# ecoSYSTEM

XODULAR

pure data modular
synthesizer system

user's guide

*Dedicated to Joseph for believing in me and for helping me realize this project.*

# INTRODUCTION: ABOUT THE ecoSYSTEM PURE DATA MODULAR SYNTHESIZER SYSTEM

## HISTORY OF THE ecoSYSTEM

The XODULAR ecoSYSTEM is a new modular synthesizer system in Pure Data. Where the first XODULAR system was a collection of simpler synthesis building blocks, the ecoSYSTEM is a much more personal instrument. The modules are more specific and complex. I wanted to create an instrument with a unique workflow and sound. For this reason, I do suspect that it is not as easy to dive straight into as my previous system, but the sonic possibilities are much much wider. I hope you have some fun with it!

## USER INTERFACE:

First of all: Download a copy of Pure Data Extended at puredata.info ( ecoSYSTEM uses no external libraries except for [knob] from the flatgui library, so to run it in PD Vanilla simply install that library. It is beyond the scope of this manual to explain that process though )

Open the ecoSYSTEM.pd file with Pure Data

Choose Audio Settings in Pure Data. Sound out from the ecoSYSTEM is hardwired from THE MAESTRO module to channel 1 and 2 on the user's sound card

Understand the difference between EDIT MODE and PERFORMANCE MODE in Pure Data. To make patch connections, one has to be in EDIT mode and to use the control interface one has to be in PERFORMANCE MODE (Cmd+E toggles between the two modes)

All INPUTS are at the top of the module and all the OUTPUTS are at the bottom. Infinite amount of connection can be drawn from the same output so there is no need for multiples in the system.q

The modules cannot be duplicated by copying and pasting like in the first XODULAR system. You can however load them as abstractions. Just call them by the same name written on the module with _ between words. For example: the PRESET VOLTAGE SOURCE can be called as an abstraction by writing [preset_voltage_source]

Shift+click allows you to fine tune the settings of a knob/slider with higher-resolution.

For a deeper understanding of Pure Data please refer to the Floss Manuals ( http://en.flossmanuals.net/pure-data/ ) or the helpful Pure Data Community on Facebook

## SIGNAL FLOW:

There are three types of signals in the ecoSYSTEM: audio, cv and trigger/gate/pulse/clock. The latter are marked with RED inlets and outlets. General rule in the ecoSYSTEM is that all connections are possible. Or, at least, just like in any hardware modular system - all connections might not work but there's no harm in trying.

The ecoSYSTEM uses color-coding to clarify the signal flow as much as possible. Red inlets and outlets are related to trigger/gate/pulse/clock signals. Pink text is a bipolar function. Blue knobs are attenuators for a CV input.

Pure Data will stop producing sound if a DSP feedback loop is detected. So feedback patches that works like a charm with harder is trickier in this environment. To get around this problem, you can make use of the FEEDBACK PATCHBAY in the ecoSYSTEM. What we can do to avoid the DSP loop is to add 1ms of delay to a signal and then you can feed a signal back in to the same module. Drag a patchchord into the [delwrite~ fb1 1] object and drag another patch-chord out from the [delread~ fb1] object into your feedback destination.

The ecoSYSTEM automatically saves and recalls the position of all the module controls when you save the patch. This way you can save a patch like any file on your computer.

For an in-depth explanation of each module continue reading the manual or skip to the page for a specific module.

# VOICES

## FLUX PRESET WAVEFORMS:
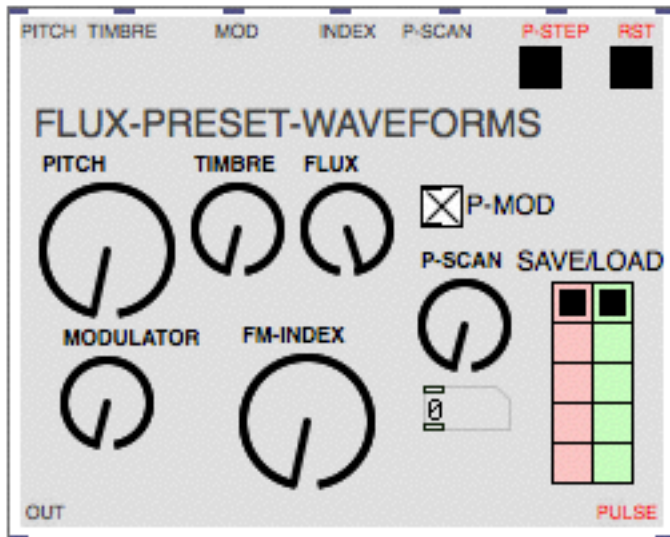


The FLUX PRESET WAVEFORMS is a complex oscillator with the ability to store 5 waveforms and address those waveforms with CV or sequentially with TRIGGERS.

**CONTROLS:**

PITCH - controls the pitch of the FPW.

TIMBRE - morph between folded sine and sawtooth

FLUX -  The FPW has 16 sine wave partials which are constantly being fed random amplitude. The FLUX knob controls the rate at which the partials receive a new random amplitude. The result is either a slow morph (10 seconds ) of overtones or rapid fluctuations at 100 ms.

MODULATION - controls the pitch of the modulator oscillator

FM-INDEX - controls the FM index

P-SCAN - knob to scroll through the preset 1-5

SAVE/LOAD - click the pink column to save present waveform to slot 1-5 and click green column to load saved waveforms.

P-MOD - when the the toggle is on any incoming modulation to inlets P-STEP and P-SCAN will come through. Un-tick the box and any incoming CV won't affect the preset section. This is useful because all knobs and control on the module becomes more or less useless when you are modulating through presets. Because all controls are jumping to new values constantly you won't be able to change the sound when P-MOD is activated. Un-tick and make adjustments to any parameter. Then click the save column again to save the new adjustment to a preset slot and activate P-MOD again to continue preset modulation.

**INPUTS:**

PITCH, TIMBRE, MOD, INDEX - inlets for modulating these parameters. All knobs becomes an offset control when being modulated.

P-SCAN - inlet for addressing the five preset waveforms with external CV

P-STEP - expects a trigger/gate/pulse signal and when received will sequentially step through preset waveforms 1 - 5

**OUTPUTS:**

OUT - outputs complex wave

PULSE - outputs a pulsewave unaffected by all controls on the module except for the PITCH control. This can be used either as a crude square wave or as a trigger/gate/clock source.

# SINEBANK:
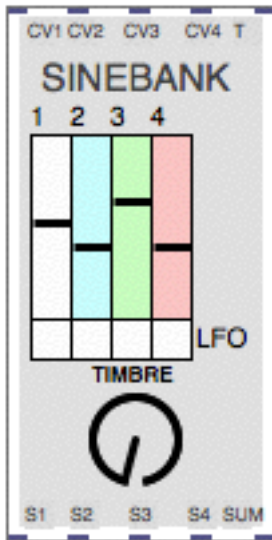
The SINEBANK consist of four sine wave oscillators that individually can be set to VCO or LFO mode.
All waves have separate outputs as well as a mix out plus individual inlets for CV control.

