

# modDemix



v2.3

**modDemix:**

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Make Noise warrants this product to be free of defects in materials or construction for a period of one year from the date of purchase (proof of purchase/invoice required).

Malfunction resulting from wrong power supply voltages, backwards or reversed eurorack bus board cable connection, abuse of the product or any other causes determined by Make Noise to be the fault of the user are not covered by this warranty, and normal service rates will apply.

During the warranty period, any defective products will be repaired or replaced, at the option of Make Noise, on a return-to-Make Noise basis with the customer paying the transit cost to Make Noise. Please contact [technical@makenoisemusic.com](mailto:technical@makenoisemusic.com) for Return To Manufacturer Authorization.

Make Noise implies and accepts no responsibility for harm to person or apparatus caused through operation of this product.

Please contact [technical@makenoisemusic.com](mailto:technical@makenoisemusic.com) with any questions, needs & comments, otherwise... go MAKE NOISE!

<http://www.makenoisemusic.com>



### **About This Manual:**

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Illustrated by W.Lee Coleman

Thanx to Surachai for his help in beta testing, and to the electronic music pioneers who reclaimed radio communications tech for musical purposes.

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**Electrocution hazard!**

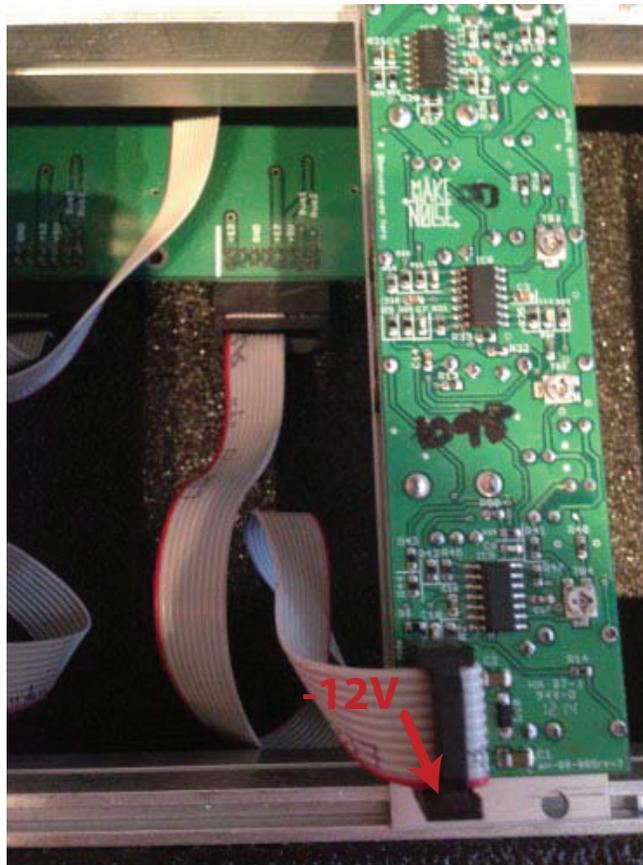
Always turn the Eurorack case off and unplug the power cord before plugging or un-plugging any Eurorack bus board connection cable.

Do not touch any electrical terminals when attaching any Eurorack bus board cable.

The Make Noise modDemix is an electronic music module requiring 30mA of +12VDC and 30mA of -12VDC regulated voltages and a properly formatted distribution receptacle to operate. It must be properly installed into a Eurorack format modular synthesizer system case.

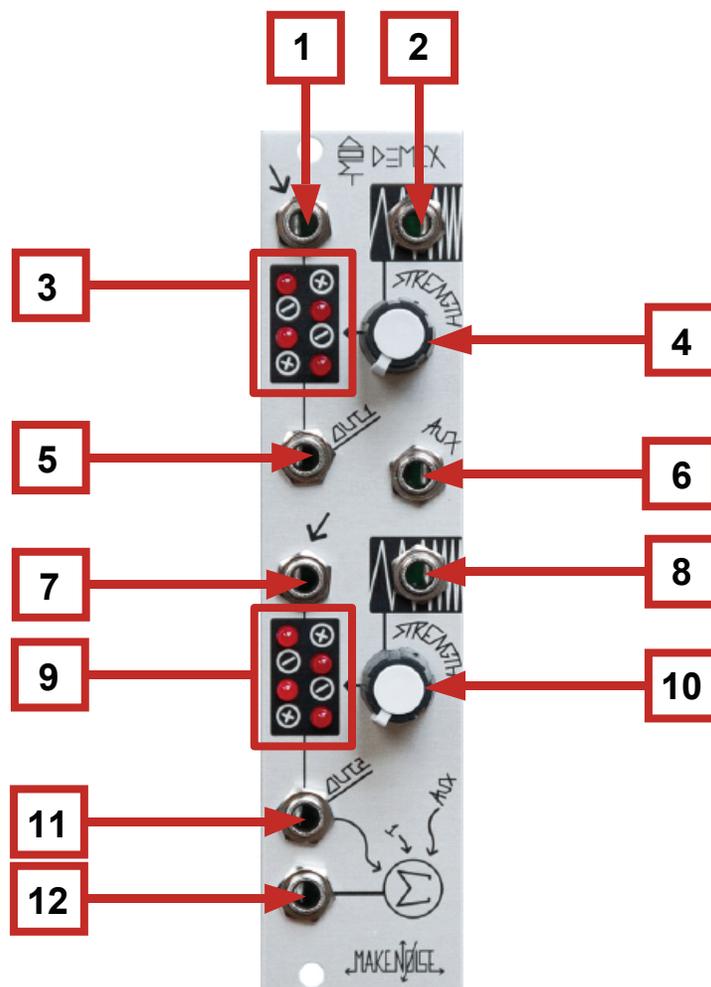
Go to <http://www.makenoisemusic.com/systems.shtml> for examples of Eurorack Systems and Cases.

