when not in use by turning off the display.

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DIRECT VOLTMETER INPUT

Signals can be measured unaffected by the signal processor using this jack. The signal present here is buffered and hard wired to the adjacent THRU jack to the right of this input.

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NORMAL OUTPUT and THRU/MULTIPLE

The jack labeled +OUT is the post processor output. This output is buffered and normaled to the THRU jack and acts as a +OUT multiple. However, using the DIRECT VM INPUT jack will break the multiple as indicated on the panel. If a jack was connected in the THRU output, the new signal inserted into VM will now be present on that jack.

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INVERTED OUTPUT

This output provides an inverted version of the post processor output. Please note that the information on the display is indicative of the +OUT only; unless you self patch the -OUT into the VM input.

PRESET	FUNCTION	SUGGESTED USE
.1	Divide by 10	Video & Ext Bridging Attenuation
.2	Divide by 5	Video & CV Bridging Attenuation
.5	Divide by 2	CV Scaling, 10V to 5V 5V to 2.5V
1	Unity	No Gain
2	Multiply by 2	CV Scaling, 5V to 10V 2.5V to 5V
5	Multiply by 5	CV Scaling, 1V to 5V Boost Low/Ext Signals
10	Multiply by 10	CV Scaling, 1V to 10V Boost Low/Ext Signals

Compact Utility

Finally - a compact utility that addresses your needs. GND CTRL was designed to fill a gaping hole or should we say an - overfilled hole in the utility world. Until now, utility modules were designed with rarely more than one basic function. This often required filling up limited rack space with attenuators, multiples and inverters -taking up space needed for that new VCO or VCF - and still, without any convenient way to measure or even scale CVs.

Even more frustrating is that all that redundancy of function in one module is hardly necessary in a small system or for typical small to medium sized patches. GND CTRL takes the best of utilities and couples them with the convenience of a built in voltmeter and preset scaling unit in a compact and space saving 8hp. There is no doubt GND CTRL will make patching easier and more efficient while saving panel resources.

Voltage Bridging

The growing variety of analog and microprocessor driven modules in Euro is great, but given the lack of standards, not all modules produce or accept the same range of control voltages. GND CTRL's gain presets address this issue and provide an easy way to interface modules while getting the best range and response. Common voltages produced and utilized by the majority of Eurorack audio/video modules are unipolar, 0.5V, 0-1V, 0-5V, 0-10V and bipolar +/-2.5V and +/-5V. The Presets address these conversion ratios. With the visual aid of the voltmeter along with the Manual Attenuator and DC bias make this task a simple one. Dead spots and compatibility issues are history.

Bridging External Devices

GND CTRL can be used to boost line level signals for use in the modular environment and similarly to attenuate modular signals for monitoring level sensitive devices.

DC Voltage Source

Use the DC Bias to produce an adjustable bipolar DC voltage source. Mix the signal with modulators or use as a trigger voltage source for pressure sensitive resistors and voltage source for boosting CV range. The currently displayed voltage is available at the +OUT and THRU outputs as well as an inverted version at the -OUT output.

Know Your Voltages!

Knowing precise voltage levels in a patch is far more accurate than remembering a knob's position. We all know just how subtle settings can be.

Not only that but this knowledge provides a much deeper understanding of modular synthesis and what is happening in your patches.

CALIBRATION PROCEDURE

The calibration should be performed exactly as follows: Using an accurate multi-meter to three decimal places. And a stable voltage source.

- 1.) Start up GC and the multi-meter.
- 2.) Patch the voltage source to a attenuator and then to the AUX input of GC.
- 3.) Patch a cable from the THRU output on GC to the multi-meter probe leads.
- 4.) Using the multimeter, set the voltage from your voltage source to 5.35 or close to that - just a value to two decimal places that is close to 5V but not 5V exactly!
- 5.) Set the stabilizer pot to about 9 o'clock
- 6.) Using the PCB trimmer and taking the measurement off the MAX reading - set GC MAX reading to exactly what you get off the multi-meter to two decimal places - as close as possible.
- 7.) Using the attenuator on your voltage source, cycle through voltages from 0 to 10V and make sure that the reading is within 10-15mV across the board or as close to that as is possible . The reading will slightly skew increasingly off the mark as you tend away from 5V in both directions. But doing it this way gives the best all round performance.

IMPORTANT!

Do not attempt to jumper the 6 pin header on the back of the GND CTRL PCB! This is for possible future voltmeter firmware updates. There are no easter eggs or secret settings beyond the possibility of a "SURPRISE, YOU FRIED YOUR MODULE!" smoke fest. You will also void any possibility of a free repair. That being said, we are here to help if you ever have any problems with our modules! If you are curious and have questions just ask :)

The number one cause of damage are reversed or misaligned power connections. Always abide by the -12V aligned with the RED stripe rule for SSF modules. We do tolerate mistakes as all our modules are reverse polarity protected but do please pay attention because not all modules have this feature!

Thank you for your purchase and as always - ENJOY!