**CONTROLS:**

1, 2, 3, 4 - the four sliders controls the pitch of each sine wave.

VCO/LFO - the toggle underneath each slider controls the frequency range. Tick the box to access LFO mode with slower rates and leave un-ticked for VCO mode.

TIMBRE - global control for waveshaping/folding all four sine waves.

**INPUTS:**

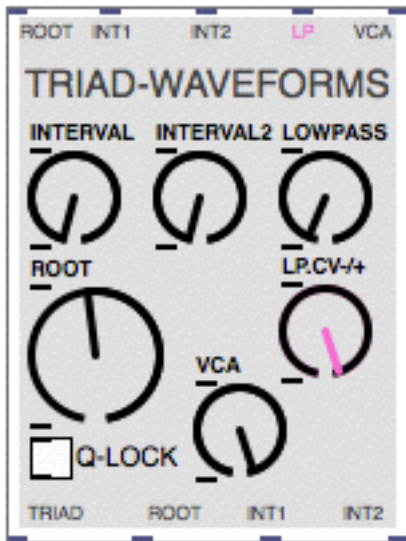CV1, CV2, CV3, CV4 - inlets for modulating the frequency of sine wave 1-4

T - inlet for modulating the TIMBRE control

**OUTPUTS:**

S1, S2, S3, S4 - individual outputs for sine wave 1 - 4

SUM - outputs the sum of al sines

# TRIAD-WAVEFORMS

The TRIAD-WAVEFORMS is an intervalic oscillator with three intervals. These can either be locked to the current scale of the PRESET-VOLTAGE-SOURCE or run freely. There is also an onboard low pass filter with attenueverter for incoming CV and VCA.

**CONTROLS:**

ROOT - global frequency control.

INTERVAL 1 - set an interval in relation to the ROOT knob. Range equals one octave.

INTERVAL 2 - set an interval in relation to the ROOT knob. Range equals one octave.

LOWPASS - controls the cut off on a low pass filter

LP.CV-/+ - attenueverter for CV coming in at the LP input

VCA - controls the output volume and acts as an offset for modulation coming in at the VCA input.

Q-LOCK - tick the box to make TRIAD-WAVEFORMS track the scale of the PRESET-VOLTAGE-SOURCE. Leave un-ticked for un-quantized pitch control
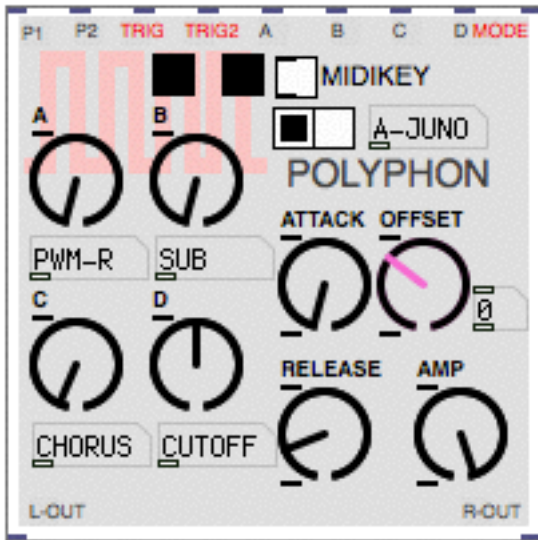
**INPUTS:**

ROOT, INT1, INT2, LP and VCA - inlets for modulating corresponding parameters

**OUTPUTS :**

TRIAD - outputs the sum of ROOT, INT1 and INT2

ROOT, INT1 and INT2 - separate outputs for each oscillator

# POLYPHON:



The POLYPHON is a 4 voice polyphonic synth with the option of choosing between two types of synthesis. It can be controlled either with CV from the Ecosystem or from an external midi-keyboard. It has 4 parameters to control the timbre, an attack-release envelope (attack-sustain-release if you're controlling it from external midikeyboard )

The POLYPHON does not produce sound constantly like other oscillators. It needs to be triggered at the TRIG or TRIG2 input to open up the internal envelope and produce sound. Also, make sure the AMP knob is turned up.

**CONTROLS :**

A-JUNO or P-MOD: Choose between an emulation of the Alpha-Juno sound or a phase modulation synth.

A-JUNO mode:

A - PWM-rate

B - volume control for saw sub-oscillator

C - Chorus amount

D - Cutoff control for a low pass filter

P-MOD mode:

A - pitch of modulator osc

B - modulation index

C - controls the timbre from dark to bright sound

D - amount of wavefolding

ATTACK - attack length for the internal envelope

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RELEASE - release length for the internal envelope

OFFSET - offsets the pitch of incoming CV at P1 and P2

AMP - volume control for the POLYPHON

MIDIKEY - tick box to enable external control from midikeyboard

**INPUTS:**

P1 and P2 - (pitch1 and pitch2) You can send two independent CV sources to P1 and P2 which will be triggered accordingly by the TRIG and TRIG2 inputs. You control the pitch of the oscillator here. But you also need to provide gate/trig/clock information to TRIG or TRIG2 to produce sound. The POLYPHON is stereophonic so for best results patch into two channels of THE MAESTRO hard-panned left and right. CHANNEL 5 & 6 is a good choice because of the onboard delay on those channels of THE MAESTRO.

TRIG and TRIG2 - gate/trigger inputs trigger CV present at that moment at P1 and P2

A, B, C and D - inlets for modulating parameters A-D in both A-JUNO mode and P-MOD mode

MODE - trigger/gate input for changing modes between A-JUNO and P-MOD

**OUTPUTS :**

L- OUT - left output

R-OUT - right output

# MODULATION

## PRESET VOLTAGE SOURCE:

The PRESET-VOLTAGE-SOURCE is primarily a 7-step probability sequencer with the ability to store and recall 5 different sequences. It can be used as a clock divider since it has individual gate outputs for each step. It also features slide and numerous scale options.
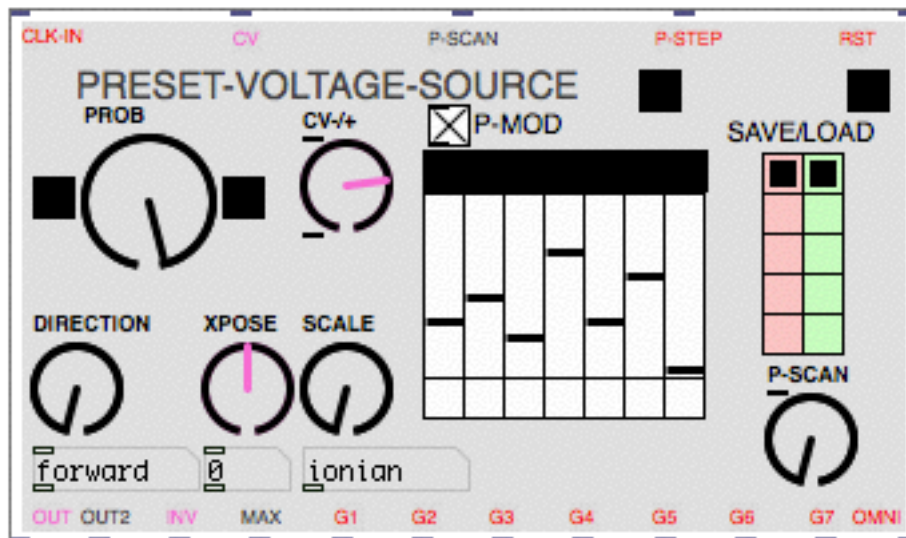