To install, find 6HP in your Eurorack synthesizer case, confirm proper installation of included eurorack bus board connector cable on backside of module (see picture below), plug the bus board connector cable into the Eurorack style bus board, minding the polarity so that the RED stripe on the cable is oriented to the NEGATIVE 12 Volt line on both the module and the bus board. On the Make Noise 6U or 3U Busboard, the negative 12 Volt line is indicated by the white stripe.



**Please refer to your case manufacturers' specifications for location of the negative supply.**

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### modDemix Panel Controls

1. Signal 1 IN: signal to be processed.
2. Carrier/ CV 1 IN: determines amplitude & phase of Signal 1 IN.
3. Channel 1 LEDs: LED indication of signal activity in four quadrants. Vertical position represents amplitude and phase of input signal; horizontal position represents amplitude and phase of carrier/CV input signal.
4. Carrier/ CV 1 Strength: attenuator for Carrier/ CV IN: Normalized to +5V so that with nothing patched the associated attenuator operates as a unipolar manual control for the parameter. Range 0V-5V.
5. Signal 1 OUT.
6. AUXiliary INput to Summing stage: An AUXiliary IN allows for the chaining of multiple modDemix (or Optomix) units to create larger mixes.
7. Signal 2 IN: signal to be processed. Normalled to Signal 1 OUT.
8. Carrier/ CV 2 IN: determines amplitude & phase of Signal 2 IN.
9. Channel 2 LEDs. LED indication of signal activity in four quadrants. Vertical position represents amplitude and phase of input signal; horizontal position represents amplitude and phase of carrier/CV input signal.
10. Carrier/ CV 2 Strength: attenuator for Carrier/ CV IN. Normalized to +5V so that with nothing patched, the associated attenuator operates as a unipolar manual control for the parameter. Range 0V-5V.
11. Signal 2 OUT.
12. SUM OUT: mix of Signal 1 OUT, Signal 2 OUT & AUX. IN.

**Standard AM, Balanced Modulation, Signal Multiplication, Frequency Mixing, Single Sideband, Double Side-band** and even **XOR** (as in Boolean logic) have all been used to implement "Ring Modulators" for musical purposes in the last 50 years. In a way, **Ring Modulation** has become a catch-all term for music technology that results in a complex, clangorous, modulated sound.

The modDemix consist of 2 identical direct coupled circuits that may be used together or independently to process audio or control signals by means of amplitude modulation and the many derivatives of AM such as double/ single-sideband, voltage controlled amplification/ attenuation, voltage controlled polarization or multiplication and of course, ring modulation. The modDemix is a specialized amplitude modulation circuit that could be thought of as a "Thru-Zero VCA," meaning that in addition to the AM, when the Carrier signal (called Carrier/ CV) changes phase, the resulting signal's phase will flip as well. What makes the modDemix unique when compared to other Balanced Modulators, is that because it is Direct Coupled, it will perform wonderfully both as an Audio Rate modulator to implement Ring-Modulation, and as a Control Rate modulator to implement multiplication of control voltages. Additionally, the circuit used within the modDemix will, with ease, turn OFF around zero volts at the Carrier/ CV INput, a characteristic that makes the circuit behave very well as a VCA. Both of the circuits feed a SUMming stage, which thus allows the module to be used as a voltage controlled mixer. The Carrier/CV In input attenuators are "combo knobs," acting as unipolar panel controls. In practice, this means the SUMming stage can also be a mixer with amplitudes set by the two panel controls. An AUXiliary IN allows for the chaining of multiple modDemix (or Optomix) units to create larger mixes. An attenuator at the Carrier/ Control INput allows for setting the Strength or level of the incoming signal. When performing ring modulation, adjusting the strength of the Carrier will alter the integrity of the resulting modulated and/ or demodulated signal, thus affecting the timbre as well as the amplitude. When using the modDemix in most other ways, the Strength control will be directly related to the amplitude of the resulting signal.

To better understand the concepts of AM and it's derivatives, patch a DC offset from CH. 2 of Make Noise MATHS (using associated panel control to set the level) to Signal IN of modDemix. Patch a DC offset from CH. 3 of MATHS to Carrier/ CV IN of the modDemix. Set modDemix Strength to full CW. Take output from Signal OUT on modDemix, patch to an Oscilloscope, DVM for visual feedback, or patch to the 1V/ Octave input on a VCO and listen to the results. Setting a +3V offset at the Signal in, and +5V offset at Carrier/ CV IN would result in a +3V Signal OUT. A +3V Signal IN and a -5V signal OUT would result in a -3V Signal OUT. Please note that because it is designed for musical purposes, the modDemix Carrier/ CV IN is scaled so as to operate with voltages typical of the euro format modular synthesizer, which is why it takes +5V at Carrier to generate the +3V Program Signal at the OUT.

Now replace the DC Offset signal patched to the Signal IN on modDemix, with that of a VCO, preferably a SINE waveform, at audio rate. Leave MATHS CH. 3 patched to Carrier/ CV IN. Patch modDemix Signal OUT to your monitoring system. Adjust MATHS CH. 3 from full CCW to full CW and observe the change in amplitude and phase. Listen for the point at which the sound goes "Thru-Zero."

Now remove the DC Offset signal patched to the Carrier/ CV IN, and replace with the MATHS SUM OUT. Be sure to set MATHS CH. 2 and 3 to 50% (NULL). Leave the VCO patched to modDemix Signal IN. Initiate the CYCLE behavior on CH. 1 MATHS. Adjust the MATHS CH. 1 attenuvertor to around 3 o' Clock. Observe standard Amplitude Modulation. Listen for the presence of Sidebands, and "Carrier Feed-Through." Experiment with the rate of MATHS cycling, and the Strength control.

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Using same patch as above, add a negative offset to the Cycling CH. 1 of MATHS, by adjusting CH. 2 panel control to full CCW. Observe Balanced Modulation. Observe the low amount of Carrier Feed-Thorough. Depending upon the Negative Offset added, the Carrier all but vanishes, making the resulting Sidebands more audible. This is the sound most commonly associated with Ring Modulation. Experiment with different amounts of negative offset, which could be used to control the Depth of the Ring Modulation. Also experiment with different Carrier Strengths and observe the resulting timbre and amplitude changes.

Return the CH. 2 panel control to 50% (NULL). Set CH. 4 of MATHS for a slow Rise and Fall, and set the corresponding attenuator to about 10 o' Clock. Initiate the cycling behavior at CH. 4. Observe voltage control over Ring Modulation Depth. Experiment with combinations of DC Offsets (MATHS CH. 2), triggered or Cycling Offsets (CH. 4 MATHS) added to the Carrier (MATHS CH. 1). Patch a sequencer from Pressure Points to CH. 3 MATHS and add that to the Carrier (as generated by CH. 1 MATHS). Experiment.

## Patch Ideas:

### Simple Mixer with Chaining

Patch two signals to be mixed to Ch1 and Ch2 Signal INputs. Adjust relative amplitudes with Ch1 and Ch2 STRENGTH controls. Chain additional elements (such as an Optomix or another modDemix) via the AUX input. Mixed signal will appear at SUM OUTput.

### VCA

Patch signal to be processed (audio or control) to Signal IN. Patch uni-polar control signal such as Envelope, LFO, Pressure Points CV or gates, to the corresponding Carrier/ CV IN. Take output from Signal OUT. Use Strength to set the level of the resulting signal. If the Carrier/ CV Signal is oscillating at audio rate, you will achieve Amplitude Modulation. Like Ring-Modulation, AM produces audible sidebands. The main difference is that the Carrier signal is not suppressed, so along with those sidebands, you hear the Carrier. Musically speaking, this sound is quite useful when a complex timbre is desired, but not at the loss of a strong root note.

### Voltage Controlled Mixer

Use the VCA patch, apply control signals such as the CV outs from Pressure Points to the Carrier/CV Ins of both channels. Take output from SUM out. Create larger mixes by chaining several ModDemix and/or Optomix together. To do this patch the SUM out from one into the Aux. IN on the next one in the chain, and so on, to create 2, 4, 6, 8 channel mixes.