**CONTROLS:**

- PROB - this knobs sets the probability of a step happening. Fully CW every clock at the CLK-IN input will advance the sequencer and fully CCW the sequencer will stand still.

DIRECTION - sets the direction of the sequencer. Available options are forward, backwards and random

XPOSE - this knobs will transpose the sequencer either down one octave or up one octave

SCALE - select scale. Available scales are: ionian, dorian, phrygian, lydian, aeolian, whole, chromatic, harmonic-major, lydian minor, ancient, tetra, indian, pelog and slendro

CV-/+ - attenueverter for incoming CV at the CV input

PMOD - if the box is ticked, incoming CV at P-STEP and RST will pass through. Un-tick to momentarily pause any incoming CV from there. This is useful when adjusting sequencer presets.

7 SLIDERS - seven vertical sliders that adjust the pitch for each step

7 SLIDE TOGGLES: underneath each slider is a toggle which sets the slide state on or off. Ticked box means slide is activated.

SAVE/LOAD: Five slots for saving sequences and recalling/loading them. This can be done manually by clicking the mouse in a slot. Or you can adress the presets with CV at the P-SCAN input or step through them sequentially at the P-STEP input.

P-SCAN: this knob scrolls through the 5 presets. Can be addressed with CV.

**INPUTS:**

CLK-IN: input for clocking the sequencer. The PRESET VOLTAGE SOURCE has no internal clock. It has to be clocked externally to run.

CV - CV input to modulate the pitch of the sequencer. Note that this input is modulating pre-quantizer, so CV here will not transpose the sequencer. Just change to other pitches within the same scale. If you need to transpose the sequencer you should make use of the preset system and save presets with different transpositions. The CV is only passed through to the OUT and INV outputs. OUT2 and MAX is not affected by this CV input. This is useful because it allows you to have to several different lines from the same sequence.

P-SCAN: CV input to address the five presets

P-STEP - gate/trigger input to sequentially step through preset 1-5

RST - gate/trigger input to reset the sequencer to step 1

**OUTPUTS:**

OUT - outputs the sequencer and is affected by CV at the CV input

OUT2 - same as OUT but NOT affected by the CV input

INV - inverted version of the sequence and is affected by the CV input.

MAX - un-quantized output of the sequence. Especially useful for modulation duties when you need the entire dynamic range of CV. MAX is  NOT affected by the CV input.

G1-G7 - individual gate outputs for each step

OMNI - outputs all gates 1-7

**PRESET VOLTAGE SOURCE TIPS &TRICKS:**

2 independent lines:Patch the OUT output to an oscillator. Patch OUT2 to another oscillator. If you modulate the PREST VOLTAGE SOURCE at its CV input. You will hear the oscillators playing two independent melodic lines.

3 independent lines: Same as above but patch the INV output to a third sound source.

Change sequence length:  patch the G4 output via the FEEDBACK PATCHBAY and into the RST input. This way you will get a looping 4 step sequence. Use different gate outputs to set the sequence length accordingly

Chain sequences: If you patch the G7 output via the FEEDBACK PATCHBAY and back into the P-STEP input of the PRESET VOLTAGE SOURCE. The sequencer will play all 7 steps and then change to the next saved sequence.  By saving similar sequences into the five slots and slightly change some parameters allows for pretty long and complex lines. Try setting the probability knob at different settings on each preset and you will get a nice variation in intensity.

# SHAPES~:
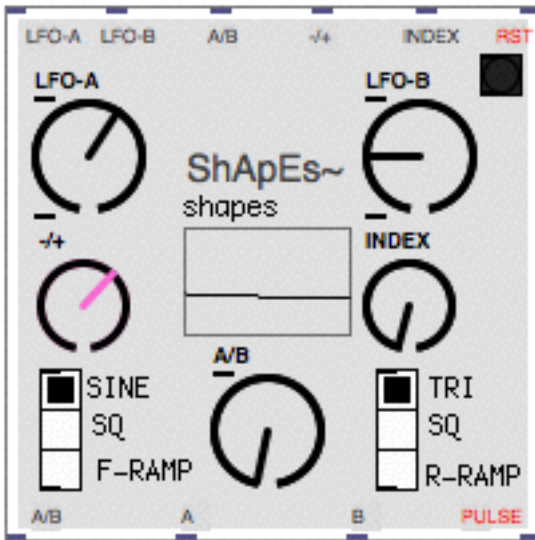


SHAPES is dual LFO module for complex lfo-shapes.

**CONTROLS:**

LFO-A: sets the frequency of LFO-A

-/+ - attenueverter for the output signals of all outlets except the PULSE output

SINE, SQ, F-RAMP - choose waveform  for LFO-A

A/B - crossfader control for mixing the two LFOs at the A/B output

LFO-B - set the frequency of LFO-B

INDEX - sets the amount of frequency modulation from LFO-B to LFO-A

TRI, SQ, R-RAMP - choose waveform  for LFO-B

INPUTS:

LFO-A, LFO-B, A/B, -/+ and INDEX - CV inputs for these parameters

RST - gate/trigger input to reset the waveform of both LFO-A & B

**OUTPUTS:**

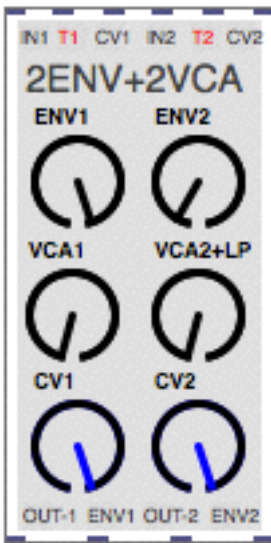A/B - outputs the mix of LFO-A &B set by the A/B crossfader knob.

A - outputs only LFO-A

B - outputs only LFO-B

PULSE - outputs a pulsewave locked to the frequency of LFO-A. Useful for clocking other modules in the Ecosystem.