### Balanced Modulation, aka "Ring Modulation," aka Frequency Mixing

Patch audio signal to be processed to Signal IN. This will be the Program. The Carrier signal should be a bi-polar Audio Rate Signal such as a VCO (so it needs to swing from positive to negative). The resulting signal, at Signal OUT, will be the result of the Signal IN having both amplitude and phase directly related to that of the Carrier/ CV IN. To achieve single or double sideband, the balanced modulator is followed by filters tuned so as to eliminate all but one or two sidebands. Obviously, this is not entirely possible within the current synthesizer system, since it requires filters designed exclusively for the job, still many interesting timbres may be heard by using two band pass filters in parallel after the modDemix, for "Stereo-Quasi-Double-Sideband." Modulating the filter cutoff will animate the sidebands.

### Control Signal Multiplication or Voltage Controlled Polarization

Same as Balanced Modulator patch, only both the Signal IN and Carrier IN are both Control Signals as opposed to Audio Signals. Use the signal patched to Carrier/ CV IN to multiply the Signal patched to Signal IN. Take output from Signal OUT. Remember the "Thru-Zero VCA" concept when trying to understand how to use this patch.

**Ring Modulation with increased fundamental presence**

Patch VCO output such as a sine wave to Ch1 Signal IN, and modulating signal such as another sine wave to Ch2 Carrier/CV IN. Take output from SUM OUT. Adjust balance of RM signal and fundamental with the STRENGTH knobs.

**modDemod**

To ease the patching of modDemod effects, Signal 2 IN is normaled to Signal 1 OUT, thus connecting the two circuits in series. Patch Signal to be processed to Signal 1 IN. Patch Carrier to Carrier/CV1 IN, and also (via multiple) to Carrier/CV2 IN. Take output from Signal 2 OUT. The variation from circuit to circuit will introduce demodulation errors that sound as distortions. Using the Strength controls, it is possible to introduce more errors and greatly reduce the integrity of the resulting signal. A nice variation on this patch uses a pair of independent Carrier VCOs, which are tuned to the same frequency, but not synced. Variations in waveshape and Phase inaccuracies between the two VCOs will introduce more demodulation errors and distortions.

**Octave UP**

Patch your signal to be processed to Signal 2 IN, and (via multiple) to Signal 2 Carrier/CV IN, and Signal 1 Carrier/CV IN. Patch Signal 2 OUT into Signal 1 IN, and take the output from SUM Out. Use the STRENGTH controls to adjust timbre and blend of octaves.

**DPO Supersaw**

This patch uses voltage controlled inversion to derive a sawtooth wave from the DPO's Final Output. Mixing it with the VCOA Sawtooth produces a slightly unconventional, but nonetheless classic, supersaw.

Turn off all modulation to Final output parameters and the MOD BUS. Adjust FOLD panel control to ~9:00 so the output is full amplitude but with no folds yet. Adjust ANGLE panel control to 12:00, listening for the fullest sound available. Adjust SHAPE panel control full CW (100%) to "glitched triangle".

**DPO Final OUT -> modDemix Ch1 Input**

**DPO Sawtooth -> modDemix Ch2 Input**

**modDemix SUM -> Monitor**

Detune the two sawtooths to taste, and set levels with the modDemix STRENGTH controls. The sawtooth derived from the FINAL output will be one octave above its original pitch, and it will also contain a slight "spike" at its peaks and troughs (because of its origins as a "glitched" triangle, as well as varying slightly in amplitude every other period (because of the DC offset in the DPO's square wave).

Combined with the unusual sawtooth shape on VCO A, which has a stronger-than-usual fundamental, this patch produces a supersaw with character!

### **Crossfading**

Send two signals of your choice to the modDemix Ch1 and Ch2 INputs. Select a positive-going Control Signal such as a MATHS/Function envelope or a sequence from Rene.

Using a multiple, patch the Control Signal to modDemix Ch1 Carrier/CV IN, and also to MATHS, set up as a Voltage Mirror (see MATHS manual p.17). Patch MATHS SUM to Ch2 Carrier/CV IN.

Monitor modDemix SUM Out. Some adjustment of the MATHS Ch2 and Ch3 panel controls may be necessary to fine-tune the crossfader.

### **Panning**

For panning, patch identically to the crossfading patch, except instead of two signals, mult the same signal to Ch1 and Ch2 on the modDemix. Instead of monitoring the SUM Output, send the Ch1 and Ch2 outputs to Left and Right inputs on your monitor, or to whatever further signal processing stages you prefer.

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