# 2ENV+2VCA:

This module is a flexible utility tool. It consists of two VCAs with integrated AD envelopes to shape the VCAs. Channel two has an integrated Low Pass Filter in the circuit. There are separate outputs for both the VCAs and the envelopes, so you could use it as a envelope for other duties in the system without patching anything into to its input.

**CONTROLS:**

ENV1 & 2 - control the AD envelope. Fully CCW is zero attack, zero decay. Turning the knob to noon increases the decay while attack stays at zero. After noon to fully CW decays stays long but longer attack time is added.

VCA1 - volume knob for controlling the amplitude of signal coming in at IN1

VCA 2 - volume knob + cutoff freq of a low pass filter for signal coming in at IN2

CV1 - control the ENV1 amount to modulate the VCA1 and functions as attenuator for signals coming in at CV1

CV2 - control the ENV2 amount to modulate the VCA2+LP and functions as attenuator for signals coming in at CV2

**OUTPUTS:**

OUT1 & OUT2 - signal outputs

ENV1 & ENV2 - outputs the envelope shapes of ENV1 & 2DUAL PROB. RANDOM:

**INPUTS:**

IN1 - signal input
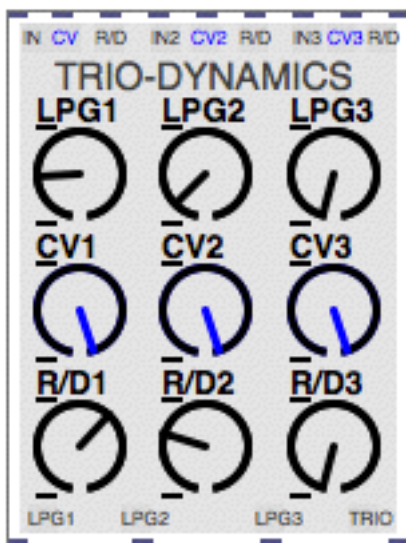
T1 - trigger input for ENV1

CV1 - inlet for modulating VCA1 with onboard attenuator (CV1)

15

IN2 - signal input

T2 - trigger input for ENV2

CV2 - inlet for modulating VCA2 with onboard attenuator (CV2)

# TRIO DYNAMICS:

The TRIO DYNAMICS is a three channel LOW PASS GATE simulation. The three channels are identical so only one will be described. There are individual outputs for each channel as well as a mix out.

**CONTROLS :**

LPG 1 - controls the amplitude and the cutoff frequency of the low pass gate. The response of this knob is dependent on the setting of the R/D ring/damp mode.

CV1 - attenuator for incoming CV at CV1

R/D1 - knob to control the response of the low pass gate. Fully CCW will produce a long ring to the VCA. Turn CW to shorten the ring and fully CW the sound is quickly dampened.

**INPUTS:**

IN - signal input

CV - CV input ( sending a gate/trigger to the CV is enough to open the Low Pass Gate and the R/D knob will control how long the gate will be open.

R/RD - inlet for modulation the R/RD parameter.

**OUTPUTS:**

LPG1 - 3 - individual signal outputs

TRIO - mix out

# COMPLEX PRESET ENVELOPE GENERATOR:

The COMPLEX PRESET ENVELOPE GENERATOR is a dual envelope generator/lfo. Use them individually or chain them together to get a A-D-A-D envelope shape. By using the preset function it is possible to achieve a A-D-A-D x5 shape. The two envelopes share the same controls and functions so only one will be described.
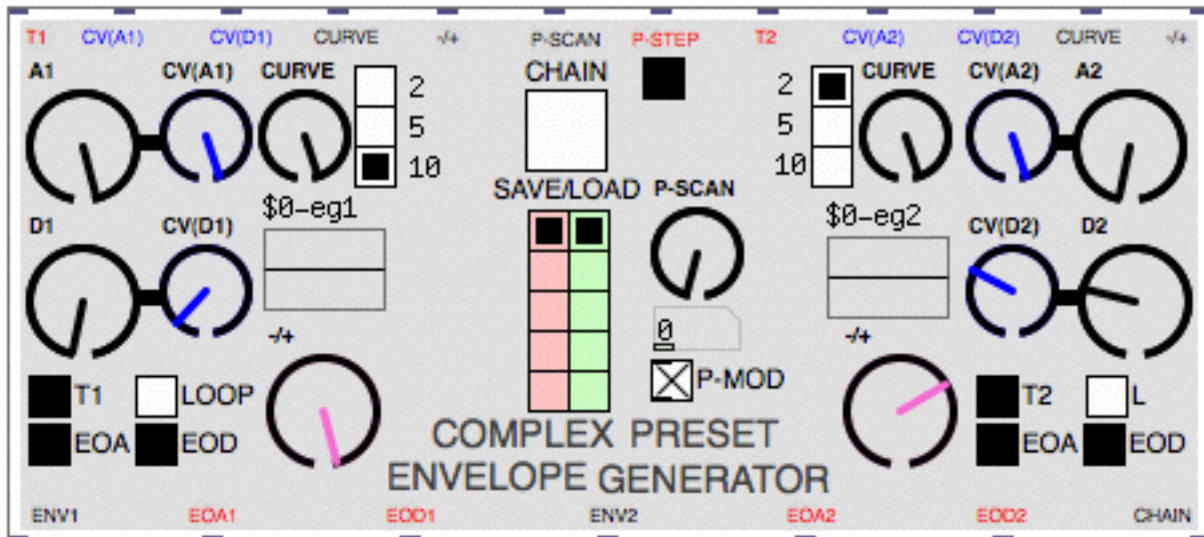


## CONTROLS:

A1 - controls the attack length of ENV1. Maximum length is either 2 seconds, 5 seconds or 10 seconds depending on the state of the 2, 5, 10 ratio to the right of the CURVE knob.

CV(A1) - attenuator for CV to modulate the attack length from input CV(A1)

CURVE - knob that changes the envelope curve from a more linear envelope shape fully CCW and a more percussive shorter decay fully CW.

D1 -  controls the decay length of ENV1. Maximum length is either 2 seconds, 5 seconds or 10 seconds depending on the state of the 2, 5, 10 ratio to the right of the CURVE knob.

CV(D1) - attenuator for CV to modulate the decay length from input CV(D1)

-/+ -polarizing gain control for the ENV1 output to fine-tuning modulation without using external modules.

CHAIN: tick the CHAIN box to immediately force a looping version of ENV1 and ENV2 to be chained together creating an A-D-A-D envelope/lfo shape.

SAVE/LOAD - manual control for saving or recalling 5 different preset shapes.

P-MOD - tick this box to let through modulation at the P-SCAN and P-STEP input.

LOOP - tick this box to loop the envelope.

**INPUTS:**

T1 - trigger/gate input to trigger ENV1

CV(A1) - cv input for ENV1 attack

CV(D1) - cv input for ENV1 decay

CURVE - cv input for the CURVE parameter

-/+ - cv input for the-/+ control

P-SCAN - scan through envelope presets with CV

P-STEP - step through envelope presets sequentially.

- same inputs then applies for ENV2…

**OUTPUTS:**

ENV1 - outputs envelope 1

EOA1 - gate/trigger output that goes high after the attack of ENV1

EOD1 - gate/trigger output that goes high after the decay of ENV1

ENV2 - outputs envelope 2

EOA2 - gate/trigger output that goes high after the attack of ENV2

EOD2 - gate/trigger output that goes high after the decay of ENV2

CHAIN - output for the chaining of ENV1 & ENV2. I.e, if you tick the CHAIN box, this is the output where the A-D-A-D chain appear. ENV1 still just outputs ENV1 etc..

# DUAL PROB. RANDOM:
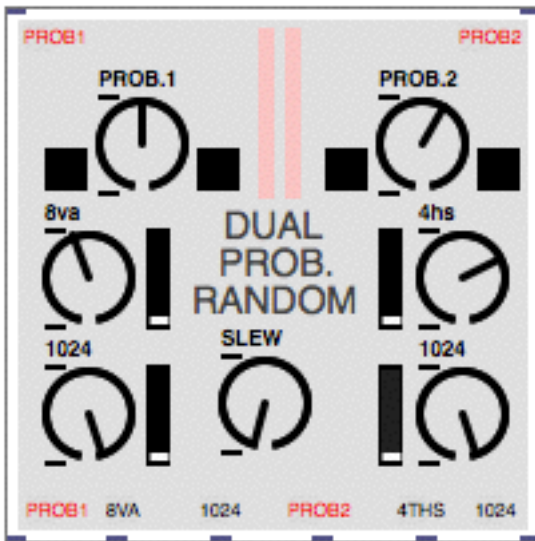


The DUAL PROB. RANDOM module is a dual random generator. The two random generators can be clocked individually. It can also be used as a probabilistic clock-divider.

**CONTROLS :**

PROB1 - determines the probability of the incoming clock happening.

8va - control to set the range of the 8va output

1024 - control to set the range of the 1024 output

SLEW - global slew/portamento control for all outputs

PROB.2 - determines the probability of the incoming clock happening.

4ths . control to set the range of the 4THS output

1024 - control to set the range of the 1024 output

**INPUTS:**

PROB.1 & 2 - inputs for clocking random generator 1 & 2

**OUTPUTS:**

PROB1 - outputs a gate determined by the PROB1 control knob

8VA - outputs random voltage in octaves with the range determined by the 8VA knob

1024 - outputs 1024 different random voltages with a range determined by the 1024 control knob
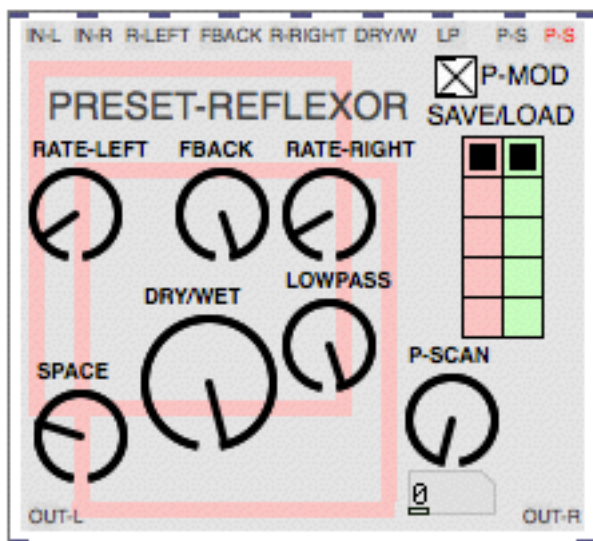
PROB2 - outputs a gate determined by the PROB2 control knob

4THS - outputs random voltage in 4ths with the range determined by the 4ths knob

1024 - outputs 1024 different random voltages with a range determined by the 1024 control knob

# SOUND PROCESSING

## PRESET REFLEXOR:



The PRESET REFLEXOR is a dual channel delay module that can be used to obtain delay, chorus, flanger, pitch shift and reverb type effects. It features a preset system to store and recall knob settings.

**CONTROLS:**

RATE-LEFT - set the delay rate of channel 1

FBACK - set the delay feedback

RATE-RIGHT - set the delay of channel two

SPACE - set the space from a small tight room to a larger space

DRY/WET - set the dry/wet state

LOWPASS - controls the cutoff of a lowpass filter on the output signal

P-MOD - tick this box to pass through any modulation at the P-S and P-S(red letters) input.

P-SCAN - knob to scroll through the five preset settings

SAVE/LOAD - click the pink column to save knob setting s into slots 1-5. And click the green column to recall presets 1-5

**INPUTS:**

IN-L channel one input

IN- R - channel 2 input

R-LEFT - CV input for channel 1 delay rate

FBACK - CV input for the feedback

R-RIGHT - CV input for channel 2 delay rate

DRY/W - CV input for the DRY/WET control

LP - CV input for the LOWPASS control

P-S - CV input for the P-SCAN control

P-S (red letters) - CV input for stepping through the presets sequentially.

**OUTPUTS:**

OUT-L - outputs channel 1

OUT-R - outputs channel 2

Patch the outputs to two different hard-panned channels on THE MAESTRO for stereo delay/reverb

# SPECTRAL BANK:

The SPECTRAL BANK consists of 16 bandpass filters with individual gain control to shape the spectrum. Use the OMNI output to output all bands, or 4 individual outputs for specific control over the spectrum. It also has an internal white noise source.
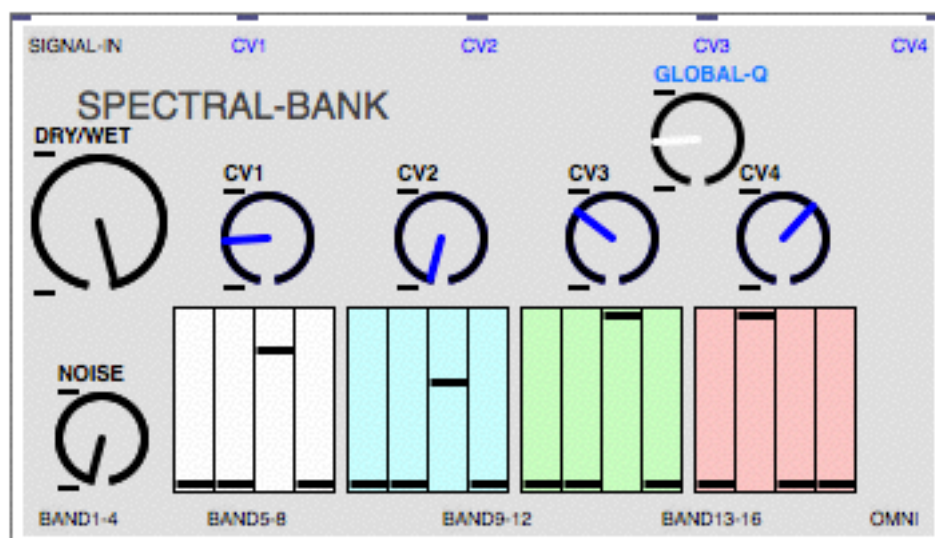
**CONTROLS:**

16 SLIDERS - gain control for individual bandpass filters

DRY/WET - crossfade between the dry signal from the SIGNAL-IN input and the wet signal

NOISE - knob to set the amount of white noise sent through the spectral bank.

CV1 - attenuator for incoming CV to modulate band 1-4

CV2 - attenuator for incoming CV to modulate band 5-8

CV3 - attenuator for incoming CV to modulate band 9-12

CV4 - attenuator for incoming CV to modulate band 13-16

GLOBAL-Q - controls the resonance for all bandpass filters

**INPUTS:**

SIGNAL-IN - signal input

CV1 - input for modulating band 1-4

CV2 - input for modulating band 5-8

CV3 - input for modulating band 9-12

CV4 - input for modulating band 13-16

**OUTPUTS:**

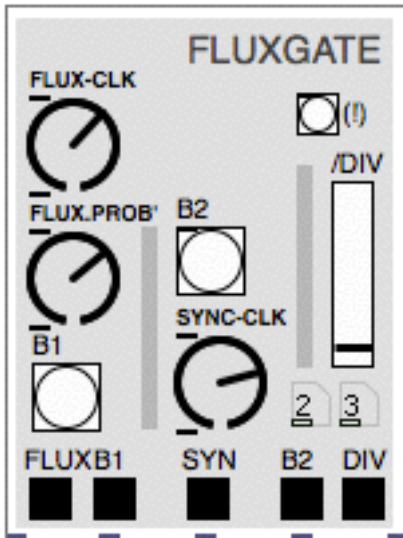BAND1-4 - outputs band 1-4

BAND5-8 - outputs band 5-8

BAND9-13 - outputs band 9-13

BAND 13-16 - outputs band 13-16

OMNI - outputs all bands.

# MIXERS VCAs & UTILITY

## FLUXGATE:

The FLUXGATE is a versatile clock source. It has several functions It is a random clock generator, a fixed clock generator, a clock divider and a manual trigger source

**CONTROLS :**

FLUX-CLK - controls the intensity of the random clock generator

FLUX-PROB - controls the probability of the random clock generated by FLUX-CLK happening.

B1 - Button that makes a gate at the B1 output. The gate will not happen exactly when you click it but at the next gate in produced by the FLUX-CLK.

SYNC-CLK - controls the speed of the synced gate at the SYN output

B2 - Button that makes a gate at the B2 output. The gate will not happen exactly when you click it but at the next gate produced by the SYNC-CLK

(!) - clicking this button executes the clock division set by the /DIV slider

/DIV - slider to set a clock division from the SYNC-CLK. First set the slider, then push the (!) button to execute the change. The divided clock is present at the DIV output

**INPUTS:** none
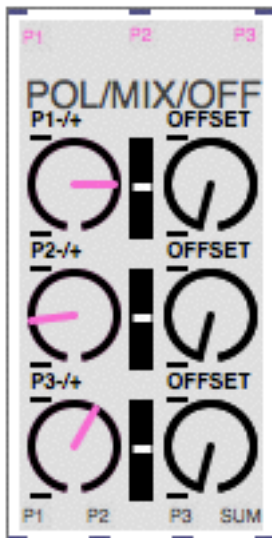
**OUTPUTS:**

FLUX 1- random clock out

B1 -outlets a manual gate when clicking the B1 button

SYN - synced clock output

B2 - outlets a manual gate when clicking the B2 button

DIV - outlets a division of the SYN clock set by the /DIV slider and executed by the (!) button.


# POL/MIX/OFF:



The POL/MIX/OFF is a utility tool mainly intended to fine-tune cv sources. It works as a polarizer, mixer, offset control. It consists of three identical channels.

**CONTROLS:**

P1-/+ - Polarizer control. At noon the signal is amplified zero. Turn clockwise to increase the signal and counter-clockwise for a negative inverted version of the signal. There is a vertical meter monitoring the incoming signal.

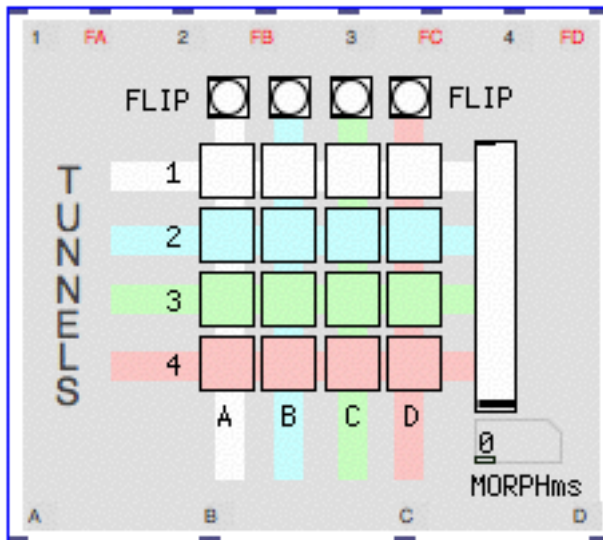OFFSET - knob to offset an incoming signal at P1-P3

**INPUTS:**

P1-P3 - input audio, cv or gate to channel 1-3

**OUTPUT:**

P1-P3 - individual outputs for channel 1.-3

SUM - Sum out

## TUNNELS:



TUNNELS is a muting matrix mixer for flexible routings of CV or audio. It has 4 inputs and 4 outputs. You set the on or off stage by toggling boxes. You can manually flip the state of all toggles on a channel by clicking the FLIP button, or do it using a gate/trigger source. There's a global morph control that crossfades any on/off stage by 50-5000 ms.

## THE MAESTRO:

The MAESTRO is an eight channel output mixer. Patch sound sources to its inlets to hear sound and mix them together.
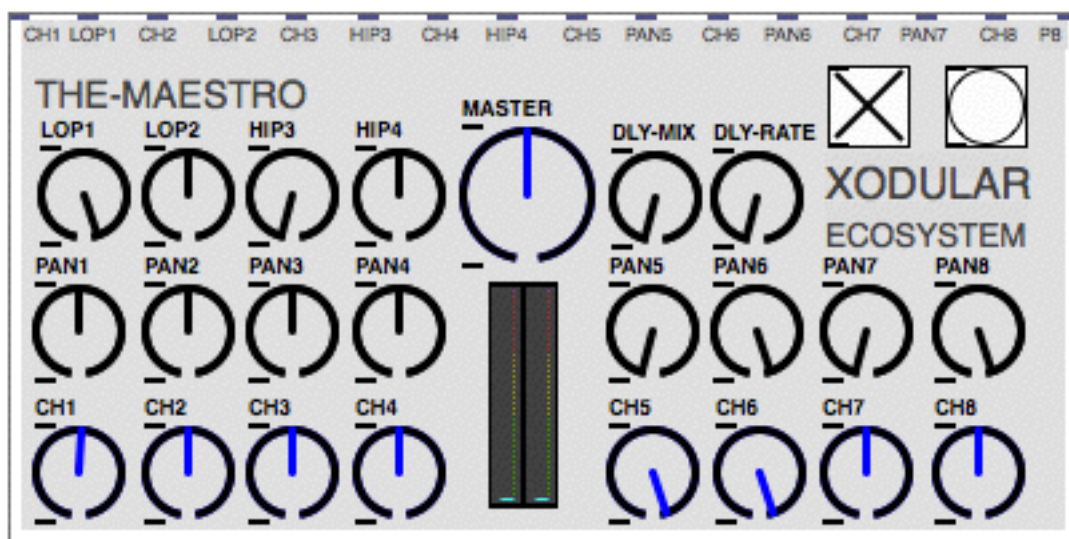
CHANNEL 1-2 - These channels have controls for gain, pan and lowpass filter frequency. The latter is under CV control.

CHANNEL 3-4 - These channels have controls for  gain, pan and hi pass filter frequency. The latter is under CV control.

CHANNEL 5-6 - These channels have controls for gain, pan and delay mix and delay rate. These channels are particularly useful in tandem with the POLYPHON as an easy way to apply delay to the stereo source. Panning is under CV control.

CHANNEL 7-8 - These channels have controls for gain and pan only. Panning is under CV control.

THE MAESTRO is hardwired to output 1 and 2 on your soundcard or internal speakers. Changing this requires changing the [dac~ 1 2] inside the module to numbers of your choice.

# MIDI MODULES & FEEDBACK PATCHBAY:

The Xodular Ecosystem features some very simple midi abilities. It is beyond the scope of this system and manual to get into advance MIDI but anything you want to do is most certainly possible in Pure Data. The MIDI modules in the Ecosystem are found at the bottom of the system.
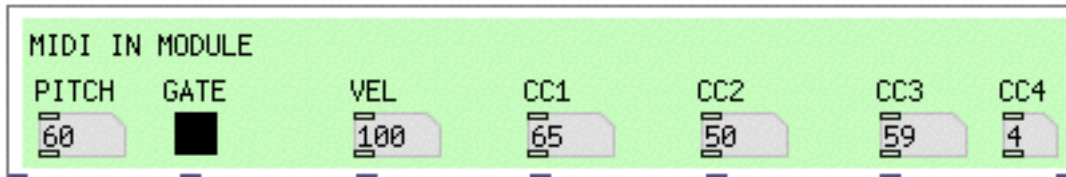
**MIDI OUT:**
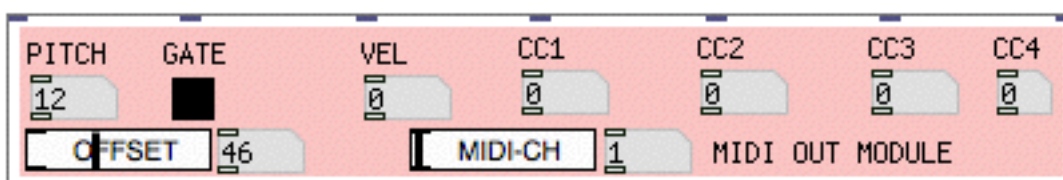


MIDI OUT has inlets for PICTH, GATE, VELOCITY and CC1-4. To change the CC numbers you need to open the module and change the name of the objects [ctlout 1] to desired number - [ctlout numberofchoice]

The module features a slider for offsetting pitch sent to external midi gear. Also, adjust the MIDI-CH slider to select between channels 1- 16

**MIDI IN:**



The MIDI IN module has outlets for PITCH, GATE, VELOCITY and CC1-4 that you can patch to wherever you like in the Ecosystem. To change CC numbers, use same method as described above.

Make sure that your MIDI equipment are chosen in the MIDI SETTINGS in Pure Data and you should be good to go. Any external MIDI gear needs to be connected and turned on BEFORE turning on Pure Data for it to work.
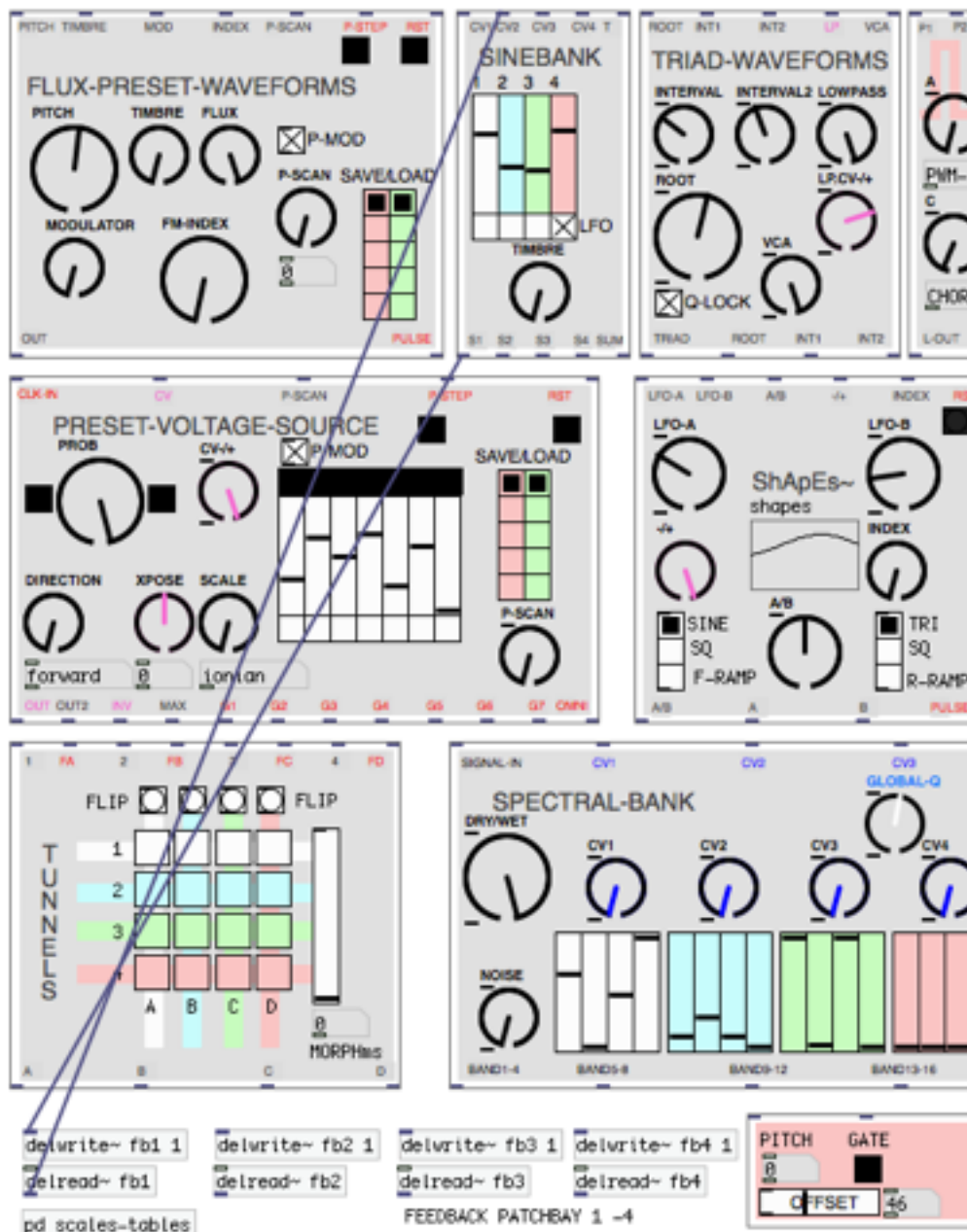
# FEEDBACK PATCHBAY:
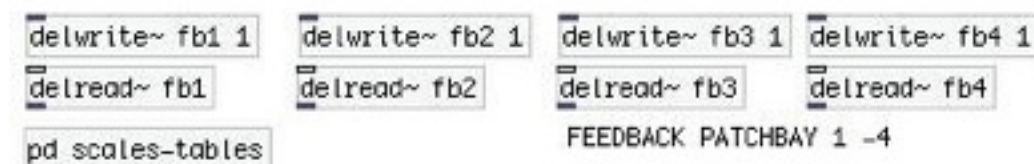


The FEEDBACK PATCHBAY is a way of avoiding DSP loops in Pure Data. Patch a signal into any of the four [delwrite~ ] objects to delay the signal by 1 ms. The signal can then be taken from the [delread~] object underneath and then be used for feedback patching. You will notice when a DSP loops occur. All audio will go silent and your patch will stop. Redo your latest connection via the FEEDBACK PATCHBAY and you are good to go.
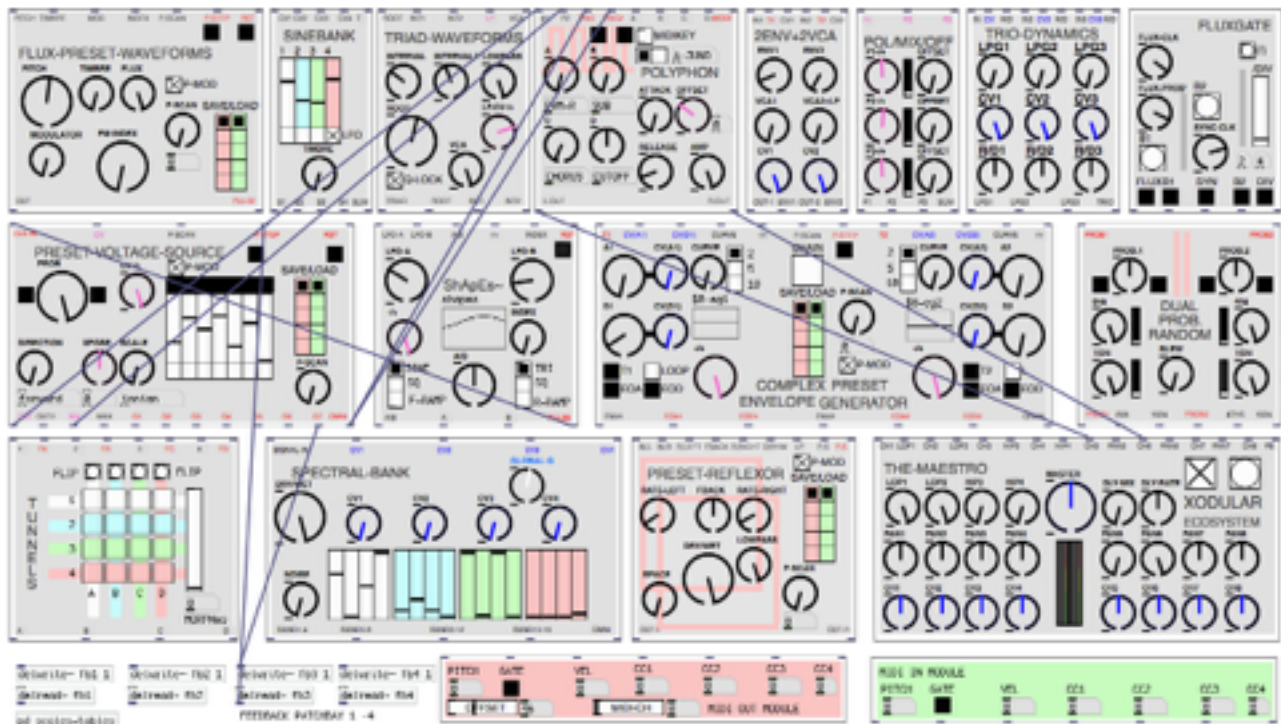
# EXAMPLE PATCHES

## EXAMPLE PATCH 1: USING THE FEEDBACK PATCHBAY

This example illustrates how to get around DSP loops in Pure Data. In this patch, sine wave 1 on the SINEBANK is frequency modulation sine wave 2 via the FEEDBACK PATCHBAY.

# EXAMPLE PATCH 2: CHAIN 5 SEQUENCES AND SEND DUOPHONIC CHORDS TO THE POLYPHON

This patch uses the individual gate output of step 7 from the PRESET VOLTAGE SOURCE, via the FEEDBACK PATCHBAY, to the P_STEP inlet on the PRESET VOLTAGE SOURCE. This will play the sequence and then switch to the next preset saved in slots 1-5. The OUT and INV outputs are sent to P1 and P2 on the POLYPHON. The OMNI gate output triggers T1 and T2 to open the envelope on the POLYPHON. So the POLYPHON is playing the notes from the PRESET_VOLTAGE SOURCE's sequence at the same time as the inverted notes from the sequence.

# EXAMPLE PATCH 3: USING FLUX PRESET WAVEFORMS

This patch uses the FLUX output from the FLUXGATE and to trigger channel 1 on DUAL PROB. RANDOM and to open up the LPG1 of the TRIO DYNAMICS. The random 1024 output is sent both to modulate the RING/DAMP of the LPG1 and into the P-SCAN input OF THE FLUX PRESET WAVEFORMS. The ability to store 5 waveforms and play them in sequence makes the FPW an ideal oscillator to make grooves and sequences without using the PRESET VOLTAGE SOURCE.